Original Article

Menopausal Symptom Severity, Family Support and Coffee Consumption as Determinants of Sleep Quality among Menopausal Women in Indonesia

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ARTICLE INFO

Article History

Submit : January 29, 2026
Accepted : June 23, 2026
Published : July 1, 2026

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Citation:

Diyu, I. A. N. P. ., Agustini, N. K. T. ., Sagitarini, P. N. ., & Kamaryati, N. P. . (2026). Menopausal Symptom Severity, Family Support and Coffee Consumption as Determinants of Sleep Quality among Menopausal Women in Indonesia. Journal of Applied Nursing and Health, 8(2), 1065–1078. https://doi.org/10.55018/janh.v8i2.580

ABSTRACT

Background: Menopause represents a critical transition in women's lives during which poor sleep quality is commonly reported yet often overlooked. However, limited evidence exists regarding factors associated with sleep quality among menopausal women in Indonesia, particularly from a biopsychosocial perspective. Therefore, this study aimed to identify factors associated with sleep quality among menopausal women.

Methods: This cross-sectional study, reported in accordance with the STROBE guidelines, included 277 women aged ≥40 years recruited from the service areas of community health centres (Puskesmas) in Denpasar, Indonesia, using convenience sampling. Women receiving hormone replacement therapy, using medications for menopausal symptom relief, or with a history of hysterectomy or oophorectomy were excluded. Data were collected through self-administered questionnaires, including the Menopause Rating Scale (MRS), Family Support Scale (FSS), and Pittsburgh Sleep Quality Index (PSQI), all of which demonstrated acceptable validity and reliability. Sleep quality was the dependent variable, while menopausal symptom severity, family support, coffee consumption, physical activity, employment status, menopausal status, and comorbid conditions were examined as independent variables. Data were analysed using descriptive statistics, chi-square tests, and multivariate logistic regression.

Results: Nearly half of the women reported poor sleep quality (49.5%). Multivariate logistic regression analysis identified menopausal symptom severity, family support and coffee consumption as significant factors associated with sleep quality. Women with moderate-to-severe menopausal symptom severity had 7.42 times higher odds of poor sleep quality than those with none-to-mild symptoms (OR=7.42; 95%CI: 3.95–14.70; p<0.001. Women with low family support had 5.98 times the odds of poor sleep quality than those with adequate family support (OR=5.98; 95% CI: 3.21–11.14; p<0.001). In addition, women who consumed coffee had 3.35 times higher odds of poor sleep quality compared with non-consumers (OR=3.35; 95%CI:1.90–6.56; p<0.001).

Conclusion: Menopausal symptom severity, family support and coffee consumption were significantly associated with sleep quality among menopausal women. These findings may underscore the importance of considering biological, behavioural, and social factors when assessing sleep-related concerns and developing supportive care strategies for menopausal women.

***Keywords*:** Menopause; Sleep Quality; Menopausal Symptom Severity; Family Support; Coffee consumption.

Implications for Practice:

- Integrating routine screening for sleep disturbances and menopausal symptom into community health service can help early identification of women at risk of poor sleep quality.
- In resource-limited setting such as Indonesia, assessing coffee consumption and family support may provide a practical approach to identifying menopausal women at risk of poor sleep quality.
- Family-centered education and counseling programs may be considered to improve social support and promote healthy sleep behaviors among menopausal women

Introduction

Sleep quality plays an essential role in maintaining women's physical and psychological health and disturbance during major reproductive transitions especially menopause is increasingly have emerged as growing public health concern. Menopause is a natural biological transition characterized by declining ovarium function and reduced estrogen levels, which contribute to a constellation of symptoms including vasomotor symptoms, psychological symptoms and sleep disturbances (Davis et al., 2023; Santoro et al., 2021) . Global demographic projections indicate that by 2030 approximately 1.2 billion women are expected to be in peri- or postmenopausal stages of life, reflecting a substantial rise in the population at risk for menopause-related health concerns, including sleep disturbances (Nissy et al., 2025) . In Indonesia, the number of women aged ≥45 years continues to increase, emphasizes the urgency of examining health issues associated with the menopausal transition (BPS, 2021; Kemenkes, 2021)

