



MENSTRUATION, WORK, AND THE ENVIRONMENT: A QUALITATIVE STUDY OF FEMALE STREET VENDORS

Lela Handayani^{1*}, Ferly Oktriyedi², Ria Wulandari³

¹ Diploma III Midwifery Study Program, Akademi Kebidanan Pretasi Agung, Jl. Ranga Lawe, Campus Complex Tulang Bawang, Lampung 34682, Indonesia

² Master of Public Health Science, Universitas Anak Bangsa, Jl. Pinus I No. 693, Kacang Pedang, Pangkal Pinang, Bangka Belitung 33684, Indonesia

³ Diploma III Nursing Study Program, Universitas Kader Bangsa, Jl. Mayjen HM Ryacudu No.88, 7 Ulu, Seberang Ulu I, Palembang, Sumatera Selatan 30253, Indonesia

*lelahandayani.lh@gmail.com

ABSTRACT

Female street vendors are informal workers exposed to environmental and occupational factors such as vehicle exhaust, dust, heat, long working hours, inadequate fluid intake, and limited sanitation access, which may affect reproductive health. Objective to describe menstrual complaints, their impact on work activities, and related environmental and occupational conditions among female street vendors. This preliminary qualitative descriptive study involved 15 female street vendors of reproductive age selected purposively. Data were collected through semi-structured interviews and field observations, then analyzed descriptively using themes, frequencies, and percentages. The most common complaints were abdominal pain or cramps (66.7%), irregular menstrual cycles and fatigue (60.0%), back pain (53.3%), and dizziness/headaches and mood changes (46.7%). Menstrual complaints felt heavier after long working hours in 53.3% of informants, while 40.0% experienced concentration difficulties and 20.0% reduced trading hours. Environmental factors included exposure to vehicle exhaust and dust (73.3%), working 8–12 hours daily (66.7%), heat discomfort (60.0%), inadequate fluid intake (46.7%), and limited toilet access (40.0%). Menstrual complaints were common and affected work activities alongside less supportive occupational and environmental conditions.

Keywords: female vendors; informal workers; menstrual disorders; reproductive health; working conditions

How to cite (in APA style)

Handayani, L., Oktriyedi, F., & Wulandari, R. (2026). Menstruation, Work, and the Environment: A Qualitative Study of Female Street Vendors. *Indonesian Journal of Global Health Research*, 8(6), 685–694. <https://doi.org/10.37287/ijghr.v8i6.2732>.

INTRODUCTION

Women's reproductive health encompasses healthy reproductive function as well as physical, mental, and social well-being. Therefore, menstrual disorders are an important indicator of concern for women of reproductive age (Munro et al., 2022). Menstrual disorders can include changes in the regularity, frequency, duration, and amount of bleeding, dysmenorrhea, fatigue, headaches, back pain, and mood swings, which can impact women's quality of life and daily activities (Mitsuhashi et al., 2023). In working women, menstrual disorders have also been reported to be associated with decreased productivity, presenteeism, absenteeism, and limitations in work activities (Serya et al., 2025). Women street vendors are a group of informal workers who face various working conditions, such as long working hours, exposure to vehicle exhaust fumes and dust, heat, limited rest periods, access to drinking water, and inadequate sanitation facilities (Hariparsad & Naidoo, 2019). Research shows that exposure to air pollutants such as NO₂ and SO₂ is associated with menstrual cycle irregularities, while long working hours and heat exposure have also been reported to be associated with menstrual disorders in female informal workers (Choi et al., 2025; Boadi & Bofo, 2026). Limited access to toilets, water, privacy, and opportunities to change sanitary napkins can also impact women's comfort, menstrual health, and productivity during work (Lee et al., 2025).

Based on these conditions, menstrual complaints among female street vendors need to be understood within the context of their work and the environment in which they trade, rather than being viewed solely as individual biological issues (Sisay et al., 2025). A qualitative descriptive approach is needed to explore the types of menstrual complaints experienced, their impact on trading activities, and women's perceptions of their working and environmental conditions (Amukugo et al., 2023). Therefore, the study entitled "Menstrual Complaints and Working Conditions of Female Street Vendors" was conducted to provide a preliminary overview of menstrual health and working conditions among female street vendors. Specifically, this study aimed to identify the types of menstrual complaints experienced by female street vendors, describe the impact of these complaints on their trading activities, and explore occupational and environmental conditions that may be associated with menstrual health. The findings are expected to provide preliminary evidence for developing further research and appropriate reproductive health interventions for women working in the informal sector.

