



Association of Stress Levels and Sleep Quality with Menstrual Cycle Disorders among Reproductive-Age Indonesian Female Migrant Workers

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Abstract

Female migrant workers in the *kaigo* sector in Japan experience occupational demands that may affect sleep quality, stress levels, and menstrual health. This study aimed to analyze the associations of stress levels and sleep quality with menstrual cycle disorders among reproductive-age Indonesian female migrant workers in Gunma Prefecture, Japan. An observational analytic study with a cross-sectional design was conducted involving 50 female migrant workers aged 18–35 years selected through purposive sampling. Stress levels were measured using the Perceived Stress Scale (PSS-10), sleep quality using the Pittsburgh Sleep Quality Index (PSQI), and menstrual cycle disorders according to the International Federation of Gynecology and Obstetrics (FIGO) classification. Data were analyzed using the Chi-square test or Fisher-Freeman-Halton exact test, as appropriate, with statistical significance set at $p < 0.05$. Most respondents experienced menstrual cycle disorders (68.0%), poor sleep quality (64.0%), and moderate stress levels (48.0%). Sleep quality was significantly associated with menstrual cycle disorders ($p < 0.001$). Compared with good sleep quality, fair sleep quality was associated with higher odds of menstrual cycle disorders (OR=4.67, 95% CI: 0.40–53.95), while poor sleep quality showed substantially higher odds (OR=67.67, 95% CI: 6.08–752.66). Stress levels were also significantly associated with menstrual cycle disorders ($p = 0.034$), although sparse data across stress categories limited the stability of estimates. These findings suggest that stress and sleep quality may be associated with menstrual cycle disorders among Indonesian female migrant workers in the *kaigo* sector. However, the results should be interpreted cautiously because of the small sample size, sparse data, and potential unmeasured confounding. Larger longitudinal studies are needed to clarify temporal relationships and potential causal mechanisms.

Keywords: Stress Level; Sleep Quality; Menstrual Cycle Disorders; Indonesian Migrant Workers

INTRODUCTION

Based on data from the Japan Platform for Migrant Workers towards Responsible and Inclusive Society the number of Indonesian migrant workers in Japan reached 169,539 (Japan Platform for Migrant Workers towards Responsible and Inclusive Society, 2024). Japan is one of the countries with the highest proportions of older adults worldwide. According to the Annual Report on the Ageing Society 2025, Japan's population reached approximately 123.8 million in October 2024, of whom 36.24 million (29.3%) were aged ≥ 65 years. This demographic situation has increased the demand for long-term care services and the need for workers in the kaigo sector (Cabinet Office, 2025).

The kaigo sector involves substantial physical and psychological demands. Care workers assist older adults with daily activities, including personal care, mobility, and other basic needs. In addition to physical workload and emotional involvement in elderly care, shift work, particularly night and rotating shifts, may disrupt circadian rhythms and affect sleep patterns. Evidence from studies of shift workers indicates that work schedules may be associated with differences in sleep quality (Chang & Peng, 2021). Furthermore, research has investigated associations between shift work and menstrual characteristics, including studies of Japanese nurses and broader evidence from meta-analysis (Hu et al., 2023; Mayama et al., 2020). Work-related psychosocial factors may also be associated with reproductive and menstrual health outcomes (Sasaki et al., 2025).

Menstrual cycle disorders are common reproductive health problems among women of reproductive age. According to the International Federation of Gynecology and Obstetrics (FIGO), abnormalities in ovulatory function and menstrual patterns may include disturbances in cycle frequency, regularity, duration, and flow. Menstrual disorders may be influenced by multiple factors, including hormonal

disturbances, nutritional status, medical conditions, sleep quality, and psychological stress (Munro et al., 2022). When persistent, menstrual disturbances may affect quality of life and reproductive health.

Psychological stress may influence reproductive function through interactions between the hypothalamic–pituitary–adrenal (HPA) axis and the hypothalamic–pituitary–gonadal axis. Stress-related hormonal responses may interfere with the regulation of gonadotropins and ovulatory function. A systematic review and meta-analysis has examined menstrual cycle-related changes in HPA-axis reactivity to psychosocial and physiological stressors, providing physiological context for understanding the relationship between stress and reproductive function (Klusmann et al., 2023). In addition, a systematic review reported an association between psychological stress and menstrual cycle irregularity among adult women (Poitras, Shearзад, Qureshi, Blackburn, & Plamondon, 2024). Previous studies have also examined associations between perceived stress and menstrual function among female medical students (Nagma, 2015).

