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ORIGINAL ARTICLE

Perimenopausal symptom burden: implications for health, work and earlier clinical management

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ABSTRACT

Objective: Perimenopausal women often experience symptoms impairing quality of life, yet they receive limited clinical attention. This study aimed to assess symptom burden, health-related quality of life (HRQoL) and work-related outcomes across reproductive aging stages.

Method: Secondary analysis included 1478 women aged 40–54 years from 12 Latin American countries, classified by age and menstrual status into four groups: age 40–44 years with regular cycles (reference), age 45–49 years with regular cycles, age 45–49 years with irregular cycles (perimenopause) and age 50–54 years with absent menses (early postmenopause). Symptoms, HRQoL, work-related outcomes and job satisfaction were assessed using validated instruments Multivariable logistic regression analyses were performed.

Results: Symptom severity increased progressively across stages, with severe symptoms rising from 18.3% (reference group) to 50.6% in postmenopausal women ($p < 0.001$). Compared with the reference group, women with irregular cycles and those with absent menses had higher odds of severe symptoms (odds ratio [OR] 2.97 and 3.71), lower HRQoL (OR 1.62 and 1.97) and lower job satisfaction (OR 2.01 and 3.07), respectively. Menopausal stage was not independently associated with work-related quality of life.

Conclusion: Symptom burden and its impact on health and job satisfaction emerge before menopause and may inform earlier, stage-specific clinical guidance.

ARTICLE HISTORY

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KEYWORDS

Perimenopause; symptom burden; health-related quality of life; work outcomes; menopausal transition

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PLAIN LANGUAGE SUMMARY

Many women experience bothersome symptoms in the years before menopause, when menstrual cycles are still present. These symptoms, such as hot flushes, sleep problems, mood changes, fatigue and joint pain, often occur while women are working and managing family and social responsibilities. However, most clinical attention focuses on the period after menopause, when menstruation has stopped. This study examined how symptoms during midlife are associated with women's health and working life before and after menopause. We analyzed data from 1478 women aged 40–54 years from 12 Latin American countries, grouped by age and menstrual pattern (regular cycles, irregular cycles or no periods for at least 1 year). We assessed symptom severity, health-related quality of life (HRQoL) and work-related outcomes, including job satisfaction. We found that symptoms increased across reproductive aging stages. Women aged 45–49 years commonly report severe menopausal symptoms irrespective of menstrual regularity, although the prevalence of these symptoms is higher among those experiencing menstrual irregularities. Job satisfaction also declined in women with irregular cycles and after menopause. These findings show that the health impact of menopause begins before periods stop. Earlier recognition may improve well-being and support women during this life stage.

Introduction

The symptoms of menopause can be distressing, particularly as they occur at a time when women have important roles in society, within the family and in the workplace [1]. Several population-based studies have shown that moderate to severe menopausal symptoms are independently associated with poorer health-related quality of life (HRQoL) scores and reduced occupational performance, leading to increased absenteeism and presenteeism [2,3]. Given the demographic shift toward an aging female workforce, the health and economic implications of menopause have become a relevant public health concern.

In response to this burden, major scientific societies have developed comprehensive, evidence-based clinical practice guidelines for the management of menopausal symptoms. The International Menopause Society (IMS) and the North American Menopause Society (NAMS) provide detailed recommendations regarding menopausal hormone therapy (MHT), non-hormonal therapeutic options and individualized risk assessment [4,5]. These guidelines have substantially improved the standardization of care for symptomatic postmenopausal women and clarified the benefit–risk profile of available therapies.

However, an important gap persists. The onset of menopause-related health disturbances frequently occurs during the late reproductive years, when menstrual cycles are still present but hormonal fluctuations become more pronounced [6]. Women during the perimenopause often report vasomotor symptoms, sleep disruption, mood instability and cognitive complaints [7]. Although cardiometabolic and long-term health risks are influenced by the timing of menopause [8,9], less attention has been paid to the earlier symptomatic phase preceding the final menstrual period. Clinical guidance specifically addressing the identification and management of symptomatic premenopausal women remains limited, as current recommendations primarily focus on postmenopause [4,5].

The so-called 'luteal out-of-phase (LOOP) effect', described during perimenopause, refers to a pattern in which a new menstrual cycle may begin before completion of the preceding luteal phase, resulting in overlapping cycles and disrupted cyclicity [10,11]. This phenomenon is consistent with the endocrine variability observed during the menopausal transition, as characterized by the Stages of Reproductive Aging Workshop (STRAW +10) staging system, which includes shortened cycles, intermittent anovulation and luteal phase dysfunction [12]. These alterations contribute to irregular and often heavy menstrual bleeding. In parallel, marked fluctuations in estradiol levels combined with relative progesterone deficiency may contribute to hot flushes, mood instability, sleep disturbance and mastalgia.

This therapeutic and conceptual gap may contribute to under-recognition of symptomatic women. Whether earlier recognition or management modifies subsequent health or occupational outcomes remains to be established in longitudinal studies. From a public health standpoint, failure to address perimenopausal symptomatology may have cumulative effects on long-term well-being, productivity and healthcare utilization.