Menopause is a natural biological transition marking the end of the reproductive phase in a women's life. Declining levels of estrogen and progesterone often trigger a variety of physical and psychosocial changes. One of the most frequently reported issues among menopausal women is disturbed sleep, including difficulty initiating or maintaining sleep, early awakening and poor sleep quality overall (Ahmady et al., 2022; Jeon, 2024; Soares et al., 2024).Population-based studies consistently report a high burden of poor sleep quality among menopausal and postmenopausal women. Recent large-scale study indicates that nearly half of postmenopausal women experience poor sleep quality or sleep disorders (Ahmady et al., 2022; Wong et al., 2023). Rather than minor symptom, poor sleep-in menopausal women has been correlated with significant health detriments, encompassing impaired well-being, mood disturbances, reduce daily productivity and an increased likelihood of developing cardiometabolic illness(Jeon, 2024; Nappi et al., 2022; Soares et al., 2024).

Sleep disturbances represent one of the most prevalent symptoms reported across the menopausal transition, with recent evidence estimating that approximately 40-69% of women experiences sleep problem during this period(Maki et al., 2024). The prevalence estimates ranging from approximately 16-47% during perimenopause and increasing to 35-60% during menopause and post menopause (Troìa et al., 2025). Poor sleep quality during the menopausal transitions is understood to result from hormonal fluctuations, vasomotor symptoms, emotional and anxiety related symptoms, lifestyle factors and broader psychosocial stressors (Tandon et al., 2022; Troìa et al., 2025). The disturbances adversely affect cognitive performance, emotional stability, cardiovascular health, metabolic function and overall quality of life (Fan et al., 2025;

Soares et al., 2024; Sparks & Wang, 2025; Tandon et al., 2022). Although sleep disturbance has important clinical consequences, they are still frequently overlooked and insufficiently addressed in primary and community healthcare systems, particularly in Southeast Asia(Aggarwal et al., 2022; Jaisamrarn et al., 2025).

Previous studies identified multiple factors associated with sleep quality during menopause encompassing menopausal status, lifestyle behaviors, comorbid conditions and psychosocial factors (Hwang et al., 2021; Oanh et al., 2021). However, findings across studies remain inconsistent. Several studies reported that menopausal symptoms and vasomotor symptoms were strongly associated with poor sleep quality, whereas other studies demonstrated weaker or non-significant associations after adjustment for psychosocial and behavioral factors (Baker, Lampio, et al., 2018; Troìa et al., 2025). Similarly, although coffee consumption and physical activity are considered modifiable behavioral factors affecting sleep, evidence regarding their influence among menopausal women remains inconclusive, particularly in Asian populations(Hwang et al., 2021) (Zhou et al., 2025).

Psychosocial determinants such as family support have also received limited attention in menopause-related sleep research despite evidence suggesting that social support may buffer stress and improve coping during menopausal transition (Barmawi et al., 2023; Li et al., 2022). Existing studies have predominantly focused on biological symptoms, while the combined influence of biological, behavioral, and social factors on sleep quality remains underexplored, especially among Indonesia menopausal women. Furthermore, cultural context may influence symptom perception, coping mechanism and sleep experiences, highlighting the importance of context-specific investigation.

This study was guided by the biopsychosocial framework, which conceptualizes sleep quality as the result of interactions among biological, behavioral and social factors. In this study, menopausal symptom severity represented the biological domain, coffee consumption and physical activity represented behavioral factors, while family support reflected the social dimension. This framework provides a theoretical basis for understanding how multiple interrelated determinants contribute to sleep quality among menopausal women.

