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Factors Associated with Severe Menopausal Symptoms and Their Relationship with Sleep Quality and Quality of Life among Iraqi Postmenopausal Women

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ABSTRACT

Background: *Although the population of postmenopausal women continues to grow worldwide, Iraqi evidence describing the severity of menopausal symptoms, the factors driving that severity, and their relationship to sleep and quality of life remains limited.* ***Objective:*** *To identify factors associated with severe menopausal symptoms among Iraqi postmenopausal women and to examine how symptom severity relates to sleep quality and quality of life.* ***Methods:*** *In this twelve-month cross-sectional study, 400 postmenopausal women were recruited from Alzahraa Teaching Hospital, Najaf, Iraq, using consecutive sampling. Symptom severity, sleep quality, and menopause-specific quality of life were measured with the Menopause Rating Scale (MRS), the Pittsburgh Sleep Quality Index (PSQI), and the Menopause-Specific Quality of Life Questionnaire (MENQOL), respectively, while physical activity was captured with the International Physical Activity Questionnaire—Short Form (IPAQ-SF). Independent predictors of severe menopausal symptoms (MRS total score >30) were identified using multiple logistic and multiple linear regression.* ***Results:*** *Participants had a mean MRS total score of 18.6±9.2, and 60 women (15.0%) met criteria for severe symptoms. Among the 391 women with complete PSQI data, 69.6% had poor sleep quality (PSQI>5). MRS total score correlated positively with PSQI global score ($r=0.52$, $p<0.001$) and with overall MENQOL score ($r=0.61$, $p<0.001$). Multiple logistic regression identified six independent predictors of severe symptoms: obesity (BMI ≥30 kg/m²; AOR=2.14, 95% CI 1.32–3.47, p=0.002), low physical activity (AOR=2.68, 95% CI 1.58–4.55, p<0.001), low educational attainment (AOR=1.87, 95% CI 1.12–3.12, p=0.017), current smoking (AOR=2.31, 95% CI 1.09–4.89, p=0.029), presence of a chronic disease (AOR=1.76, 95% CI 1.05–2.95, p=0.032), and menopause before age 45 (AOR=1.95, 95% CI 1.08–3.52, p=0.027). A multiple linear regression on the continuous MRS score reproduced these six predictors and additionally identified waist circumference as an independent correlate of severity ($R^2=0.34$).* ***Conclusion:*** *Approximately 15% of postmenopausal women in this cohort experienced severe menopausal symptoms. Obesity, lack of physical activity, low education status, smoking habit, chronic diseases and younger age at menopause were associated with higher odds for severe symptoms which was strongly associated with poorer sleep and lower quality of life. Interventions that are focused on lifestyle, especially regarding weight management and physical activity could be useful in alleviating this symptom burden.*

Keywords: Menopause; Menopause Rating Scale; Sleep Quality; Quality of Life; Predictors.

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INTRODUCTION

Because life expectancy keeps rising, the global population of postmenopausal women is expanding rapidly, and most women can now expect to spend a third or more of their lives beyond menopause.[1] The clinical definition of menopause—the permanent cessation of menstruation due to depletion of ovarian follicles, diagnosed only retrospectively after 1 year without a period—has long been fixed in time, and its stages are classified per the STRAW+10 criteria. [2]The transition to menopause is accompanied by decreasing circulating oestrogen, leading to effects on many organ systems that produce multiple somatic, psychological and urogenital symptoms. [3] Musculoskeletal aches are among the most frequently reported complaints in mid-life women, with global prevalence estimated as high as 65% in a large meta-analysis.[4] Vasomotor symptoms — the hallmark feature of menopause — typically persist for a median of more than seven years, and continue beyond a decade in a meaningful subset of women after the final menstrual period.[5,6,7]

Beyond the discomfort they cause directly, menopausal symptoms also disrupt sleep, mood, and overall quality of life, and current guidelines therefore favor an individualized approach combining lifestyle measures with non-hormonal or hormonal treatment as needed.[8,9] A broad biological understanding of menopause is essential for guiding this kind of supportive and therapeutic decision-making.[10] A range of modifiable and non-modifiable factors has been linked to greater symptom severity. Longitudinal cohort data connect higher body weight and larger body size to more severe vasomotor and sexual symptoms.[11] Conversely, women who are more physically active tend to carry a lighter psychological and physical symptom load.[12,13] Independent effects of race, ethnicity, and socioeconomic markers such as educational attainment have also been documented in large multi-ethnic cohorts.[14] Similarly, type 2 diabetes — a common chronic metabolic condition — has been associated with greater severity of genitourinary, sleep-related, and metabolic menopausal symptoms.[15,16]

For appropriately selected women, hormone therapy remains the most effective option for bothersome vasomotor symptoms, though it should be avoided or used cautiously in those with a history of hormone-sensitive cancer, severe psychiatric illness, or significant hepatic or renal impairment.[17] Women who were on hormone therapy or had any of these conditions were excluded from this study, since either factor could distort the symptom severity actually attributable to untreated menopause.