METHOD

This preliminary study used a qualitative descriptive approach supplemented by field observations to obtain an initial overview of reproductive health, menstrual complaints, their impact on trading activities, and the environmental and work conditions of female street vendors. The informants in the preliminary study were 15 female street vendors who were of reproductive age, still menstruating, had worked as vendors for at least six months, and were willing to provide information. Informants were selected using purposive sampling based on their suitability for the study's objectives. Data collection was conducted through structured or semi-structured interviews and direct observation at the trading locations. The interviews were used to explore women's experiences regarding menstrual cycle regularity, pain or cramps, fatigue, back pain, dizziness, mood swings, changes in the amount and duration of bleeding, and the impact of these complaints on trading activities. Additionally, the interviews explored perceived working conditions, such as daily work hours, rest periods, exposure to vehicle exhaust fumes and dust, heat, adequate drinking water, and ease of toilet access while trading.

Field observations were conducted to directly assess the conditions of the trading areas, including proximity to traffic, traffic density, the presence of smoke and dust, heat and sun exposure, work positions and activities, duration of standing or sitting, availability of rest areas, access to drinking water, and the availability and condition of toilets. Observation results were recorded using observation sheets and field notes. Interview data were analyzed descriptively and qualitatively by grouping the information into several main themes: (1) reproductive health and menstrual complaints, (2) the impact of complaints on trading activities, and (3) perceived environmental and work conditions. Simple data, such as the number of informants experiencing a particular complaint, can be presented in frequency and percentage form to clarify the preliminary study results. The interview and observation results were presented narratively and in tables to provide an initial overview of the reproductive health conditions of female street vendors and the accompanying environmental and occupational context. This preliminary study was not intended to test causal relationships, but rather to identify key problems, understand the field context, and strengthen the basis for the main research. Ethical approval for this study was obtained from the Research Ethics Committee prior to data collection. All research procedures were conducted in accordance with applicable ethical principles, and participation was voluntary after informed consent was obtained from each informant.

RESULT

Menstrual Disorders

Based on interviews with 15 female street vendors, various menstrual complaints were identified, including pain, changes in cycle regularity, physical and psychological symptoms, and changes in

bleeding patterns. The distribution of menstrual complaints experienced by respondents is presented in table 1.

Table 1.
Distribution of Menstrual Complaints among Female Street Vendors (n=15)

No.	Complaints Experienced	f	%
1	Abdominal pain/cramps during menstruation	10	66,7
2	Irregular menstrual cycle	9	60,0
3	Fatigue or weakness	9	60,0
4	Lower back pain	8	53,3
5	Dizziness or headache	7	46,7
6	Mood changes/irritability	7	46,7
7	Heavier menstrual bleeding than usual	5	33,3
8	Menstruation lasting more than 8 days	4	26,7
9	Spotting/bleeding between menstrual periods	3	20,0

The findings show that menstrual complaints were common among female street vendors. Abdominal pain or cramps were the most frequently reported complaint (66.7%), followed by irregular menstrual cycles and fatigue (60.0% each), lower back pain (53.3%), and dizziness or mood changes (46.7% each). Some respondents also experienced heavier bleeding, prolonged menstruation, and intermenstrual spotting. These findings indicate that menstrual health problems are an important reproductive health concern among female street vendors.

The Impact of Menstrual Complaints on Trading Activities

Menstrual complaints experienced by female street vendors not only cause physical discomfort but also affect their ability to carry out their trading activities. These impacts include worsening symptoms after long hours of work, difficulty concentrating, an increased need for rest, and even reduced trading time. The distribution of the impact of menstrual complaints on trading activities is presented in table 2.

Table 2.
Distribution of the Impact of Menstrual Complaints on Trading Activities among Female Street Vendors (n=15)

No.	Impact on Work	f	%
1	Menstrual complaints became more severe after working for long hours	8	53,3
2	Difficulty concentrating while working	6	40,0
3	Needed to take more frequent breaks	5	33,3
4	Reduced working hours or did not work	3	20,0

The findings indicate that menstrual complaints affected the work activities of female street vendors. More than half (53.3%) reported that symptoms became more severe after long working hours, while 40.0% had difficulty concentrating. In addition, 33.3% needed more frequent breaks and 20.0% reduced their working hours or did not work. These findings suggest that menstrual complaints may interfere with work performance and daily productivity.