Understanding the determinants of sleep quality during the menopausal transition has important implications for nursing and public health practice. Identifying modifiable biological, behavioral and social factors can support targeted screening. Inform nursing clinical decision-making, and guide the development of practical, culturally appropriate interventions within primary care services, are strategically positioned to conduct early assessment, deliver health education and provide supportive care to improve sleep health and enhance quality of life among menopausal women.

Overall, the inconsistent literature underscores the need for context-specific research examining biological, behavioral and social factors associated with sleep quality among menopausal women in Indonesia. Therefore, this study aimed to examine the biological, behavioral and social determinants of sleep quality among menopausal women in Indonesia using a biopsychosocial framework

Methods

Study Design

Cross sectional study was conducted over a six-month period from July-December 2024 in community health

centers (Puskesmas) in Denpasar, Bali, Indonesia. This study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiological (STROBE) guidelines for cross-sectional studies.

Participants

The study population comprised women aged 40 years and older who resided within the service areas of Community Health Centers (Puskesmas) in Denpasar, Bali. he minimum required sample size was calculated using the Sampsize Calculator (SourceForge.net®) based on an estimated prevalence of poor sleep quality of 77.8%, a 95% confidence level, and a 5% margin of error. The estimated minimum sample size was 266 participants. Therefore, the final sample of 277 participants exceeded the calculated requirement. Participants were recruited using a convenience sampling technique. Participants were recruited consecutively from eligible women attending Community Health Centers (Puskesmas) during the study period. Women meeting the inclusion criteria were invited to participate after receiving information about the study objectives and procedures. Inclusion criteria were women aged ≥ 40 years who agreed to participate. Exclusion criteria included current use of hormone replacement therapy, use of medications for menopausal symptom severity relief, history of hysterectomy or oophorectomy. No participants withdrew after providing informed consent, and questionnaires with substantial missing data were excluded from analysis.

Instruments

Data were collected using standardized, validated questionnaires. Sociodemographic and clinical characteristics included age, marital status, education, employment, coffee consumption, physical activity, body mass index (BMI), history of hypertension, diabetes mellitus and other comorbid conditions. Menopausal status was classified using The Stages of Reproductive Aging Workshop (STRAW) criteria (Soules et al., 2001). Menopausal symptom severity were assessed using the Indonesian version of the Menopause Rating Scale(MRS)(Heinemann et al., 2003). The Menopause Rating Scale (MRS) consists of 11 items assessing somatic, psychological and urogenital symptoms. Higher scores indicate greater menopausal symptom severity. The Indonesia version demonstrated good reliability in this study (Cronbach's α=0.84). Family support was measured using the Indonesian version of Family Support Scale (FSS)(Dunst et al., 1986). Family Support Scale (FSS) consists of 18 items measuring perceived family support, with higher scores reflecting better family support. The Indonesian version demonstrated excellent internal consistency (Cronbach's α=0.95). Sleep quality was evaluated using the Indonesian version of Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989). Pittsburgh Sleep Quality Index (PSQI), which consists of 19 items across seven domains. Total PSQI scores range from 0-21, with scores >5 indicating poor sleep quality. The Indonesia version showed good reliability (Cronbach's α=0.89).

Data Collection

Data were collected over a six-month period from July to December 2024 by the principal investigators with the assistance of two trained research enumerators. Eligible participants investigators with the assistance of two trained research enumerators. Prior to data collection, research enumerators received one-day training regarding study objectives, participants recruitment procedures, ethical considerations, questionnaire

administration and data confidentiality. Eligible participants were approached at Community Health Centers (Puskesmas) and provided with detailed information about study prior to participation. After obtaining informed consent, participants completed a set of self-administered questionnaires with data collection taking approximately 15-20 minutes per-respondent. Completed questionnaires were reviewed daily by the principal investigators to ensure completeness and accuracy. All collected data were complete and missing data were identified in the final dataset. Completed questionnaires were stored in a locked cabinet and electronic data files were password-protected and accessible only to the research team. During the data collection process, standard health and safety protocols were strictly observed to ensure participant safety and comfort.