Despite the clinical relevance of this topic, Iraqi data remain scarce and fragmented. Existing local studies have mostly examined age at menopause and general awareness of the menopausal transition,[18,19] or the prevalence of specific mental-health outcomes such as depression, generalized anxiety disorder, and insomnia among postmenopausal women. A more recent Baghdad-based study examined the relationship between menopausal symptoms and quality of life using the Menopause Rating Scale, but did not simultaneously measure sleep quality objectively or apply multivariable modelling to isolate independent determinants of severity.[20,21] To our knowledge, no prior Iraqi study has examined symptom severity, sleep quality, and menopause-specific quality of life together within a single multivariable framework.

To address this gap, the current study used three internationally validated instruments: the Menopause Rating Scale (MRS) to capture somatic, psychological, and urogenital symptoms;[22,23] the Pittsburgh Sleep Quality Index (PSQI) as a subjective, seven-component measure of sleep quality;[24,25] and the Menopause-Specific Quality of Life

Questionnaire (MENQOL) to assess vasomotor, psychosocial, physical, and sexual domains of quality of life.[26,27]

The primary aim of this study was to identify predictors of menopausal symptom severity among Iraqi postmenopausal women. Secondary aims were to describe sleep quality and quality of life in this cohort and to examine how each relates to symptom severity.

METHODS

Study design and duration

This cross-sectional observational study was carried out in Al-Zahraa Teaching Hospital, Najaf, Iraq, over a twelve-month period (July 2024–June 2025).

Study population and sample size

Using a single-center design, every postmenopausal woman attending the participating clinics during the period of study was screened for eligibility. Of 431 eligible women, 400 (92.8%) agreed to take part; the remaining 31 declined, most often citing lack of time (n=19) or lack of interest (n=12). This sample size reflects the cumulative number of eligible, consenting women identified over the twelve-month recruitment window at a single site, rather than a figure derived from an a priori power calculation.

Although sample size was not calculated prospectively, a retrospective calculation performed in G*Power (v3.1) indicated that 400 women provide more than 90% power to detect an odds ratio of 1.8 or higher for the strongest predictor in the final model, assuming a 15% baseline prevalence of severe symptoms in the reference group and a two-sided alpha of 0.05. This suggests the achieved sample was adequate, even though it was determined by practical recruitment limits over a fixed period rather than by prospective calculation. Eligible women had experienced menopause confirmed by at least one year of amenorrhoea, were 45–65 years old, and provided written informed consent.

Women were excluded if they had used menopausal hormone therapy currently or within the previous six months, had undergone surgical menopause (bilateral oophorectomy), had a history of gynaecological or breast cancer, had severe psychiatric illness that would compromise reliable self-report, or had chronic renal or hepatic failure.

Data collection tools

A standardized form captured sociodemographic and clinical data, including age, body mass index (BMI), waist circumference, age at menopause, parity, educational level, occupation, marital status, socioeconomic status, smoking, and chronic disease (diabetes mellitus, hypertension).

Physical activity was assessed with the IPAQ-SF, a standardized instrument validated internationally for quantifying activity levels.[28] Scores were expressed as continuous MET-minutes per week and were also grouped into low, moderate, and high categories following standard IPAQ criteria.

Symptom severity was captured with the MRS, an eleven-item self-report instrument covering somatic, psychological, and urogenital domains; each item is scored from 0 (none) to 4 (very severe), giving a possible total ranging from 0 to 44, with scores above 30 conventionally denoting severe symptoms.[22,23]

Sleep quality was assessed with the PSQI, a 19-item instrument yielding seven component scores that sum to a global score ranging from 0 to 21; poor sleep quality was suggested if the score was above five.[24]

Quality of life was assessed with the MENQOL, a 29-item scale covering vasomotor, psychosocial, physical, and sexual domains, each rated from 0 (not bothered) to 6 (extremely bothered).[26,27]

Nine women (2.3%) left some PSQI items blank and were excluded from PSQI-specific analyses (n=391), and five women (1.3%) had incomplete MENQOL forms and were

excluded from MENQOL-specific analyses (n=395). MRS data were complete for the full sample. Two waist-circumference values more than 140 cm were checked against clinic records, confirmed as accurate measurements rather than data-entry errors, and were retained in the analysis.