Environmental and Occupational Conditions

In addition to menstrual complaints, female street vendors also face various environmental and occupational conditions that can potentially impact their comfort and health while selling. These conditions include exposure to vehicle exhaust fumes and dust, long working hours, heat, limited fluid intake, and inadequate toilet access. The distribution of respondents' environmental and occupational conditions is presented in table 3.

Table 3.
Distribution of Environmental and Occupational Conditions among Female Street Vendors (n=15)

No.	Work/Environmental Conditions	f	%
1	Exposure to vehicle exhaust and dust during work	11	73,3
2	Working 8–12 hours per day	10	66,7
3	Experiencing heat or thermal discomfort while working	9	60,0
4	Difficulty maintaining adequate fluid intake during work	7	46,7
5	Limited access to toilet facilities	6	40,0

The findings show that female street vendors face several unfavorable working conditions. Most respondents were exposed to vehicle exhaust and dust (73.3%), worked 8–12 hours per day (66.7%), and experienced heat discomfort (60.0%). In addition, 46.7% had difficulty maintaining adequate fluid intake, while 40.0% reported limited access to toilets. These conditions may affect comfort, work capacity, and menstrual and reproductive health, although this descriptive study cannot establish causal relationships.

DISCUSSION

Menstrual Disorders

The study results showed that female street vendors experienced various menstrual complaints, particularly abdominal pain or cramps (66.7%), irregular menstrual cycles and fatigue (60.0%), low back pain (53.3%), and dizziness and mood swings (46.7%). The high prevalence of menstrual pain requires attention, as severe dysmenorrhea has been shown to be associated with decreased quality of life, impaired activity, absenteeism, presenteeism, and decreased productivity in women's work (Nariai et al., 2025). The co-occurrence of menstrual complaints also suggests that menstrual health should be viewed as part of women's overall reproductive health, not simply as a periodic complaint during menstruation (Hiraike et al., 2026).

The irregular menstrual cycle found in 60.0% of respondents is an important finding because menstrual characteristics are related to women's reproductive function and fertility (Cao et al., 2024). Menstrual irregularities can occur when ovulatory function is impaired, including in endocrine conditions such as polycystic ovary syndrome, which is characterized by menstrual irregularities, impaired follicular maturation, and anovulation (Palomba et al., 2024). However, the presence of irregular cycles in this preliminary study does not directly indicate PCOS or infertility, but rather suggests a sign that requires further reproductive evaluation if persistent (Sasaki et al., 2025). Psychological and occupational stress also need to be considered, as a systematic review indicates that most studies have found an association between psychological stress and menstrual dysfunction, particularly irregular cycles and changes in bleeding volume (Poitras et al., 2024).

Predominant menstrual pain also needs to be understood carefully, as primary dysmenorrhea can occur without any underlying organic disorder, while secondary dysmenorrhea may be associated with underlying pelvic disorders (McKenna & Fogleman, 2024). One condition that needs to be considered in cases of severe, progressive, or persistent menstrual pain is endometriosis, as this disease is often characterized by pelvic pain, including dysmenorrhea, and can be accompanied by fertility problems (Taylor et al., 2025). The association between endometriosis and infertility has been widely reported, with the risk of infertility in women with endometriosis estimated to be higher than in the general female population (Macer & Taylor, 2024). Therefore, dysmenorrhea found in respondents cannot be considered evidence of endometriosis, but severe or persistent pain should be considered as a reason for further reproductive health evaluation (Szubert et al., 2025).

Changes in bleeding patterns were also found in respondents, including heavier bleeding than usual in 33.3%, menstruation lasting more than 8 days in 26.7%, and spotting or bleeding outside of menstruation in 20.0%. Changes in the regularity, frequency, duration, and volume of bleeding are important parameters in the evaluation of abnormal uterine bleeding and need to be systematically assessed to identify possible underlying causes (Kitahara et al., 2024). Recent clinical research indicates that irregular cycles and heavy bleeding are common forms of AUB in women of reproductive age, with ovulatory disorders being an important non-structural cause (Alshahrani et al., 2024). Further evaluation is needed because AUB can be associated with structural causes such as polyps, adenomyosis, and leiomyomas, as well as non-structural causes such as ovulatory disorders, coagulation disorders, endometriosis, and iatrogenic factors (Jain & Munro, 2023).