Data Analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) for windows (Version 23.0). Descriptive statistics were used to summarize participant characteristics. Bivariate associations between independent variables and sleep quality were examined using the chi-square test. Variables with $p<0.25$ in the bivariate analysis were included in the multivariate logistic regression model using the backward likelihood method to identify the most relevant factors associated with poor sleep quality. Variable selection was also guided by the biopsychosocial framework and existing literature. Multicollinearity was assessed using variance inflation factor (VIF) and tolerance values, model fit was evaluated using Hosmer-Lemeshow goodness-of-fit test. Adjusted odds ratios (AORs) with 95% confident intervals (CIs) were calculated to estimate the strength and direction of associations. Statistical significance was set at $p<0.05$

Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee of ITEKES Bali (No.04.0233/KEPITEKES-BALI/VI/2024). All procedures were conducted in accordance with the ethical principles of the Declarations of Helsinki. Written informed consent was obtained from all participants prior to data collection. Participant anonymity, confidentiality, beneficence, respect for persons and justice were strictly maintained throughout the study.

Results

Table 1. Demographic Characteristics of Respondents (n=277)

Characteristic	Category	n (%)
Demographic		
Age (years)	40-53	137 (49.5)
	54-78	140 (50.5)
Menopausal status	Pre-menopause	78 (28.2)
	Peri-menopause	42 (14.8)
	Post-menopause	158 (57.0)
Educational Level	Lower education	12 (4.3)
	Higher education	265 (95.7)
Marital Status	Never married	5 (1.8)
	Married	253 (91.3)
	Widowed	14 (5.1)
	Divorced	5 (1.8)
Occupation	Unemployed	113 (40.8)
	Employed	164 (59.2)
Healthy lifestyle behaviors		
Coffee consumption	Yes	159 (57.4)
	No	118 (42.6)
Physical activity	Yes	147 (53.1)
	No	130 (46.9)
Clinical condition		
Hypertension	Yes	60 (21.7)
	No	217 (78.3)
Diabetes Mellitus	Yes	8(2.9)
	No	269 (97.1)
Other comorbid condition	Yes	30 (10.8)
	No	247 (89.2)
Body Mass Index (BMI)	Underweight (<18.5 kg/m2)	10 (3.6)
	Normal (18.5-24.9 kg/m2)	152 (54.9)

Characteristic	Category	n (%)
	Overweight (25.0-29.0 kg/m2)	91 (32.9)
	Obese (≥30 kg/m2)	24 (8.7)
Total		N (277)

Table 1 illustrates the characteristics of participant of this study. The results showed a total of 277 women aged 40 years and older participated in this study, with slightly more than half being in the older age range (50.5%). The majority of respondents were classified as postmenopausal women (50.7%) and most of participants had higher level education (95.7%) and were married (91.3%). Regarding employment status more than half of women were employed (59.2%). In terms of lifestyle behavior, coffee consumption was commonly reported (57.4%) and just half of participants engaged in regular physical activity (53.1%). With respect to clinical condition, most of them did not report hypertension or diabetes mellitus, although small proportion had other comorbid conditions (10.8%) and more than half of the participants had a normal BMI (54.9%).

Table 2. Distribution of menopausal symptom severity, family support and sleep quality (n=277)

Variable	Category	n (%)
Menopausal symptom severity	None-mild	179 (64.6)
	Moderate-severe	98 (35.4)
Family support	Adequate	168 (60.6)
	Low	109 (39.4)
Sleep quality	Good	140 (50.5)
	Poor	137 (49.5)

Table 2 showed distribution of menopausal symptom severity, family support and sleep quality. Most of participants reported none to mild menopausal symptom severity (64.6%). Majority of women perceived adequate family support (60.6%) and nearly half of them experienced poor sleep quality (50.5%).