Therefore, the present study represents a secondary analysis of the REDLINC XIII cohort designed to address a specific question that has not been examined in previous reports. Unlike earlier analyses, which evaluated menopause more broadly or focused on work-related outcomes in wider age groups, this study compares women at distinct reproductive aging stages defined simultaneously by age and menstrual status, allowing a more precise assessment of the menopausal transition while minimizing the influence of chronological age. The present study aims to evaluate whether reproductive aging stage, defined by age and menstrual pattern, is associated with menopausal symptom severity, HRQoL, work-related quality of life and job satisfaction in midlife Latin American women. By integrating menopausal symptoms, HRQoL, work-related quality of life and job satisfaction within the same analytical framework, this study provides new evidence regarding the associations between reproductive aging stage and these outcomes during the menopausal transition. These findings contribute to a better understanding of the health burden experienced across the menopausal transition and may inform future longitudinal research and the development of stage-specific clinical strategies.

Methods

Study design and participants

This study represents a secondary analysis of data derived from the REDLINC XIII study, a multicenter cross-sectional investigation conducted across 30 healthcare centers in 12 Latin American countries between June 2024 and January 2025. The methodology and baseline characteristics of the overall cohort have been previously described [13]. For the purposes of the present sub-analysis, only women aged 40–54 years were included. Additional exclusion criteria included prior hysterectomy and/or oophorectomy and menstrual status not meeting the predefined classification criteria. After applying these criteria, 1478 women were included in the final analysis (Figure 1).

Women were categorized into four groups according to age and menstrual status: 322 women aged 40–44 years with regular menstruation (reference group); 288 women aged 45–49 years with regular menstruation; 271 women aged 45–49 years with irregular menstrual cycles (inter-cycle variability ≥7 days; perimenopausal group); and 597 postmenopausal women aged 50–54 years (early postmenopause) [12].

This classification enabled the assessment of menopausal symptoms (Menopause Rating Scale [MRS]), HRQoL (Short Form-36 Health Survey [SF-36]) and work-related quality of life across reproductive aging stages while minimizing confounding by chronological age. Women aged 40–44 years with regular cycles were selected as the reference group, as previous analyses have shown that women aged 45–49 years with regular menstruation may already experience climacteric symptoms [7]. The comparison between the second and third groups was specifically designed to isolate the impact of menstrual transition while minimizing the influence of age. Women aged ≥55 years were excluded to reduce age-related confounding.

Studied variables

Demographic and health data

The following variables were analyzed: age (years), years of education, parity (number of children), partner status, sexual activity (defined as ≥1 sexual encounter in the previous year), current use of MHT, physical inactivity (defined as engaging in <150 min per week of moderate-intensity aerobic activity, such as brisk walking, cycling, recreational sports or dancing) [14], current smoking, obesity (classified according to World Health Organization [WHO] criteria as body mass index ≥30.0 kg/m^2), current use of psychotropic medications (antidepressants, hypnotics or anxiolytics) and comorbidities (defined as receiving treatment for dyslipidemia, diabetes mellitus or hypertension). Occupational status was categorized as housewife, employed or self-employed. Menopausal status was defined according to the STRAW+10 criteria [12].

Study instruments

Menopausal symptoms

The MRS was used to assess menopausal symptoms [15]. This scale assesses the presence and severity of 11 symptoms, which are divided into three subscales: somatic-vegetative symptoms (items 1–3 and 11), psychological symptoms (items 4–7) and urogenital symptoms (items 8–10).

The symptoms assessed by the questionnaire include hot flashes, cardiac discomfort, sleep disturbances, muscular and joint discomfort, depressive mood, irritability, anxiety, physical and mental exhaustion, sexual problems, bladder issues and vaginal dryness. Each of the 11 items can be rated on a Likert scale ranging from 0 (absent) to 1 (mild), 2 (moderate), 3 (severe) or 4 (very severe).

This scale allows the calculation of mean and standard deviation values for each item within a study population. In

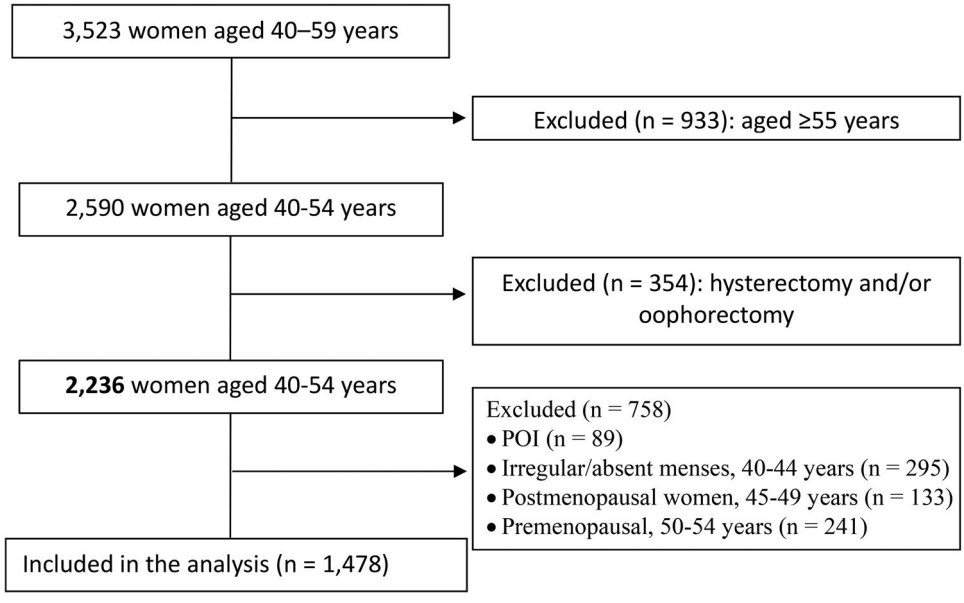


Figure 1. Participant flowchart. POI, premature ovarian insufficiency.