Sleep quality may also play an important role in menstrual and reproductive health. Sleep disturbances may affect circadian regulation and neuroendocrine processes involved in reproductive function. A systematic review identified associations between sleep disturbances and several menstrual disturbances, including menstrual irregularity (Jeon & Baek, 2023). Research involving Indonesian populations has also investigated relationships between sleep quality and menstrual cycle characteristics among adolescents (Saputra et al., 2025). These findings suggest that sleep quality warrants further investigation as a potential correlate of menstrual health.

Previous studies have demonstrated associations between stress, sleep quality, and menstrual cycle disorders. (Izzati, Nuraini, & Tarigan, 2023) reported factors associated with menstrual cycle

disorders among adolescent girls. Similarly, (Saputra et al., 2025) found an association between sleep quality and menstrual cycle characteristics among adolescents. (Wahyuni Muslimat, Suriani B, Amin, Ningsi, & Subriah, 2026) also reported significant associations between stress levels, sleep quality, and menstrual cycles among midwifery students. However, most previous studies have focused on adolescents or university students rather than migrant workers.

Indonesian migrant workers in Japan represent an important population for examining occupational and reproductive health because their experiences involve both the demands of care work and adaptation to a different social and cultural environment. Previous qualitative research on Indonesian care professionals working in Japan found that cross-cultural adaptation involved changes in caregiving practices, values, and perceptions as workers adjusted to the Japanese care environment (二瓶, 2022). Research specifically examining Indonesian care workers in Japan has further shown that their work experiences are complex and multifaceted, emphasizing the importance of supportive and inclusive workplaces (Gunawan, Efendi, Tsujita, & Oda, 2024)

Migrant care workers may experience occupational and migration-related stressors, including communication difficulties, workplace relationships, work-life balance, physical working conditions, and adaptation to new cultural expectations. Research on Indonesian care worker candidates in Japan has examined factors associated with mental health in the context of migration and occupational adaptation (Nugraha & Ohara-Hirano, 2016). In addition (Asis & Carandang, 2020) examined stressors experienced by migrant care workers in Japan. These findings provide a relevant context for investigating the potential relationships between occupational demands, psychological stress, sleep quality, and menstrual health among Indonesian migrant workers.

Preliminary interviews with several reproductive-age Indonesian female migrant workers employed in the kaigo sector revealed complaints related to work stress, sleep disturbances, and menstrual irregularities. These preliminary observations further indicated the relevance of examining the potential relationships among these factors in this population.

Although previous studies have reported associations between stress levels, sleep quality, and menstrual cycle disorders among adolescents and university students, research examining these relationships among Indonesian female migrant workers in the Japanese kaigo sector remains limited. The characteristics of kaigo work, including rotating shifts, physical workload, and psychological demands, may place workers at different risks for reproductive health problems compared with other populations. Therefore, this study aimed to analyze the relationship between stress levels and sleep quality with menstrual cycle disorders among reproductive-age Indonesian female migrant workers in the kaigo sector in Gunma Prefecture, Japan.

METHOD

This study was a quantitative analytical observational study with a cross-sectional design. This study aimed to analyze the relationship between stress levels and sleep quality with menstrual cycle disorders among reproductive-age Indonesian female migrant workers aged 18–35 years working in the kaigo sector in Gunma Prefecture, Japan. The study population consisted of Indonesian female migrant workers aged 18–35 years who worked in the kaigo sector in Gunma Prefecture, Japan, and met the established inclusion criteria. Since the exact number of Indonesian female migrant workers working in the kaigo sector in Gunma Prefecture was not available, participants were selected using purposive sampling. A total of 50 respondents

who met the inclusion and exclusion criteria participated in the study. The inclusion criteria were Indonesian female migrant workers aged 18–35 years who worked in the kaigo sector in Gunma Prefecture, Japan, were willing to participate by providing informed consent, and completed the questionnaire. Respondents who did not complete the questionnaire were excluded from the study. The independent variables were stress levels and sleep quality, while the dependent variable was menstrual cycle disorders.

The Indonesian version of the Perceived Stress Scale (PSS-10) was used to assess perceived stress. The instrument consists of 10 items, with each item scored from 0 (never) to 4 (very often), resulting in a total score ranging from 0 to 40 (Cohen et al., 1983; Hakim et al., 2024). Stress levels were categorized as normal (0–14), mild (15–18), moderate (19–25), and severe (26–40). The Indonesian version of the Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality. The PSQI evaluates sleep quality and sleep disturbances during the previous month and consists of seven components. Sleep quality was categorized as good, fair, and poor based on the scoring criteria applied in this study (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989; Setyowati & Chung, 2021). Menstrual cycle disorders were assessed using a menstrual cycle characteristics questionnaire developed based on the classification of the International Federation of Gynecology and Obstetrics (FIGO). Menstrual cycles were categorized as normal or abnormal based on menstrual cycle length and regularity according to the criteria established for this study (Munro et al., 2022).