Table 3. Bivariate analysis of factors associated with sleep quality (n=277)

Variable	Category	Total n (%)	Good sleep quality n (%)	Poor sleep quality n (%)	p-value*
Demographic					
Age (years)	40-53	137 (49.5)	75 (54.7)	62 (45.3)	0.206
	54-78	140 (50.5)	65 (46.4)	75 (53.6)	
Menopausal status	Premenopause	78 (28.2)	50 (64.1)	28 (35.9)	0.012*
	Perimenopause	41 (14.8)	16 (39.0)	25 (61.0)	
	Postmenopause	158 (57.0)	74 (46.8)	84 (53.2)	
Education level	Lower education	12 (4.3)	4 (2.9)	8 (5.8)	0.223
	Higher education	265 (95.7)	136 (97.1)	129 (94.2)	
Marital status	Never married	5 (1.8)	1 (20.0)	4 (80.0)	0.146
	Married	253 (91.3)	133 (52.6)	120 (47.4)	
	Widowed	14 (5.1)	5 (35.7)	9 (64.3)	
	Divorced	5 (1.8)	1 (20.0)	4 (80.0)	
Employment status	Unemployed	113 (40.8)	45 (39.8)	68 (60.2)	0.003*
	Employed	164 (59.2)	95 (57.9)	69 (42.1)	
Healthy Lifestyle Behaviors					
Coffee consumption	Yes	159 (57.4)	100 (69.2)	59 (37.1)	<0.001*
	No	118 (42.6)	40 (33.9)	78 (66.1)	
Physical activity	Yes	147 (53.1)	83 (56.5)	64 (43.5)	0.048*

Variable	Category	Total n (%)	Good sleep quality n (%)	Poor sleep quality n (%)	p-value*
	No	130 (46.9)	57 (43.8)	73 (56.2)	
Clinical condition					**1.000**
Hypertension	Yes	60 (21.7)	30 (50.0)	30 (50.0)	
	No	217 (78.3)	110 (50.7)	107(49.3)	
Diabetes Mellitus	Yes	8 (2.9)	3 (37.5)	5 (62.5)	0.454
	No	269 (97.1)	137 (50.9)	132(49.1)	
Other comorbid conditions	Yes	30 (10.8)	9 (30.0)	21 (70.0)	0.029*
	No	247(89.2)	131(53.0)	116(47.0)	
Body Mass Index (BMI)	Underweight (<18.5 kg/m2)	10 (3.6)	4 (40.4)	6 (60.0)	0.515
	Normal (18.5-24.9 kg/m2)	152(54.9)	72 (47.4)	80 (52.6)	
	Overweight (25.0-29.0 kg/m2)	91 (32.9)	51 (56.0)	40 (44.0)	
	Obese (≥30 kg/m2)	24 (8.7)	13 (54.2)	11 (45.8)	
Menopausal symptom severity	None to mild	179(64.6)	120(67.0)	59 (33.0)	<0.001*
	Moderate to severe	98 (35.4)	20 (20.4)	78 (79.6)	
Family support	Low	109 (39.4)	25 (22.9)	84 (77.1)	<0.001*
	Adequate	168 (60.6)	115 (68.5)	53 (31.5)	

*Significant at p < 0.05

Bivariate analysis indicated that sleep quality was significantly associated with menopausal status (*p=0.012*), employment status (p=0.003*)*, coffee consumption (p <0.001), physical activity (p=0.048*)* and the presence of other comorbid condition (*p=0.029)*. Moreover menopausal symptom severity (p <0.001), and family support (p=<0.001) also associated with sleep quality (**Table 3**).

Variables with p<0.25 in the bivariate analysis were entered into the multivariate logistic regression model using the backward likelihood ratio method. The final model retained four variables: employment status, coffee consumption, menopausal symptom severity, and family support. The model explained 47.6% of the variance in sleep quality (Nagelkerke R^2 = 0.476). The Hosmer–Lemeshow goodness-of-fit test yielded χ^2 = 15.902 (p = 0.040), indicating borderline model fit. Result of the final regression model are presented in **Table 4**.