addition, mean scores for each subscale can be calculated (sum of rates of each subscale item) and the sum of each subscale scores provides a total MRS score. Severe menopausal symptoms are defined as a score equal to or greater than 14 points [16]. A higher total MRS score indicates a greater deterioration in quality of life. The questionnaire has been validated in both Spanish and Portuguese (Brazil) [17,18].

Health-related quality of life questionnaire

HRQoL was assessed using the SF-36 [19]. This questionnaire comprises 36 items designed to assess multiple dimensions of HRQoL. The items are grouped into eight distinct domains: physical functioning (limitations in performing a wide range of physical activities; 10 items), role limitations due to physical health (problems with work or other daily activities due to physical health; four items), bodily pain (intensity of pain and its interference with normal work, both at home and outside; two items), general health (personal perceptions of current health, future health prospects, and resistance to illness; five items), vitality (feelings of energy and fatigue; four items), social functioning (extent to which physical or emotional problems interfere with social activities; two items), role limitations due to emotional problems (difficulties with work or daily activities due to emotional problems; three items) and mental health (general mental health, including depression, anxiety, behavioral control and psychological well-being; five items).

Responses use Likert scales (2, 3, 5 or 6 points). Some items are reverse scored so that higher scores always reflect better HRQoL. Raw responses are transformed to a 0–100 scale, with higher values indicating better HRQoL. Domain scores are calculated as the mean of all transformed item scores within each domain. The average of the eight domain scores was used as a comprehensive global measure of HRQoL. The SF-36 has been translated and psychometrically validated for use in Spanish [20] and Brazilian Portuguese [21] across Latin American populations.

Work-related assessment instruments

Given that the work-related assessment instruments are intended for individuals in paid employment, they were administered to 899 women who met this criterion.

The Work-Related Quality of Life Scale (WRQoL) was developed by Easton and Van Laar to assess perceived work-related quality of life [22]. It comprises 24 items rated on a 5-point Likert scale ranging from 1 ('strongly disagree') to 5 ('strongly agree'). The items are organized into six domains: control at work, home–work interface, general well-being, working conditions, job and career satisfaction, and stress at work. For each domain, item scores are summed and averaged to obtain a representative domain score. The overall WRQoL score is calculated by summing the domain scores, with higher values indicating better perceived work-related quality of life. For the present study, the Spanish-language version of the scale was used [23], except in Brazil where the Portuguese version was administered [24].

Job satisfaction was assessed using the Job Satisfaction Scale (JSS) developed by Warr et al. [25]. This instrument evaluates job satisfaction as an attitudinal response to employment, reflecting the worker's subjective appraisal of various job characteristics, including supervision, remuneration, opportunities for promotion, autonomy, task variety, physical working conditions and interpersonal relationships. The scale adopts a motivational framework aimed at identifying both satisfiers and dissatisfiers within the workplace. The original instrument comprises 15 items rated on a 7-point Likert scale ranging from 1 ('extremely dissatisfied') to 7 ('extremely satisfied'). A mean score is calculated, with values ≥5 indicating high job satisfaction. For analytical purposes, the domains of the JSS were grouped into intrinsic and extrinsic satisfaction dimensions. Intrinsic satisfaction included the nature of work, supervision and co-workers domains, reflecting satisfaction derived from the content and interpersonal aspects of work. Extrinsic satisfaction comprised the pay, promotion, fringe benefits, contingent rewards, operating procedures and communication domains, representing organizational and structural job conditions. Validated Spanish [26] and Brazilian Portuguese [27] versions of the scale were used in this study.

Statistical analysis

All statistical analyses were performed using SPSS software, version 21.0 for Windows (SPSS Inc., Chicago, IL, USA). Continuous variables are presented as the mean and standard deviation, while categorical variables are presented as the percentage with 95% confidence interval (CI). The Kolmogorov–Smirnov test was used to evaluate the normality of data distributions, and Levene's test was employed to assess the homogeneity of variances ($p > 0.05$ indicating homogeneity). Depending on these assumptions, comparisons of continuous variables were conducted using either Student's *t*-test (for normally distributed data) or the Mann–Whitney *U*-test (for non-normally distributed data). Comparisons of categorical variables were performed using the chi-square test.

To evaluate the independent association between menopausal stage and adverse health and work-related outcomes, separate multivariable logistic regression models were constructed for severe menopausal symptoms, low HRQoL, low job satisfaction and low WRQoL score. Menopausal stage was operationalized according to age and menstrual status and was categorized into four groups: women aged 40–44 years with regular menstrual cycles (reference category), women aged 45–49 years with regular cycles, women aged 45–49 years with irregular cycles and women aged 50–54 years with absent menstruation. Odds ratios (ORs) and 95% CIs were calculated. All models were adjusted for the sociodemographic, lifestyle, reproductive and clinical covariates presented in Table 1.