Statistical analysis

Data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables are presented as mean ± standard deviation (SD), whereas categorical variables are expressed as frequencies and percentages. The distribution of continuous variables was assessed using the Shapiro–Wilk test. Variables with a normal distribution were compared using the independent-samples t test, while the Mann–Whitney U test was applied for non-normally distributed data. Associations between categorical variables were examined using the chi-square test. Pearson's or Spearman's correlation coefficients were calculated, depending on the distribution of the data, to evaluate the relationships among MRS, PSQI, MENQOL scores, BMI, waist circumference, and physical activity

Potential confounding variables included in the regression analyses were selected based on previous literature and clinical relevance. These variables comprised BMI category, physical activity level, educational attainment, smoking status, chronic disease at study entry, and age at menopause. Prior to model construction, multicollinearity was assessed using tolerance values and variance inflation factors (VIF). All predictors met acceptable criteria (VIF <2 and tolerance >0.5), indicating that multicollinearity was unlikely to influence the regression estimates.

Severe menopausal symptoms (MRS >30 versus ≤30) were modelled using multiple logistic regression with the covariates above. With 60 women having severe symptoms and seven covariates in the final model, the events-per-variable ratio was approximately 8.6 — somewhat below the conventional threshold of ten — a limitation addressed further in the Discussion.[29] To corroborate the logistic regression using the continuous symptom score, a multiple linear regression was also performed, adding waist circumference as an additional covariate and using total MRS score as the dependent variable.[30] A two-sided p-value below 0.05 was considered statistically significant throughout.

Ethical considerations

All women signed written informed consent after receiving a complete description of the study's purpose and procedures. All data were kept confidential. This report follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations for cross-sectional cohorts.[31]

RESULTS

Four hundred postmenopausal women were enrolled during the one-year study period. Mean age was 54.6±5.9 years, and mean age at natural menopause was 48.3±3.7 years. Table 1 shows the sociodemographic and clinical characteristics.

Table 1. Baseline characteristics of participants (N=400).

Characteristics	Values
Age (years), mean±SD	54.6±5.9
Age at menopause (years), mean±SD	48.3±3.7
Years since menopause, mean±SD	6.3±4.8
BMI (kg/m²), mean±SD	28.7±4.5
Normal (<25), n (%)	96 (24.0%)
Overweight (25–29.9), n (%)	168 (42.0%)
Obese (≥30), n (%)	136 (34.0%)
Waist circumference (cm), mean±SD	92.4±10.3

Characteristics	Values
Parity, mean±SD	4.2±2.1
Education — illiterate, n (%)	88 (22.0%)
Education — primary, n (%)	112 (28.0%)
Education — secondary, n (%)	100 (25.0%)
Education — university or higher, n (%)	100 (25.0%)
Occupation — housewife, n (%)	272 (68.0%)
Occupation — employed, n (%)	128 (32.0%)
Socioeconomic status — low, n (%)	136 (34.0%)
Socioeconomic status — middle, n (%)	192 (48.0%)
Socioeconomic status — high, n (%)	72 (18.0%)
Marital status — married, n (%)	296 (74.0%)
Current smoker, n (%)	32 (8.0%)
Physical activity (IPAQ) — low, n (%)	220 (55.0%)
Physical activity (IPAQ) — moderate, n (%)	128 (32.0%)
Physical activity (IPAQ) — high, n (%)	52 (13.0%)
Any chronic disease, n (%)	168 (42.0%)
Diabetes mellitus, n (%)	72 (18.0%)
Hypertension, n (%)	96 (24.0%)

The three scales showed acceptable-to-good internal consistency in this sample: Cronbach's alpha was 0.81 for the MRS, 0.74 for the PSQI, and 0.86 for the MENQOL.

The mean MRS total score was 18.6±9.2 (range 0–44); applying the pre-specified cut-offs, 180 women (45.0%) had no or mild symptoms, 160 (40.0%) had moderate symptoms, and 60 (15.0%) had severe symptoms. Mean PSQI global score was 8.4±4.1 (n=391), with 272 women (69.6%) classified as poor sleepers (PSQI>5). Mean overall MENQOL score was 3.2±1.4 (n=395), with the vasomotor domain showing the highest mean bother score. Symptom, sleep, and quality-of-life scores are presented in Table 2.

Table 2. MRS, PSQI, and MENQOL scores (N=400, unless otherwise noted).