Table 4. Multivariate regression analysis factors associated with sleep quality (n=277)

Variable	Adjusted OR (95%CI)	p-value*
Peri/post menopause (Ref: Premenopaue)	1.58 (0.76-3.26)	0.27
Unemployed (Ref: employed)	0.57 (0.31-1.06)	0.07
Coffee consumption (Ref: No)	3.35 (1.90-6.56)	<0.001*
No physical activity (Ref: yes)	0.75 (0.39-1.45)	0.40
Other comorbid condition (Ref: no comorbid condition)	1.28 (0.44-3.71)	0.64

Variable	Adjusted OR (95%CI)	p-value*
Moderate-to-severe menopausal symptom severity (Ref: none-mild)	7.42 (3.95-14.70)	<0.001*
Low family support (Ref: adequate family support)	5.98 (3.21-11.14)	<0.001*

Note: model statistics Hosmer–Lemeshow χ^2 = 15.092, p = 0.040; Nagelkerke R^2 = 0.476
*Significant at p < 0.05

In the final model, coffee consumption, menopausal symptom severity and family support remained significantly associated with poor sleep quality. Women who consumed coffee had 3.35 higher odds of poor sleep quality compared with those who did not consume coffee (AOR=3.35, 95% CI:1.90-6.56, p<0.001). Women with moderate-to-severe menopausal symptom severity had 7.42 times higher odds of poor sleep quality than those with none-to-mild symptoms (AOR=7.42,95% CI:3.95-14.70, p<0.001). In addition, women with low family support had 5.98 times higher odds of poor sleep quality compared with those reporting adequate family support (AOR=5.98, 95% CI:(3.21-11.14, p<0.001) (**Table 4**).

Discussion

The prevalence of poor sleep quality observed in this study was 49.5%, this align with recent global evidence suggesting a prevalence of poor sleep quality 50.8% among menopausal women (Jia et al., 2024) yet higher than prevalence reported in some Asian populations, including midlife Asian women 38.2% and Korean women 26% (Hwang et al., 2021; Wong et al., 2023). Earlier studies have also shown a wide range in the prevalence of poor sleep quality during menopause, ranging from 14-65% (Ahmady et al., 2022). These variations may reflect differences in population characteristics, cultural context, lifestyle behaviors, and social support across study setting. The high prevalence found in this study emphasize the need to understand the various factors affecting sleep quality during menopausal transition.

Menopausal symptom severity was strongly associated with poor sleep quality. Women experiencing moderate to severe menopausal symptom severity were more likely to report poor sleep quality than those with none-to-mild symptoms. This finding is consistent with previous studies showing that vasomotor and related somatic symptoms can negatively affect sleep quality and continuity (Kim et al., 2018). Sleep disturbance commonly occur with vasomotor and mood symptoms during the menopausal transition contributing some sleep disrupt to difficulties initiating and maintaining sleep (Baker, Lampio, et al., 2018). Hormonal fluctuations during menopause may also increase vulnerability to mood disturbance, anxiety, and emotional instability, which can subsequently worsen sleep quality (Troìa et al., 2025). Although most studies have reported a significant relationship between menopausal symptoms and sleep disturbance, some studies indicate that this association weakens after adjustment for psychological distress, health behaviors, and comorbid conditions (Baker, De Zambotti, et al., 2018). Such findings suggest that sleep disturbances during menopause are multifactorial and cannot be attributed solely to biological changes. Importantly, this study found that women with moderate-to-severe menopausal symptoms were over seven times more likely to experience poor sleep quality. This demonstrates the clinical value of evaluating symptoms to identify women at a greater risk of sleep related problem. Overall, these result underscore the importance of considering menopausal

symptoms burden when assessing sleep health among menopausal women.