Final models were restricted to women in paid employment. Low HRQoL, low job satisfaction and low WRQoL score were defined as scores within the lowest quartile of the sample distribution. Severe menopausal symptoms were defined as a total MRS score ≥14 [16].

Table 1. Sociodemographic and clinical characteristics of participants according to age group and menstrual status.

	Age 40–44 years	*Age 45–49 years*		*Age 50–54 years*
	Regular cycles	*Regular cycles*	*Irregular cycles (>7 days)*	*No cycles for ≥1 year*
Characteristic	*(n = 322)*	*(n = 288)*	*(n = 271)*	*(n = 597)*
Age (years)	42.0 ± 1.4	47.0 ± 1.4[a]	47.1 ± 1.0[a]	52.3 ± 1.4[a]
Years of education	15.6 ± 4.4	15.1 ± 4.4	14.4 ± 4.8[a]	13.9 ± 5.3[a]
Number of children	1.7 ± 1.2	1.9 ± 1.2[b]	1.9 ± 1.3[b]	2.2 ± 1.5[a]
Has a partner	74.2 (69.4–79.0)	74.0 (68.9–79.1)	79.0 (74.1–83.9)	77.2 (73.9–80.6)
Sexually active	86.0 (82.2–89.8)	84.4 (80.2–88.6)	84.1 (79.8–88.5)	76.1 (72.6–79.5)[c]
Current MHT use	0.93 (0.12–1.99)	4.51 (2.10–6.93)[c]	8.9 (5.5–12.3)	19.1 (15.9–22.3)[c]
Physical inactivity	48.8 (43.3–54.3)	57.3 (51.5–63.0)[c]	50.9 (44.9–56.9)	49.9 (45.9–53.9)
Obesity (BMI ≥ 30 kg/m^2)	19.6 (15.2–23.9)	21.2 (16.4–25.9)	27.3 (22.0–32.6)[c]	20.9 (17.7–24.2)
Smoker	11.5 (8.0–15.0)	7.6 (4.6–10.7)	8.9 (5.5–12.3)	8.0 (5.9–10.2)
Current psychotropic medication use	15.8 (11.8–19.9)	19.1 (14.5–23.7)	25.1 (19.9–30.3)[c]	26.6 (23.1–30.2)[c]
Presence of comorbidities	11.8 (8.3–15.3)	17.0 (12.7–21.4)	27.3 (22.0–32.6)[c]	41.0 (37.1–45.0)[c]

[a]Statistically significant difference ($p < 0.05$), Mann–Whitney *U* test.
[b]Statistically significant difference ($p < 0.05$), Student's *t*-test.
[c]Statistically significant difference ($p < 0.05$), chi-square test.
Data presented as mean ± standard deviation or percentage (95% confidence interval). Comparisons were performed against the reference group (women aged 40–44 years with regular menstruation). Only statistically significant *p*-values are shown. Normality of data distribution assessed using the Kolmogorov–Smirnov test. BMI, body mass index; MHT, menopausal hormone therapy.

For all analyses, two-sided $p < 0.05$ was considered statistically significant. For clarity and to improve table readability, statistically significant *p*-values are reported as <0.05, although several associations reached $p < 0.001$.

Ethical considerations

The study protocol received ethical approval from the Ethics Committee of the University of Cartagena (Reference number 178-26-11-24-1-1), based in Cartagena, Colombia. The research was conducted in accordance with the principles outlined in the Declaration of Helsinki. Before participation, all women were informed about the study's aims and procedures and provided written informed consent. This article was initially written in Spanish and subsequently translated into English. Grammar and style corrections were supported by ChatGPT.

Results

Table 1 summarizes the sociodemographic and clinical characteristics of the participants according to age group and menstrual status. Mean age increased progressively across groups ($p < 0.05$). Years of education were significantly lower among women aged 45–49 years with variable menstrual cycles and among those who were postmenopausal compared with the reference group aged 40–44 years. The number of children was higher in the older groups. The proportion of women reporting a partner was similar across categories; however, sexual activity was significantly lower among postmenopausal women. Current MHT use increased significantly with advancing age and menopausal status. Physical inactivity was more frequent among women aged 45–49 years and postmenopausal women than among the youngest group. Obesity prevalence was significantly higher among women aged 45–49 years with variable cycles and among postmenopausal women. The current use of psychotropic medication and the presence of comorbidities increased significantly across groups and were highest among postmenopausal women.

Table 2. MRS total and subscale scores and prevalence of severe menopausal symptoms according to age group and menstrual status.

	Menstrual cycle pattern				
MRS subscale	*Regular, age 40–44 years (n = 322)*	*Regular, age 45–49 years (n = 288)*	*Irregular,[a] age 45–49 years (n = 271)*	*Absent,[b] age 50–54 years (n = 597)*	p-*Value for the trend*
Somatic	2.4 ± 3.0	3.0 ± 2.9[c]	5.1 ± 4.0[d]	5.4 ± 3.7[d]	0.001
Psychological	3.2 ± 3.8	4.3 ± 3.9[c]	5.7 ± 4.6[d]	5.7 ± 4.2[d]	0.001
Urogenital	1.7 ± 2.5	2.3 ± 2.5[c]	3.3 ± 2.9[d]	4.2 ± 3.2[d]	0.001
Total MRS score	7.4 ± 8.0	9.7 ± 8.1[c]	14.1 ± 10.1[d]	15.3 ± 9.7[d]	0.001
Severe symptoms[e]	18.3 (14.1–22.6)	28.1 (22.9–33.4)[f]	43.5 (37.6–49.5)[f]	50.6 (46.6–54.6)[f]	0.001