Data were collected online using a Google Form questionnaire distributed to eligible participants. Before completing the questionnaire, participants received information regarding the study objectives,

procedures, confidentiality, and their voluntary participation. Participants who agreed to participate provided informed consent electronically before completing the questionnaire. All collected data were kept confidential and used solely for research purposes. Participants' identities were not disclosed in any research report or publication. Data analysis was performed using IBM SPSS Statistics version 32. Univariate analysis was conducted to describe respondents' characteristics and the distribution of each research variable. The results were presented as frequency distributions and percentages, while means and standard deviations were used where appropriate. Bivariate analysis was performed to examine the relationships between stress levels and sleep quality with menstrual cycle disorders. The Chi-Square test was used to assess associations between categorical variables. When the assumptions of the Chi-Square test were not fulfilled because of expected cell counts of less than 5, the Fisher-Freeman-Halton Exact Test was applied. Statistical significance was determined at a p-value of <0.05.

RESULT AND DISCUSSION

Characteristics of Respondents

Table 1. Distribution of Respondents Based on Age

Age Group	Frequency (n)	Percentage (%)
18–25 years	33	66.0
26–35 years	17	34.0
Total	50	100.0

Table 1 shows that among the 50 respondents, 33 (66.0%) were aged 18–25 years, while 17 (34.0%) were aged 26–35 years. Thus, the majority of participants were in the younger reproductive-age group.

Table 2. Distribution of Respondents Based on Menstrual Cycle Status

Menstrual Cycle Status	Frequency (n)	Percentage (%)
Normal	16	32.0
Abnormal	34	68.0
Total	50	100.0

Table 2 shows that 34 respondents (68.0%) had abnormal menstrual cycles, while 16 (32.0%) had normal menstrual cycles. The high proportion of abnormal menstrual cycles indicates that menstrual cycle disturbances were relatively common among the respondents. However, because this study used a cross-sectional design, these findings describe an observed association and cannot establish a causal relationship.

Table 3. Distribution of Respondents Based on Sleep Quality

Sleep Quality	Frequency (n)	Percentage (%)
Good	8	16.0
Fair	10	20.0
Poor	32	64.0
Total	50	100.0

Table 3 shows the distribution of respondents based on sleep quality. Among the 50 respondents, 8 (16.0%) had good sleep quality, 10 (20.0%) had fair

sleep quality, and 32 (64.0%) had poor sleep quality. Thus, the majority of respondents experienced poor sleep quality.

Table 4. Distribution of Respondents Based on Stress Levels

Stress Level	Frequency (n)	Percentage (%)
Normal	8	16.0
Mild	11	22.0
Moderate	24	48.0
Severe	7	14.0
Total	50	100.0

Table 4 frequently observed category, affecting 24 respondents (48.0%). Mild stress was reported by 11 respondents (22.0%), while 8 respondents (16.0%) had normal stress levels and 7 respondents (14.0%) experienced severe stress. Overall, 42 respondents (84.0%) experienced at least mild stress.

Association Between Sleep Quality and Menstrual Cycle Disorders

Table 5. Association Between Sleep Quality and Menstrual Cycle Disorders among Indonesian Female Migrant Workers in the Kaigo Sector in Gunma Prefecture, Japan

Sleep Quality	Menstrual Cycle		Total n (%)	OR (95% CI)	p-value
	Normal n (%)	Abnormal n (%)			
Good	7 (87,5)	1 (12,5)	8 (100)	1.00	
Fair	6 (60,0)	4 (40,0)	10 (100)	4.67 (0.40-53.95)	
Poor	3 (9,4)	29 (90,6)	32 (100)	67.67 (6.08-752.66)	
Total	16 (32,0)	34 (68,0)	50 (100)		<0,001

Association Between Stress Levels and Menstrual Cycle Disorder

Table 6. Association Between Stress Levels and Menstrual Cycle Disorders among Indonesian Female Migrant Workers in the Kaigo Sector in Gunma Prefecture, Japan

Stress Level	Menstrual Cycle		Total n (%)	p-value
	Normal n (%)	Abnormal n (%)		
Severe	2 (28,6)	5 (71,4)	7 (100)	
Normal	0 (0,0)	8 (100,0)	8 (100)	
Mild	2 (18,2)	9 (81,8)	11 (100)	
Moderate	12 (50,0)	12 (50,0)	24 (100)	
Total	16 (32,0)	34 (68,0)	50 (100)	0,034

Table 5 shows that respondents with poor sleep quality had a higher proportion of abnormal menstrual cycles. Among respondents with poor sleep quality, 29 respondents (90.6%) experienced abnormal menstrual cycles, whereas only 3 respondents (9.4%) had normal menstrual cycles. In contrast, respondents with good sleep quality mostly had normal menstrual cycles, with 7 respondents (87.5%).