Family support was also significantly associated with sleep quality among menopausal women. In Indonesia, where collectivist cultural values emphasize close family relationships and interdependence family members often serve as the primary source of emotional, informational, and practical support. Adequate family support may help women adapt to menopausal changes and provide resources that facilitate coping during the menopausal transition. This finding is consistent with evidence suggesting that social support plays an important role in sleep and well-being outcomes (Li et al., 2022). Limited family support has been linked to greater psychological distress and psychosocial stress, which are known contributors to sleep disturbance. Studies among perimenopausal women have reported higher levels of family support are associated with sleep quality, partly through pathways involving anxiety and depression (Liang et al., 2025). However, psychological factors were not independently assessed in the present study, therefore similar mechanism could not be evaluated. Similarly, lower levels of family support have been associated with poorer quality of life among menopausal women (Sari & Susilawati, 2021). Nevertheless, not all studies have identified family support as an independent predictor of sleep quality. Some studies have reported that the association becomes attenuated after adjustment for psychological well-being and other psychosocial factors, suggesting that additional mechanism may contribute to the relationship. Differences in cultural, norms, family structures, and measurement approaches may partly explain these inconsistencies across studies. Importantly, women reporting low family support had nearly six-fold higher odds of poor sleep quality, suggesting that assessment of family support may help identify menopausal women at increased risk of sleep-related problems.

Coffee consumption was another factor associated with poor sleep quality. Caffeine stimulates central nervous system by blocking adenosine receptors, which increase alertness and delays the onset of sleep. Prior research indicates that consuming caffeine can increase the time it takes to fall asleep, shorten overall sleep duration, and lower sleep efficiency (Gardiner et al., 2023). Because this connection remains significant even after controlling for other variables, drinking coffee appears to be a key behavioral factor impacting sleep quality. during menopause. This aligns with biological evidence connecting caffeine intake to diminished sleep. However, earlier studies have also produced mixed result, with showing little to no impact, especially among regular coffee drinkers who have built tolerance to the simulant (Phan et al., 2025). Furthermore, the current study evaluated intake simply as a yes-or-no variable, without gathering data on the amount, frequency, timing, or exact caffeine dose. Consequently, this result should be viewed with caution, as different coffee-drinking habits can affect sleep in various ways. Despite these limitations, the evidence emphasizes that coffee consumption as a potential behavioral factor that warrant further investigation in menopausal women.

Several variables that were associated with sleep quality in the bivariate analysis, including menopausal status, employment status, physical activity and comorbid conditions, did not remain significant in the multivariate model. This finding suggests that their perceived effects on sleep quality might be accounted for by stronger predictors retained in the final model, specifically the severity of menopausal symptoms and family support. Similarly, no

independent associations were observed for BMI, hypertension or diabetes mellitus. Previous studies have reported mixed findings regarding the association of menopausal status, physical activity, and comorbid conditions with sleep quality (Ahmady et al., 2022; Hwang et al., 2021; Oanh et al., 2021; Wong et al., 2023). These contradictory findings mat arise from variations in population characteristics, cultural contexts, sample composition and measurement. Additionally, the low prevalence of certain conditions, particularly diabetes mellitus, might have hindered the statistical ability to detect independent association. Further research is required to fully understand the impact of these factors on the sleep quality of menopausal women.

Beyond statistical significance, the magnitude of the observed association may also have clinical relevance for nursing practice. Higher than seven-fold increased odds poor sleep quality was reported for women with moderate-to-severe menopausal symptoms and higher almost six-fold for those reporting low family support. These effect sizes indicate that overall menopausal symptoms burden and family support may be assessed to identify women at increased susceptibility of poor sleep quality, thus establishing points of screening and counseling efforts in community.

Taken together, the findings indicate that sleep quality among menopausal women is associated with interconnected biological, behavioral and social factors. Menopausal symptoms severity, coffee consumption and family support were independently associated with sleep quality, highlighting the potential importance of considering multiple dimensions of health during the menopausal transition. However, the study was guided by the biopsychosocial framework, the only domain directly measured were biological, behavioral, and social domains. Psychological construct, which are essential part of the framework were not assessed independently. Thus, findings should be interpreted as providing partial rather than comprehensive support for a biopsychosocial understanding of sleep quality during menopause. Despite the limited generalizability of the findings, this study provides context-specific evidence regarding factors associated with sleep quality among menopausal women in Indonesia.