[a]Cycle length variation ≥7 days.
[b]Amenorrhea ≥1 year.
[c]Comparison performed against the reference group (women aged 40–44 years with regular cycles) using Student's *t*-test.
[d]Comparison performed against the reference group (women aged 40–44 years with regular cycles) using the Mann–Whitney *U*-test.
[e]Severe menopausal symptoms defined as a Menopause Rating Scale (MRS) total score ≥14 points.
[f]Comparison performed against the reference group (women aged 40–44 years with regular cycles) using the chi-square test.
Data presented as mean ± standard deviation or percentage (95% confidence interval). Higher scores indicate greater symptom severity. Only statistically significant *p*-values ($p < 0.05$) are shown. Cronbach's α for the MRS in this sample was 0.858.

Table 2 presents the MRS total and subscale scores as well as the prevalence of severe menopausal symptoms according to age group and menstrual status. Mean scores for all MRS subscales (somatic, psychological and urogenital) increased progressively across reproductive aging stages (all *p*-values for trend = 0.001). Compared with women aged 40–44 years with regular menstrual cycles, significantly higher somatic, psychological and urogenital scores were observed among women aged 45–49 years with regular cycles and increased further among those with variable cycles and among women aged 50–54 years with absent menses (all $p < 0.05$). The total MRS score showed a similar pattern, rising from 7.4 ± 8.0 in women aged 40–44 years to 15.3 ± 9.7 in women aged 50–54 years with absent menses. Likewise, the prevalence of severe menopausal symptoms increased significantly across

groups, from 18.3% in the youngest group to 50.6% among women with absent menses ($p < 0.05$).

Table 3 presents the SF-36 domain scores according to age group and menstrual status. Overall, several domains of HRQoL declined across reproductive aging stages. Compared with women aged 40–44 years with regular menstrual cycles, women with irregular cycles and those with absent menses (age 50–54 years) had significantly lower scores in physical functioning and role limitations due to physical health ($p < 0.05$). Bodily pain and general health perception were also significantly reduced in these groups. Vitality scores declined progressively, with significantly lower values observed from age 45–49 years onwards. Social functioning and role limitations due to emotional problems were significantly lower in women with irregular cycles and in those with absent menses. Mental health scores showed a modest but significant reduction in the older groups.

The total SF-36 score decreased significantly from 71.6 ± 11.6 in women aged 40–44 years to 64.9 ± 13.6 in women aged 50–54 years with absent menses ($p < 0.05$). As no universally accepted clinical cut-off exists for the total SF-36 score, low HRQoL was defined as values within the lowest quartile of the sample distribution (cut-off 61.9), a commonly used approach in epidemiological research [28]. Using this definition, the proportion of women with low HRQoL was significantly higher among women with irregular cycles and those with absent menses ($p < 0.05$).

Table 4 presents WRQoL domain scores according to age group and menstrual status among employed women. Overall, WRQoL scores were broadly similar across reproductive aging stages. No statistically significant differences were observed across groups for job and career satisfaction, general well-being, home-work interface, stress at work or working conditions, which remained relatively stable across categories. A small but statistically significant reduction was observed in the control at work domain among women aged 50–54 years with absent menses compared with the reference group ($p < 0.05$). The total WRQoL score and the prevalence of low WRQoL score showed minimal variation across groups, with no statistically significant differences.

Table 5 presents the JSS scores according to age group and menstrual status among employed women. Intrinsic satisfaction scores were significantly lower among women with irregular cycles and those with absent menses compared with women aged 40–44 and 45–49 years with regular menstrual cycles ($p < 0.05$). A similar pattern was observed for extrinsic satisfaction, with significantly lower scores in women with irregular cycles and in postmenopausal women. The mean total JSS score decreased from 5.03 ± 1.17 in women aged 40–44 years to 4.67 ± 1.16 in women aged 50–54 years with absent menses ($p < 0.05$). The proportion of women classified as having higher job satisfaction (greater than or equal to the median) differed significantly across groups, being highest among women aged 40–44 and 45–49 years with regular cycles and lower among women with irregular cycles and absent menses ($p < 0.05$).

Table 3. Short Form-36 Health Survey (SF-36) domain scores and HRQoL according to age group and menstrual status.