Complaints of fatigue, low back pain, dizziness, headaches, and mood swings are better understood as accompanying symptoms of menstruation and cannot be used directly to determine the presence of infertility or ovulatory disorders. However, the combination of physical and psychological complaints can exacerbate the menstrual experience and reduce a woman's ability to carry out work and daily life activities (Araujo et al., 2024). For female street vendors, these conditions are even more relevant because their work can involve psychosocial stress, long working hours, heat, and environmental exposures that must be considered alongside biological factors in assessing reproductive health (Sasaki et al., 2025). Prolonged heat exposure is also of concern, as a recent review suggests that heat stress in women may be associated with cycle irregularities, hormonal imbalances, and decreased ovarian function (Akinola et al., 2025). Exposure to air pollution also warrants attention, as a recent systematic review found that most of the studies reviewed reported an association between air pollution and decreased levels of Anti-Müllerian Hormone, a biomarker of ovarian reserve (Amini et al., 2026). Other evidence suggests that outdoor air pollutants may be associated with several aspects of female fertility, including reproductive function and pregnancy outcomes, although the strength of the evidence varies across exposure types (Latifi et al., 2024). Cycle regularity, bleeding characteristics, and menstrual pain can be used as early warning signs to identify women who require further evaluation, but cannot be used alone to diagnose ovulatory disorders or infertility (Kitahara et al., 2024). Therefore, these results support the need for further research that comprehensively assesses the reproductive health of female street vendors, taking into account individual factors, occupational factors, stress, heat, and environmental exposures that may interact with women's menstrual and reproductive functions (Latifi et al., 2024).

The Impact of Menstrual Complaints on Trading Activities

A preliminary study showed that menstrual complaints impacted the activities of female street vendors. 53.3% reported worsening symptoms after long hours of work, 40.0% experienced difficulty concentrating, 33.3% required more frequent breaks, and 20.0% reduced trading hours or stopped trading when symptoms were severe. These findings suggest that menstrual complaints extend beyond pain and can limit women's daily activities and work responsibilities, as evidenced by a study of 1,800 women of reproductive age that found menstrual pain and bleeding affected both daily life and professional activities (Leon-Larios et al., 2024). Heavy menstrual symptoms were also reported to significantly reduce work performance, particularly when women continued working while experiencing symptoms, a condition known as presenteeism (Okamoto et al., 2024). From a reproductive health perspective, menstrual patterns and symptoms provide important information about a woman's gynecological and general health, making the menstrual cycle increasingly viewed as a vital indicator of health throughout the reproductive years (Rosen Vollmar et al., 2025). Recurrent or heavy menstrual complaints are important because disorders such as menstrual pain, excessive bleeding, premenstrual syndrome (PMS), and irregular cycles are consistently associated with decreased participation and productivity in the workforce for women (Alemu et al., 2025a). A longitudinal study of over 11,000 women also demonstrated that menstrual disorders warrant attention as a women's health issue that may be associated with the ability to maintain work participation over time (Alemu et al., 2025b).

Difficulty concentrating and an increased need for rest found in a preliminary study suggest that menstrual complaints impact women's functional abilities during their trading activities. A study of 384 working women found that 52.9% experienced decreased work performance during menstruation, with complaints including pain, fatigue, menstrual irregularities, changes in blood flow, and difficulty concentrating (Chattopadhyay et al., 2025). Another study in adult women showed that the more severe the menstrual pain and flow, the more likely women were to experience presenteeism, or continue working with reduced performance (Araujo et al., 2024). This is crucial for street vendors because their work requires concentration, interaction with customers, transaction management, and the ability to maintain activity for long hours.