Implications and limitations

The findings contribute to the growing evidence that sleep quality during menopause is associated with interconnected biological, behavioral and social factors. Although the study provides partial support for a biopsychosocial perspective because psychological constructs were not directly measured, the result suggest that sleep quality during menopause are not driven by biological changes alone. The significant impact of menopausal symptoms severity and family support emphasizes the value of these factors in identifying women at a higher risk of poor sleep quality. Nevertheless, because of the cross-sectional study nature of the research, these results establish correlation rather than causation. Future longitudinal and interventions studies are needed to determine causal relationship and assess whether addressing these factors can effectively improve sleep quality. Several limitations should be considered when interpreting the findings. First, although variable selection was informed by the biopsychosocial framework and existing literature, the use of backward logistic regression may have excluded some theoretically relevant variables from the final model. Second, the cross-sectional design prevents establishing causality or determining the direction of observed

associations. Third, participants were recruited using convenience sampling from Community Health Centers (Puskesmas) in a single urban area, which may have introduced selection bias and limited the generalizability of the findings to other populations of menopausal women in Indonesia. Fourth, the use of self-reported questionnaire introduced the potential for recall and measurement biases. In particular, coffee consumption was assessed as a yes/no variable, without information on quantity or timing of intake, which may have led to exposure misclassification. Fifth, although multivariable logistic regression was used control for various covariates and MRS psychological symptoms domains, broader psychological factors such as perceived stress, clinical anxiety, depression, and coping mechanism were not assessed. Thus, residual confounding from these unmeasured factors remains a possibility. Finally, a significant Hosmer-Lemeshow test indicates a degree of model misfit, suggesting that additional unmeasured variables or the inherent complexity of sleep disturbances during menopause likely influence sleep quality among menopause. Therefore, the identified associations should be interpreted with appropriate caution.

Relevance to Practice

This study provides practical evidence to support the integration of menopause-focused sleep assessment into routine nursing care in primary and community health settings. Nurses may use validated screening tools such as the Pittsburgh Sleep Quality Index (PSQI) and Menopause Rating Scale (MRS) to identify women at risk for poor sleep quality. Practical interventions include sleep hygiene education, counselling on reducing caffeine consumption, management of menopausal symptom severity and family centered education to strengthen social support. These strategies may support the identification and management of sleep-related concerns among menopausal women in community healthcare settings.

Conclusion

Menopausal symptom severity, family support and coffee consumption were identified as significant factors associated with sleep quality among menopausal women. The finding emphasizes the complex nature of sleep disturbance during menopause and highlight the need to evaluate biological, behavioral and social factors when assessing sleep-related issues. Future longitudinal research and intervention studies are warranted to examine causal relationship and determine the effectiveness of lifestyle adjustment and family-oriented strategies in enhancing sleep quality for this population.

Funding

This research was funded by Institute of Technology and Health Bali. The funding body had no role in the study design, data colletion, analysis, interpretation or manuscript writing

CrediT Authorship Contributions Statement

Ida Ayu Nngrat Pangruating Diyu: Conceptualization, Methodology, Supervision, Writing - Original Draft

Ni Komang Tri Agustini: Project administration, Resources, Validation

Putu Noviana Sagitarini: Project administration, Resources, Validation

Ni Putu Kamaryati: Supervision, Datta Curation, Review & Editing

Conflicts of Interest

There is no conflict of interest.

Acknowledgments

The authors would like to thank Institute of Technology and Health Bali for its financial support. Sincere gratitude is also extended to the Community Health Centers (Puskesmas) in Denpasar, Bali for faciliting the research permit, and to all women who voluntary participated as respondents in this study

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