Measures	Scores
MRS total score, mean±SD (range 0–44)	18.6±9.2
Somatic subscale (0–16)	6.8±3.4
Psychological subscale (0–16)	6.1±3.6
Urogenital subscale (0–12)	5.7±2.9
MRS severity — none/mild (0–16), n (%)	180 (45.0%)
MRS severity — moderate (17–30), n (%)	160 (40.0%)
MRS severity — severe (>30), n (%)	60 (15.0%)
PSQI global score, mean±SD (range 0–21) (n=391)	8.4±4.1
Poor sleepers (PSQI>5), n (%) (n=391)	272 (69.6%)
MENQOL overall score, mean±SD (0–6) (n=395)	3.2±1.4
Vasomotor domain	3.6±1.7
Psychosocial domain	3.0±1.5
Physical domain	3.3±1.3
Sexual domain	2.7±1.8

MRS total score correlated positively with PSQI global score, overall MENQOL score, BMI, and waist circumference, and negatively with physical activity level (all p<0.001); PSQI global score was also positively correlated with MENQOL overall score (p<0.001). Full correlation coefficients are presented in Table 3.

Table 3. Correlations between key variables (N=400).

Variable pair	r	p-value
MRS total × PSQI global	0.52	<0.001
MRS total × MENQOL overall	0.61	<0.001
PSQI global × MENQOL overall	0.47	<0.001
MRS total × BMI	0.34	<0.001
MRS total × waist circumference	0.31	<0.001
MRS total × physical activity (IPAQ MET-min/week)	−0.38	<0.001

Multiple logistic regression identified six variables independently associated with severe menopausal symptoms: obesity, low physical activity, low educational attainment, current smoking, presence of a chronic disease, and early age at menopause. Current age, time since menopause, and parity were not independently associated with symptom severity. Occupation showed a borderline unadjusted association (housewives versus employed women, p=0.06) that was no longer significant after adjusting for education and physical activity (p=0.760), suggesting the crude difference largely reflected lower education and activity levels among housewives in this sample. The model showed adequate fit (Hosmer–Lemeshow p=0.62; Nagelkerke R^2=0.29). Full results are presented in Table 4.

Table 4. Logistic regression: independent predictors of severe menopausal symptoms (MRS>30) (N=400).

Predictor	AOR	95% CI	p-value
Obesity (BMI ≥30 vs <30 kg/m²)	2.14	1.32–3.47	0.002
Low physical activity (vs moderate/high)	2.68	1.58–4.55	<0.001
Low education (illiterate/primary vs secondary/university)	1.87	1.12–3.12	0.017
Current smoking	2.31	1.09–4.89	0.029
Chronic disease present	1.76	1.05–2.95	0.032
Early menopause (age at menopause <45 y)	1.95	1.08–3.52	0.027
Age ≥55 years	1.28	0.79–2.08	0.320
Years since menopause >5	1.42	0.89–2.27	0.140
Parity ≥5	1.15	0.71–1.86	0.570
Housewife (vs employed)	1.09	0.62–1.92	0.760

A multiple linear regression using the continuous MRS score corroborated these findings, with waist circumference emerging as an additional independent correlate after adjustment for BMI. Results are presented in Table 5.

Table 5. Linear regression: predictors of MRS total score as a continuous outcome (N=400).

Predictor	B	95% CI	β	p-value
BMI (kg/m²)	0.42	0.24 to 0.60	0.21	<0.001
Physical activity (per 500 MET-min/week lower)	0.38	0.15 to 0.61	0.19	0.001
Low education (vs high)	2.15	0.62 to 3.68	0.14	0.006
Current smoking	2.87	0.58 to 5.16	0.11	0.014
Chronic disease present	1.96	0.49 to 3.43	0.13	0.009
Age at menopause (per year earlier)	0.31	0.05 to 0.57	0.12	0.019
Waist circumference (cm)	0.09	0.01 to 0.17	0.10	0.031

Model summary: $R^2=0.34$, adjusted $R^2=0.32$, $F=13.6$, $p<0.001$.

DISCUSSION

This single-center cross-sectional study of 400 Iraqi postmenopausal women identified six independent predictors of symptom severity: obesity, physical inactivity, low education, smoking, chronic disease, and early menopause, corroborated by a complementary linear regression.

These findings are in agreement with the global meta-analysis by Fang et al., which reported greater symptom severity in populations with low income.[4] Our findings are also in line with those of a Baghdad-based study reporting a high prevalence of moderate-to-severe somatic and urogenital symptoms among postmenopausal women,[21] and extends earlier Iraqi studies by quantifying severity in relation to specific sociodemographic criteria.[18,19]

The association we observed between obesity and symptom severity is consistent with a large longitudinal Chinese cohort, in which both general and central obesity were associated with severe vasomotor and sexual symptoms.[11] This can be explained by the fact that adipose tissue is metabolically active and influences peripheral oestrogen conversion and thermoregulation. Although our cross-sectional design does not allow causal inferences, the independent association between waist circumference and symptom severity suggests that central adiposity may have a role in menopausal symptoms.