The Fisher-Freeman-Halton Exact Test showed a statistically significant association between sleep quality and menstrual cycle disorders ($p < 0.001$). Using good sleep quality as the reference category, respondents with fair sleep quality had 4.67 times higher odds of experiencing an abnormal menstrual cycle (OR = 4.67; 95% CI: 0.40–53.95), while respondents with poor sleep quality had 67.67 times higher odds (OR = 67.67; 95% CI: 6.08–752.66). Therefore, poor sleep quality was significantly associated with menstrual cycle disorders among Indonesian female migrant workers in the *kaigo* sector in Gunma Prefecture, Japan.

Poor sleep quality may affect menstrual regulation through disruption of circadian rhythms and hormonal balance. Sleep disturbances can alter melatonin secretion and increase cortisol levels, which may interfere with the hypothalamic-pituitary-gonadal (HPG) axis. These hormonal disturbances may affect the secretion of Gonadotropin-Releasing Hormone (GnRH), Follicle-Stimulating Hormone (FSH), and Luteinizing Hormone (LH), potentially resulting in impaired ovulation and menstrual cycle

abnormalities. The Fisher-Freeman-Halton Exact Test showed a statistically significant association between stress levels and menstrual cycle disorders ($p = 0.034$). These findings indicate that stress levels were significantly associated with menstrual cycle disorders among Indonesian female migrant workers in the *kaigo* sector in Gunma Prefecture, Japan.

Stress may affect reproductive function through activation of the hypothalamic-pituitary-adrenal (HPA) axis, resulting in increased cortisol secretion. Elevated cortisol levels may interfere with the hypothalamic-pituitary-gonadal (HPG) axis and reproductive hormone regulation, potentially affecting ovulation and menstrual cycle regularity. In *kaigo* workers, occupational demands such as shift work, workload, emotional demands of elderly care, and adaptation to a new working environment may contribute to psychological stress and potentially affect reproductive health.

Although significant associations were found between stress levels, sleep quality, and menstrual cycle disorders, menstrual cycle regulation is multifactorial. Other factors, including nutritional status, physical activity, duration of employment, shift work patterns, reproductive history, and psychosocial conditions, may also contribute to menstrual disturbances. Further studies with larger sample sizes and additional variables are needed to provide a more comprehensive understanding of these association.

CONCLUSION

This study found that sleep quality and stress levels were significantly associated with menstrual cycle disorders among reproductive-age Indonesian female migrant workers in

the *kaigo* sector in Gunma Prefecture, Japan. Poor sleep quality showed a substantial magnitude of association with menstrual cycle disorders, although the estimates should be interpreted cautiously because of the small sample size and wide

confidence intervals. The association between stress levels and menstrual cycle disorders should also be interpreted with caution because of sparse cells across stress categories. These findings suggest that sleep quality and psychological stress may be relevant to menstrual health in this population. However, given the cross-sectional design, small sample size, purposive sampling, and potential unmeasured confounding factors, causal relationships cannot be established. Future longitudinal studies with larger and more representative samples and appropriate adjustment for potential confounders are needed to clarify the temporal and causal relationships between stress, sleep quality, and menstrual health.

DECLARATION

Author Contributions:

RES contributed to the conceptualization, methodology, investigation, data collection, formal analysis, interpretation of the findings, and preparation of the original manuscript. RKa and NW contributed to the methodology, interpretation of the findings, and critical revision of the manuscript for important intellectual content. All authors reviewed the study results, read and approved the final version of the manuscript, and agree to be accountable for all aspects of the work.

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Ethical Considerations:

Before completing the online questionnaire, all participants were provided with information about the study objectives, procedures, voluntary nature of participation, confidentiality of their responses, and their right to withdraw from the study. Informed consent was obtained electronically

from all participants before they completed the questionnaire. Formal research ethics approval had not been obtained at the time of data collection.

Competing Interests:

The authors declare that they have no competing interests.

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Availability of Data and Materials:

The data generated and analyzed during this study are not publicly available to protect participants' privacy and confidentiality. De-identified data may be available from the corresponding author upon reasonable request, subject to applicable privacy and institutional requirements.

Consent for Publication:

Not applicable. This manuscript does not contain identifiable personal information or individual participant quotations.

Clinical Trial Number:

Not applicable. This study was an observational analytical cross-sectional study and did not involve a clinical trial.

Generative AI:

During the preparation and revision of this manuscript, the authors used AI-assisted technology to improve English-language clarity, grammar, spelling, and sentence structure. The authors reviewed and verified the suggested revisions and take full responsibility for the accuracy, integrity, and originality of the manuscript. AI-assisted

technology was not used for data collection or statistical analysis. All statements regarding the study methods, results, and conclusions were verified by the authors.

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