A more severe impact was seen in respondents who reduced trading hours or stopped trading when menstrual symptoms increased. A study of 2,555 Japanese women showed that the more severe the dysmenorrhea, the greater the disruption to absenteeism, presenteeism, daily activities, work productivity, and women's physical, mental, and social quality of life (Nariai et al., 2025). A recent study of working-age women also found that approximately 7.0–8.8% experienced absences or reduced work hours due to menstrual and menopausal symptoms, while 79.7% stated that these symptoms affected work productivity (Sato et al., 2026). Thus, for women traders in the informal sector, menstrual disorders can have dual consequences, including reduced health and reduced ability to engage in productive activities and earn income. Overall, the results of this preliminary study indicate that menstrual complaints among female street vendors need to be understood as part of reproductive health, related to physical, psychological, and social well-being, and the ability to perform work. Evidence from systematic reviews shows that menstrual pain, heavy bleeding, and premenstrual disorders are consistently associated with decreased work performance, increased absenteeism, and reduced productivity in women (Alemu, Waller, & Tooth, 2025). Therefore, describing menstrual complaints, concentration, rest needs, and reduced working hours among female street vendors is important as a basis for understanding women's reproductive health in the context of informal sector employment.

Environmental and Occupational Conditions

Preliminary study results indicate that female street vendors face a variety of environmental and occupational conditions, including exposure to vehicle exhaust and dust (73.3%), working 8–12 hours per day (66.7%), experiencing heat or thermal discomfort (60.0%), difficulty maintaining adequate fluids (46.7%), and limited toilet access (40.0%). These conditions illustrate that female street vendors face a combination of environmental exposures and workloads that require attention, as occupational factors can interact with women's menstrual health and reproductive function (Sasaki et al., 2025). Exposure to vehicle exhaust and dust was the most common condition experienced by respondents, which is relevant because street vendor activities place women close to sources of air pollution for several hours each day (Latifi et al., 2024). A systematic review showed that PM_{2.5}, PM₁₀, and NO₂ are the pollutants with the strongest evidence of association with decreased ovarian reserve in women, making air pollution not only a respiratory issue but also a reproductive health consideration (Zupo et al., 2024). A recent systematic review also found that 9 of 12 studies reported a significant association between air pollution exposure and decreased levels of Anti-Müllerian Hormone, an indicator of ovarian reserve (Amini et al., 2026). Another study of various environmental toxicants showed that long-term exposure to PM_{2.5} and PM₁₀ may be associated with decreased ovarian function and reserve, although methodological limitations require further research (Zhang et al., 2025).

In addition to air pollution, working hours also need to be considered, as 66.7% of respondents engaged in trading activities for 8–12 hours per day. Cohort studies of female workers have shown that work characteristics that disrupt biological rhythms can increase the risk of irregular menstrual cycles, with night shift workers having a higher risk of irregular cycles in long-term follow-up (Lim et al., 2024). Other studies have also shown that long working hours are associated with an increased likelihood of experiencing irregular menstrual cycles in working women, making work duration a relevant occupational factor in assessing menstrual health (Ok et al., 2019). These associations are likely not independent, as psychosocial factors in the workplace have also been linked to menstrual disorders, reproductive hormones, endometriosis, and several indicators of female fertility (Sasaki et al., 2025).

Heat exposure, experienced by 60.0% of respondents, is also important because outdoor trade activities can cause women to experience heat stress for a relatively long time. A systematic review of working women shows that climate change and increasing environmental temperatures increase the risk of occupational heat strain, especially in women working in open, hot environments (Habibi

et al., 2024). Occupational heat can increase body temperature, accelerate fluid loss through sweating, and increase the risk of dehydration and decreased work capacity (Hanse et al., 2024). Recent studies on human reproduction also indicate that heat stress in women may be associated with irregular menstrual cycles, hormonal imbalances, and decreased ovarian function, although evidence in humans still needs to be strengthened (Akinola et al., 2025).

Experimental and clinical evidence compiled in the systematic review also suggests that heat exposure can disrupt folliculogenesis, granulosa cell function, oocyte quality, and reproductive hormone profiles (Harlow et al., 2025). The difficulty maintaining adequate fluids experienced by 46.7% of respondents becomes even more significant when combined with heat exposure and long working hours. Global reviews indicate that workplace heat exposure is associated with numerous health problems and lost productivity, making water access, rest breaks, and heat management essential for worker protection (Nath et al., 2026). Limited toilet access experienced by 40.0% of respondents is also relevant to menstrual health, as women need water, adequate toilets, privacy, and waste disposal facilities to manage their menstruation safely and with dignity (Phillips-Howard et al., 2024). Inadequate WASH facilities can limit women's ability to manage menstrual hygiene safely, comfortably, and privately while at work (Phillips-Howard et al., 2024).