Low physical activity appeared as the strongest independent predictor of severity in our cohort, which is in agreement with previous studies. A random-forest analysis of a large cohort in northwest China likewise identified activity level as the most influential variable for symptom severity,[12] and moderate activity was similarly linked to lower psychosocial and physical symptom burden among perimenopausal Korean women.[13] Because regular activity favorably affects thermoregulation, mood, and sleep architecture without the contraindications associated with hormone therapy, it represents an attractive, modifiable target for symptom management.[17]

The independent link we found between lower education and greater severity mirrors results from a large United States cohort (nearly 69,000 women), where socioeconomic status predicted severity even after adjusting for race and ethnicity.[14] Education may influence symptom burden through pathways such as health literacy, delayed care-seeking, and cumulative psychosocial stress, a mechanism also proposed by Lu et al.[32]

The relationship between chronic disease — particularly diabetes and hypertension — and greater symptom severity is consistent with recent evidence that women with type 2 diabetes report a substantially higher burden of genitourinary and sleep-related menopausal symptoms than non-diabetic women,[15] and that

metabolic syndrome features are more pronounced in postmenopausal than premenopausal women with diabetes.[16] This pathway warrants attention given the high burden of metabolic disease in Iraq.

This cohort is consistent with a case-control study of midlife American women, in which current and former smokers had significantly higher risk of frequent hot flashes than women who had never smoked.[33]. A pooled analysis of eight cohort studies found that smoking and obesity each independently increased the risk of severe vasomotor symptoms, with the two exposures combining rather than substituting for one another[34]. Beyond its antioestrogenic action, smoking may also affect hypothalamic thermoregulation and cortisol-mediated stress pathways.

A large cross-sectional study of Chinese women similarly found no association between parity and age at menopause, but reported a possible non-linear (U-shaped) risk pattern with parity that a simple adjusted model, as used here, would not capture.[35]

Almost seven in ten women scored above the PSQI threshold for poor sleep, well above the roughly 51% reported in a recent large meta-analysis[36]. This may be due to that our sample was restricted to women who were already at least a year postmenopausal, and poor sleep quality tends to become more common as women move further into the postmenopausal years rather than the earlier transition.

On the MENQOL side, the vasomotor domain carried the highest bother score of the four . A Hamadan-based study of Iranian women likewise found vasomotor symptoms to be the most bothersome domain and sexual symptoms the least[37.] This mean that vasomotor symptoms are not simply the most visible complaint of menopause but the most burdensome one from the patient's own perspective,so to improve menopause-specific quality of life in our population we should focus primarily on controlling these symptoms.

Limitations

1. Although the response rate was high (92.8%), selection bias cannot be excluded if non-responders differed systematically from participants, since reasons for non-participation were not explored in depth among the 31 women who declined.
2. The cross-sectional design precludes causal inference; longitudinal data would be needed to establish temporal relationships between the predictors examined here and symptom severity.
3. This was a single-center study conducted in one general hospital, which may limit generalizability to other parts of Iraq or to women without access to hospital-based care; multicenter studies would strengthen external validity.
4. With only 60 of the 400 screened women having severe symptoms, the events-per-variable ratio for the seven-covariate logistic model was approximately 8.6, somewhat below the conventional recommendation of ten, which may modestly affect the precision of the estimates.
5. All four instruments used — the MRS, PSQI, MENQOL, and IPAQ-SF — are self-administered, self-reported questionnaires rather than objective or clinician-rated measures; while each is internationally validated, this design still leaves the results open to subjective reporting bias that an objective measure (for example, actigraphy for sleep) would not carry. Finally, 2.3% of PSQI and 1.3% of MENQOL forms were incomplete and handled through complete-case exclusion in relevant analyses, which could have introduced small bias if the missing data were not random.

CONCLUSION

Severe menopausal symptoms were present in about one in seven women, which was related to poorer sleep and lower quality of life. Obesity, physical inactivity, low education, smoking, chronic disease (including diabetes), and earlier age at menopause independently predicted symptom severity. These results support the need for routine screening for symptom severity and for modification of risk factors in postmenopausal women across Iraq, especially focusing on weight control programs and physical activity promotion. Larger, multicenter, prospective studies are needed to confirm these associations and determine if lifestyle interventions can decrease symptom burden in this population.

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Conflict of interest

The authors declare that there is no conflict of interest.

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