	Menstrual cycle pattern				
SF-36 domain	*Regular, age 40–44 years (n = 322)*	*Regular, age 45–49 years (n = 288)*	*Irregular,[a] 45–49 years age (n = 271)*	*Absent,[b] 50–54 years age (n = 597)*	p-*Value for trend*
Physical functioning	88.7 ± 19.0	89.3 ± 17.0	83.4 ± 21.4[c]	78.3 ± 21.8[c]	0.001
Physical health	84.0 ± 32.0	81.2 ± 33.5	75.1 ± 35.6[c]	70.1 ± 39.9[c]	0.001
Bodily pain	78.1 ± 22.4	79.6 ± 19.9	69.3 ± 23.9[d]	68.3 ± 24.8[c]	0.001
General health	62.9 ± 18.5	64.2 ± 16.9	58.7 ± 18.4[d]	56.2 ± 18.6[d]	0.001
Vitality	61.1 ± 18.8	57.3 ± 19.0[d]	53.6 ± 18.9[d]	53.5 ± 19.7[d]	0.001
Social functioning	35.2 ± 9.9	35.4 ± 10.3	31.4 ± 10.5[d]	32.5 ± 9.5[d]	0.001
Emotional problems	81.4 ± 33.6	79.1 ± 35.3	73.3 ± 38.4[c]	74.1 ± 38.5[c]	0.040
Mental health	67.3 ± 17.9	65.2 ± 18.5	62.5 ± 17.4[d]	64.5 ± 16.7[c]	0.003
SF-36 total score	71.6 ± 11.6	71.8 ± 11.7	67.1 ± 13.7[c]	64.9 ± 13.6[c]	0.001
% Low HRQoL[e]	16.8 (12.7–20.9)	16.3(12.0–20.6)	26.9 (21.6–32.3)[f]	31.7(27.9–35.4)[f]	0.001

[a]Cycle length variation ≥7 days.
[b]Amenorrhea ≥1 year.
[c]Comparison performed against the reference group (women aged 40–44 years with regular cycles) using the Mann–Whitney *U*-test.
[d]Comparison performed against the reference group (women aged 40–44 years with regular cycles) using Student's *t*-test.
[e]Low health-related quality of life (HRQoL) defined as SF-36 total score ≤25th percentile (cut-off: 61.9).
[f]Comparison performed against the reference group (women aged 40–44 years with regular cycles) using the chi-square test.
Data presented as mean ± standard deviation or percentage (95% confidence interval). Only statistically significant *p*-values ($p < 0.05$) are shown. Cronbach's α for the SF-36 tool was 0.848.

Table 4. Work-related quality of life scores according to age group and menstrual status among employed women.

	Menstrual cycle pattern			
WRQoL domain	*Regular, age 40–44 years (n = 201)*	*Regular, age 45–49 years (n = 163)*	*Irregular,[a] age 45–49 years (n = 154)*	*Absent,[b] 50–54 years age (n = 381)*
Job and career satisfaction	22.7 ± 3.9	22.5 ± 4.2	22.3 ± 3.9	22.3 ± 4.0
General well-being	22.3 ± 4.2	22.3 ± 4.2	21.7 ± 4.4	22.0 ± 4.2
Home–work interface	10.7 ± 2.7	11.0 ± 2.7	10.7 ± 2.9	10.7 ± 2.7
Stress at work	5.3 ± 1.8	5.5 ± 2.0	5.4 ± 1.7	5.2 ± 1.8
Control at work	11.0 ± 2.3	10.6 ± 2.5	10.6 ± 2.4	10.3 ± 2.7[c]
Working conditions	11.4 ± 2.2	11.1 ± 2.6	11.5 ± 2.4	11.4 ± 2.6
Total WRQoL score[d]	83.4 ± 13.4	82.9 ± 13.6	82.2 ± 13.8	81.8 ± 13.9
% Low WRQoL[e]	20.9 (15.2–26.6)	25.2 (18.4–31.9)	22.7 (16.0–29.4)	26.8 (22.3–31.2)

[a]Cycle length variation ≥7 days.
[b]Amenorrhea ≥1 year.
[c]Comparison performed against the reference group (women aged 40–44 years) using the Mann–Whitney *U*-test.
[d]Higher Work-Related Quality of Life Scale (WRQoL) scores indicate better work-related quality of life.
[e]Low work-related quality of life defined as values ≤25th percentile (cut-off: 75.0).
Data presented as mean ± standard deviation or percentage (95% confidence interval). Only statistically significant *p*-values ($p < 0.05$) are shown. Cronbach's α for the WRQoL in this sample was 0.836.

Table 5. Job Satisfaction Scale (JSS) scores and percentage of low job satisfaction according to age group and menstrual status among employed women.

	Menstrual cycle pattern			
JSS score[a]	*Regular, age 40–44 years (n = 201)*	*Regular, age 45–49 years (n = 163)*	*Irregular,*[b] *age 45–49 years (n = 154)*	*Absent,*[c] *age 50–54 years (n = 381)*
Intrinsic satisfaction	34.7 ± 8.8	34.9 ± 8.6	32.3 ± 8.9[d]	32.3 ± 8.6[d]
Extrinsic satisfaction	40.8 ± 9.2	40.4 ± 9.4	38.2 ± 9.8[e]	37.8 ± 9.3[d]
Mean total score	5.03 ± 1.17	5.02 ± 1.18	4.70 ± 1.21[d]	4.67 ± 1.16[e]
% Low job satisfaction[f]	19.2 (13.7–24.7)	21.1 (14.8–27.5)	28.9 (21.7–36.2)[g]	27.9 (23.3–32.5)[g]

[a]Higher scores indicate better job satisfaction.
[b]Cycle length variation ≥7 days.
[c]Amenorrhea ≥1 year.
[d]Comparisons performed against the reference group (women aged 40–44 years) using Student's *t*-test.
[e]Comparisons performed against the reference group (women aged 40–44 years) using the Mann–Whitney *U*-test.
[f]Low job satisfaction defined as a mean score ≤25th percentile (cut-off: 4.13).
[g]Comparisons performed against the reference group (women aged 40–44 years) using the chi-square test.
Data presented as mean ± standard deviation or percentage (95% confidence interval). Only statistically significant *p*-values ($p < 0.05$) are shown. Cronbach's α for the JSS was 0.944.