Overall, these findings suggest that female street vendors face concurrent exposures to air pollution, long working hours, heat, fluid limitations, and inadequate sanitation facilities. Scientific evidence suggests that air pollution may be associated with ovarian reserve and fertility, while heat and working conditions may impact women's physiological function, menstruation, and reproductive health (Zupo et al., 2024). Therefore, the environmental and working conditions of female street vendors need to be understood as an accompanying context for menstrual and reproductive health, without directly inferring a causal relationship from the results of this descriptive study (Sasaki et al., 2025). These findings can further inform analytical research that objectively measures exposure to PM_{2.5}, PM₁₀, CO, NO₂, SO₂, O₃, heat, and work characteristics in relation to women's reproductive health indicators (Latifi et al., 2024).

CONCLUSION

The results of this preliminary study indicate that female street vendors experience various menstrual complaints that impact their reproductive health and work activities. These complaints include not only pain and irregular cycles, but also fatigue, impaired concentration, changes in bleeding patterns, and the need for more frequent rest and reduced trading time. These conditions occur in conjunction with various occupational and environmental factors, such as exposure to vehicle exhaust and dust, long working hours, heat, limited fluid intake, and inadequate toilet access.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the Directorate of Research and Community Service, Directorate General of Research and Development Strengthening (Dirjen Risbang), for providing financial support for this research under Contract No. 155/LL2/AL.04.03/PL-BARU/2026.

REFERENCES

- Akhigbe, R. E., Omole, A. I., Oyedokun, P. A., Odetayo, A. F., Ashamu, E. A., & Akhigbe, T. M. (2025). Heat stress and human reproduction: Effects and pathogenesis. *Journal of Thermal Biology*, 134, 104302. doi:10.1016/j.jtherbio.2025.104302.
- Alemu, B. W., Waller, M., & Tooth, L. R. (2025a). Association between menstrual disorders and women's workforce participation: A systematic review. *Heliyon*, 11(12), e43469. doi:10.1016/j.heliyon.2025.e43469.

- Alemu, B. W., Waller, M., & Tooth, L. R. (2025b). The association between menstrual disorders and workforce participation: A prospective longitudinal study. *BJOG: An International Journal of Obstetrics & Gynaecology*, 132(7), 961–971. doi:10.1111/1471-0528.18109.
- Almuhaithb, R. A., Alenazi, R. H., Almebki, R. A., Alshehri, R. A., Alemad, M. M., AlHarbi, J. M., AlAmro, S. A., Alshahrani, R. M., & Bakhsh, H. (2024). Management of abnormal uterine bleeding among reproductive age group women: A cross-sectional study. *Journal of Clinical Medicine*, 13(23), 7086. doi:10.3390/jcm13237086.
- An, L., Huang, Y., Wang, Y., Shen, S., Luo, X., Liang, X., Lu, L., Tang, C., Lin, J., Su, T., Zhan, M., Wang, D., Wang, J., Lai, X., & Li, Y. (2025). Assessment of ovarian dysfunction induced by environmental toxins: A systematic review. *Frontiers in Public Health*, 13, 1575418. doi:10.3389/fpubh.2025.1575418.
- Boadi, J., & Bofo, Y. A. (2026). Occupational heat exposure and self-reported heat-related outcomes among female head porters (Kayayei) in Accra, Ghana. *Discover Public Health*, 23, 841. doi:10.1186/s12982-026-02150-3.
- Cao, Y., Zhao, X., Dou, Z., Gong, Z., Wang, B., & Xia, T. (2024). The correlation between menstrual characteristics and fertility in women of reproductive age: A systematic review and meta-analysis. *Fertility and Sterility*, 122(5), 918–927. doi:10.1016/j.fertnstert.2024.06.016.
- Chattopadhyay, D., Chandran, S. P., & Bandyopadhyay, S. N. (2025). Investigating the impact of menstrual health on female productivity at work: Evidence from Malaysia. *African Journal of Reproductive Health*, 29(12), 76–86. doi:10.29063/ajrh2025/v29i12.8.
- Choi, J., Shin, S., Cho, J., Kim, C., & Kim, K.-N. (2026). Associations between ambient air pollution exposure and menstrual cycle irregularity in premenopausal women. *Yonsei Medical Journal*, 67(2), 165–174. doi:10.3349/ymj.2025.0010.
- de Arruda, G. T., Driusso, P., de Godoy, A. G., Rodrigues, J. C., & Avila, M. A. (2024). Presenteeism and associated factors among women with menstrual symptoms. *Archives of Gynecology and Obstetrics*, 309(5), 2071–2077. doi:10.1007/s00404-024-07425-1.
- Habibi, P., Heydari, A., Dehghan, H., Moradi, A., & Moradi, G. (2024). Climate change and occupational heat strain among women workers: A systematic review. *Indian Journal of Occupational and Environmental Medicine*, 28(1), 4–17. doi:10.4103/ijoem.ijoem_320_21.
- Hanse, B., Alam, S. M., Krishnan, S., Bhattacharjee, M., Sinha, A., Sundareswaran, L., & Kalita, J. (2024). Occupational heat stress and its health impacts—An overview of research status and need for further research in Southeast Asia with special emphasis on mitigation strategies in North East India. *International Journal of Biometeorology*, 68(12), 2477–2493. doi:10.1007/s00484-024-02765-8.
- Hariparsad, S., & Naidoo, R. N. (2019). The effects of occupational pollutants on the reproductive health of female informal street traders in Warwick Junction, Durban, South Africa: A cross-sectional study. *BMC Women's Health*, 19, 163. doi:10.1186/s12905-019-0854-7.
- Hiraike, O., Goto, D., Uchiyama, M., Takahashi, S., & Osuga, Y. (2026). Dysmenorrhea patients' experience with work productivity impact and treatment in Japan. *BMC Women's Health*, 26, 413. doi:10.1186/s12905-026-04588-8.
- Jain, V., Munro, M. G., & Critchley, H. O. D. (2023). Contemporary evaluation of women and girls with abnormal uterine bleeding: FIGO Systems 1 and 2. *International Journal of Gynecology & Obstetrics*, 162(Suppl. 2), 29–42. doi:10.1002/ijgo.14946.
- Kasahara, S., Goto, R., Suzuki, S., Sakamoto, H., et al. (2026). Financial burden of menstrual and menopausal symptoms: Productivity loss from absenteeism and presenteeism among working-age women. *Reproductive Health*, 23, 153. doi:10.1186/s12978-026-02331-y.
- Kitahara, Y., Hiraike, O., Ishikawa, H., Kugu, K., Takai, Y., Yoshino, O., et al. (2024). Diagnosis of abnormal uterine bleeding based on the FIGO classification: A systematic review and expert opinions. *Journal of Obstetrics and Gynaecology Research*, 50(10), 1785–1794. doi:10.1111/jog.16073.