Table 6. Association between menstrual cycle pattern and adverse health and work-related outcomes: adjusted logistic regression models.

	Menstrual cycle pattern (adjusted or 95% CI)			
Condition	*Regular, age 40–44 years (n = 201)*	*Regular, age 45–49 years (n = 163)*	*Irregular, age 45–49 years (n = 154)*	*Absent, age 50–54 years (n = 381)*
Severe menopausal symptoms[a]	1.00	1.71 (1.15–2.56)	2.97 (2.01–4.40)	3.71 (2.61–5.27)
Low HRQoL[b]	1.00	1.00 (0.64–1.54)	1.62 (1.07–2.45)	1.97 (1.37–2.84)
Low job satisfaction[c,d]	1.00	1.29 (0.74–2.24)	2.01 (1.19–3.40)	3.07 (1.37–6.88)
Low WRQoL score[d,e]	Menopausal stage not retained as a predictor of low WRQoL score in the final multivariable model			

[a]Menopause Rating Scale (MRS) total score ≥14.
[b]Lowest quartile of the Short From-36 Health Survey (SF-36) total score (≤61.9).
[c]Lowest quartile of the Job Satisfaction Scale (JSS) (≤4.13).
[d]Analyses restricted to women in paid employment.
[e]Lowest quartile of the Work-Related Quality of Life Scale (WRQoL) score (≤75.0).
Odds ratios were adjusted for the covariates presented in Table 1. CI, confidence interval; HRQoL, health-related quality of life.

In the adjusted logistic regression models (Table 6), menopausal stage was strongly associated with severe menopausal symptoms, showing a progressive increase in odds from women aged 45–49 years with regular cycles (OR 1.71; 95% CI 1.15–2.56) to those with irregular cycles (OR 2.97; 95% CI 2.01–4.40) and absent menstruation (OR 3.71; 95% CI 2.61–5.27), compared with women aged 40–44 years with regular cycles. A similar pattern was observed for low HRQoL, with significantly higher odds in women with irregular cycles (OR 1.62; 95% CI 1.07–2.45) and absent menstruation (OR 1.97; 95% CI 1.37–2.84), but not in those aged 45–49 years with regular cycles. Low job satisfaction was also associated with irregular cycles (OR 2.01; 95% CI 1.19–3.40) and absent menstruation (OR 3.07; 95% CI 1.37–6.88). Menopausal stage was not independently associated with low WRQoL score. All models were adjusted for the covariates presented in Table 1.

Discussion

The present study identified a consistent and progressive deterioration in menopausal symptoms, HRQoL and job satisfaction across reproductive stages, from early perimenopause to postmenopause. Importantly, these associations persisted after adjustment for relevant sociodemographic and clinical covariates, suggesting that menopausal stage independently influences women's health and selected work-related outcomes.

Menopausal symptom burden measured by the MRS increased markedly across stages, with the prevalence of severe symptoms rising from 18.3% in women aged 40–44 years to 50.6% among postmenopausal women aged 50–54 years. This progressive pattern aligns with previous epidemiological studies demonstrating that vasomotor, psychological and urogenital symptoms peak during the late menopausal transition and early postmenopause, largely driven by fluctuating and subsequently declining estradiol levels [29,30]. The strong dose–response gradient observed in our adjusted models (OR up to 3.71 for severe symptoms) reinforces the biological plausibility of this association.

HRQoL also declined progressively across reproductive stages, particularly in domains related to physical functioning, vitality, bodily pain and role limitations. These findings are consistent with prior research indicating that menopausal symptoms, especially vasomotor symptoms and sleep disturbances, are independently associated with impaired HRQoL [1,31]. Notably, women with irregular cycles and those with absent menses had significantly higher odds of low HRQoL, even after adjusting for obesity, comorbidities, psychotropic medication use and physical inactivity. This suggests that the reproductive stage contributes beyond chronological aging alone [32].

Interestingly, while HRQoL showed a clear association with menopausal stage, overall work-related quality of life (WRQoL scale) did not remain independently associated in the final multivariable model. This divergence may reflect the multidimensional nature of the WRQoL, which includes organizational, environmental and psychosocial factors that may buffer or dilute the direct impact of menopausal symptoms. Previous studies have shown that workplace context, managerial support and job flexibility significantly influence work-related well-being during midlife [33]. Thus, the menopausal stage alone may not be sufficient to explain global work-related quality of life.

In contrast, job satisfaction demonstrated a significant and progressive association with menopausal stage. Women with irregular cycles and postmenopausal status showed approximately twofold to threefold higher odds of low job satisfaction. This finding suggests that while broader WRQoL scores may be preserved, subjective satisfaction with work may be more sensitive to symptomatic burden, fatigue and emotional fluctuations during the menopausal transition. Reduced vitality and increased psychological symptoms, as observed in our cohort, may contribute to diminished occupational engagement and perceived fulfillment.