- Latifi, M., Rahim, F., Ahmadlou, M., Pouladian, N., & Allahbakhshian, L. (2024). How can outdoor air pollutants adversely affect women's fertility? Systematic review. *Advanced Biomedical Research*, 13, 115. doi:10.4103/abr.abr_45_24.
- Lee, Y. M., Kim, J. Y., Yoo, H., & Kang, M.-Y. (2025). Association of workplace toilet access with urinary tract symptoms and productivity loss among female workers. *Industrial Health*, 63(4), 356–364. doi:10.2486/indhealth.2024-0160.
- Leon-Larios, F., Silva-Reus, I., Puente Martínez, M. J., Renuncio Roba, A., Ibeas Martínez, E., Lahoz Pascual, I., Naranjo Ratia, M. C., & Quílez Conde, J. C. (2024). Influence of menstrual pain and symptoms on activities of daily living and work absenteeism: A cross-sectional study. *Reproductive Health*, 21, 25. doi:10.1186/s12978-024-01757-6.
- Macer, M. L., & Taylor, H. S. (2012). Endometriosis and infertility: A review of the pathogenesis and treatment of endometriosis-associated infertility. *Obstetrics and Gynecology Clinics of North America*, 39(4), 535–549. doi:10.1016/j.ogc.2012.10.002.
- McKenna, K. A., & Fogleman, C. D. (2021). Dysmenorrhea. *American Family Physician*, 104(2), 164–170.
- Mitsubishi, R., Sawai, A., Kiyohara, K., Shiraki, H., & Nakata, Y. (2023). Factors associated with the prevalence and severity of menstrual-related symptoms: A systematic review and meta-analysis. *International Journal of Environmental Research and Public Health*, 20(1), 569. doi:10.3390/ijerph20010569.
- Munro, M. G., Balen, A. H., Cho, S., Critchley, H. O. D., Díaz, I., Ferriani, R., Henry, L., Mocanu, E., & van der Spuy, Z. M. (2022). The FIGO ovulatory disorders classification system. *Human Reproduction*, 37(10), 2446–2464. doi:10.1093/humrep/deac180.
- Nariai, M., Wada-Hiraike, O., Maeda, E., Matsuzaki, M., Mori-Uchino, M., Furukawa, M., et al. (2025). Effects of dysmenorrhea on work productivity and quality of life in Japanese women: A large-scale web-based cross-sectional study. *PLOS ONE*, 20(11), e0329154. doi:10.1371/journal.pone.0329154.
- Nath, A., Sahu, S., & Lee, J. K. W. (2026). An umbrella review of systematic reviews and meta-analyses on occupational heat exposure, health risks, and productivity losses globally. *Current Environmental Health Reports*, 13(1), 2. doi:10.1007/s40572-025-00520-8.
- Ok, G., Ahn, J., & Lee, W. (2019). Association between irregular menstrual cycles and occupational characteristics among female workers in Korea. *Maturitas*, 129, 62–67. doi:10.1016/j.maturitas.2019.07.019.
- Okamoto, M., Matsumura, K., Takahashi, A., Kurokawa, A., Watanabe, Y., Narimatsu, H., & Yoshida, H. (2024). The association between menstrual symptoms and presenteeism: A cross-sectional study for women working in Central Tokyo. *International Journal of Environmental Research and Public Health*, 21(3), 313. doi:10.3390/ijerph21030313.
- Palomba, S., Costanzi, F., Caserta, D., & Vitagliano, A. (2024). Pharmacological and non-pharmacological interventions for improving endometrial receptivity in infertile patients with polycystic ovary syndrome: A comprehensive review of the available evidence. *Reproductive BioMedicine Online*, 49(6), 104381. doi:10.1016/j.rbmo.2024.104381.
- Phillips-Howard, P. A., Osire, E., Akinyi, C., Zulaika, G., Otieno, F. O., & Mehta, S. D. (2024). Water, sanitation and hygiene at sex work venues to support menstrual needs. *Frontiers in Public Health*, 12, 1305601. doi:10.3389/fpubh.2024.1305601.
- Poitras, M., Shearзад, F., Qureshi, A. F., Blackburn, C., & Plamondon, H. (2024). Bloody stressed! A systematic review of the associations between adulthood psychological stress and menstrual cycle irregularity. *Neuroscience & Biobehavioral Reviews*, 163, 105784. doi:10.1016/j.neubiorev.2024.105784.
- Rosen Vollmar, A. K., Mahalingaiah, S., & Jukic, A. M. (2025). The menstrual cycle as a vital sign: A comprehensive review. *F&S Reviews*, 6(1), 100081. doi:10.1016/j.xfmr.2024.100081.
- Sasaki, N., Imamura, K., Watanabe, K., Hidaka, Y., Sakuraya, A., Ando, E., Eguchi, H., Inoue, A., Tsuno, K., Komase, Y., Iida, M., Otsuka, Y., Iwanaga, M., Kobayashi, Y., Inoue, R., Shimazu, A., Tsutsumi, A., & Kawakami, N. (2025). Association of psychosocial factors at

- work with fertility and menstrual disorders: A systematic review. *Japan Journal of Nursing Science*, 22(1), e12624. doi:10.1111/jjns.12624.
- Serya, H., El-Kurdy, R., Serria, E., & El-Gilany, A.-H. (2025). Dysmenorrhea among working women and its effect on their work productivity and activity impairment. *Journal of the Egyptian Public Health Association*, 100, 18. doi:10.1186/s42506-025-00199-7.
- Zhou, L. T., Gokyer, D., Madkins, K., Beestrup, M., Horton, D. E., Duncan, F. E., & Babayev, E. (2025). The effects of heat stress on the ovary, follicles, and oocytes: A systematic review. *Biology of Reproduction*, 113(5), 1013–1028. doi:10.1093/biolre/roaf150.
- Zupo, R., Castellana, F., Nawrot, T. S., Lampignano, L., Bortone, I., Murgia, F., Campobasso, G., Gruszecka Kosowska, A., Giannico, O. V., & Sardone, R. (2024). Air pollutants and ovarian reserve: A systematic review of the evidence. *Frontiers in Public Health*, 12, 1425876. doi:10.3389/fpubh.2024.1425876.