The sociodemographic profile presented in Table 1 further contextualizes these findings. Postmenopausal women

exhibited higher rates of comorbidities, obesity, psychotropic medication use and physical inactivity, all of which may compound symptom perception and quality of life impairment [34]. However, the persistence of associations after adjustment indicates that the menopausal stage itself plays a significant role.

Collectively, these findings highlight that the menopausal transition represents not only a biological milestone but also a period of measurable health and occupational impact. Given the increasing female workforce participation in midlife, understanding and addressing menopausal health becomes essential from both clinical and organizational perspectives.

Strengths and limitations

This study has several strengths. It includes a large, multicenter sample of midlife women from 12 Latin American countries, enhancing the regional relevance and external validity of the findings. The use of validated instruments to assess menopausal symptoms, HRQoL and job satisfaction strengthens the reliability and comparability of the results. Additionally, stratification by age and menstrual pattern allowed for a more nuanced evaluation of symptom burden across reproductive stages, highlighting clinically relevant differences before menopause is fully established.

However, some limitations should be acknowledged. First, the cross-sectional design precludes causal inference and limits the ability to determine temporal relationships between symptom burden and work-related outcomes. Second, menstrual status was based on self-report, which may have introduced misclassification. Hormonal measurements were not available, preventing biological confirmation of menopausal stage. In addition, although the multivariable analyses adjusted for several relevant demographic, lifestyle and clinical variables, residual confounding cannot be excluded. Potentially important factors, including socioeconomic status, psychological distress, previous psychiatric disorders, workplace characteristics, educational environment, ethnicity and country-specific contextual differences, were not collected and therefore could not be included in the analyses. These unmeasured variables may have influenced the observed associations. Finally, because the study population comprised Latin American women, the generalizability of the findings to other populations should be interpreted with caution. Future prospective studies that incorporate these variables are needed to better understand the independent associations between reproductive aging stage and health-related and work-related outcomes. Despite these limitations, the findings provide important insight into the early impact of menopausal symptoms on health and work, underscoring the need for greater clinical attention during the premenopausal and early menopausal transition stages.

Conclusion

Taken together, our findings suggest that symptom burden before menopause is not a benign or transitional phenomenon, but one that is measurably associated with impaired health perception and reduced work-related functioning. The magnitude and consistency of these associations suggest that clinically relevant vulnerability begins earlier than traditionally emphasized in menopause-focused frameworks. Importantly, these effects emerge in women who are still menstruating and who are frequently considered outside the scope of structured menopausal care.

These results, therefore, extend the current discussion beyond postmenopausal management and support the need to reconsider the temporal boundaries of clinical attention Our findings indicate that clinically relevant symptoms and impaired quality of life are already associated with the menopausal transition. These observations support further investigation into whether earlier recognition and management may improve subsequent outcomes. Recognizing the burden of perimenopausal symptoms as a legitimate clinical entity, rather than a diffuse or expected life phase, may encourage greater clinical attention during the menopausal transition and support future research evaluating stage-specific models of care for midlife women.

Author contributions

CRediT: **Juan E. Blümel**: Conceptualization, Formal analysis, Methodology, Project administration, Software, Supervision, Writing – original draft; **Peter Chedraui**: Formal analysis, Methodology, Supervision, Validation, Writing – original draft, Writing – review & editing; **María S. Vallejo**: Investigation, Methodology, Supervision, Writing – review & editing; **Lucia Costa-Paiva**: Data curation, Investigation, Writing – review & editing; **Hugo Gutiérrez-Crespo**: Investigation, Writing – review & editing; **Maribel Dextre**: Investigation, Writing – review & editing; **Karen Díaz**: Investigation, Writing – original draft; **Alejandra Elizalde-Cremonte**: Investigation, Writing – review & editing; **Santiago Elizalde-Cremonte**: Investigation, Writing – review & editing; **Carlos Escalante-Gómez**: Investigation, Writing – review & editing; **María T. Espinoza**: Investigation, Writing – review & editing; **Ircania García**: Investigation, Writing – review & editing; **Gustavo Gómez-Tabares**: Investigation, Writing – review & editing; **Juan Matzumura-Kasano**: Investigation, Writing – review & editing; **Paolo Meza**: Investigation; **Álvaro Monterrosa-Castro**: Conceptualization, Investigation, Writing – review & editing; **Mónica Ñañez**: Investigation, Supervision; **Marcela López**: Investigation, Writing – review & editing; **Eliana Ojeda**: Investigation, Writing – review & editing; **Claudia Rey**: Investigation, Writing – review & editing; **Ana Lucia Ribeiro Valadares**: Conceptualization, Investigation, Methodology, Writing – review & editing; **Marcio A. H. Rodrigues**: Investigation, Writing – review & editing; **Javier Saavedra**: Investigation, Writing – review & editing; **Carlos Salinas**: Investigation, Writing – review & editing; **Lida Sosa**: Investigation, Writing – review & editing; **Konstantinos Tserotas**: Investigation, Writing – review & editing; **Sócrates Aedo**: Conceptualization, Formal analysis, Methodology, Writing – review & editing; **Marcela S. Aguirre**: Investigation, Writing – review & editing; **Eugenio Arteaga**: Conceptualization, Investigation, Writing – review & editing; **Félix Ayala**: Investigation, Writing – review & editing; **Ascanio Bencosme**: Investigation, Writing – review & editing; **Andrés Calle**: Investigation, Writing – review & editing.

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Data availability statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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