

Lifestyle Characteristics among Women Experiencing Spontaneous Abortion: A Nursing Perspective from Mosul, Iraq

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ABSTRACT

Background: Spontaneous abortion (miscarriage) is a common early pregnancy complication influenced by modifiable lifestyle factors. Recognizing these factors is vital for developing nursing interventions to improve maternal outcomes. **Objectives:** This study aimed to investigate the distribution of selected lifestyle factors among women with spontaneous abortion attending teaching hospitals in Mosul City, Iraq. **Methods:** A descriptive cross-sectional study was conducted from November 2023 to June 2024 involving 200 women with clinically confirmed spontaneous abortion at three major teaching hospitals in Mosul. Data was collected using structured face-to-face interviews based on a validated questionnaire. Statistical analysis was performed using SPSS version 26, with a significance level set at $p < 0.05$. **Results:** This study found significant associations between spontaneous abortion and poor nutrition ($p = 0.037$), low physical activity ($p = 0.030$), high psychological stress ($p = 0.007$), and irregular sleep patterns ($p = 0.027$). However, no significant associations were observed with smoking, drug use, or environmental exposure. Only 26.7% of participants demonstrated good lifestyle adherence, while 73.3% exhibited fair to poor adherence. **Conclusion:** The findings underscore the critical influence of modifiable lifestyle factors on pregnancy outcomes and highlight the essential role of nursing professionals in providing lifestyle-based education and support. Integrating lifestyle assessment and counseling into maternal care may contribute to the reduction of preventable pregnancy losses.

Keywords: Lifestyle and Sleep Pattern; Maternal Health; Nutrition and Physical Activity; Psychological Stress; Spontaneous Abortion

INTRODUCTION

Spontaneous abortion, commonly referred to as miscarriage, is defined as the loss of a pregnancy before the 20th week of gestation. It represents one of the most frequent complications in early pregnancy and carries profound medical, psychological, and social consequences for women and their families (Taher & Ibrahim, 2023). Globally, it is estimated that approximately 15% of clinically recognized pregnancies end in spontaneous abortion, with most occurring during the first trimester (Liu *et al.*, 2025). While chromosomal abnormalities account for a substantial proportion of pregnancy losses, growing evidence highlights the contribution of modifiable lifestyle factors in shaping maternal and fetal outcomes. This shift in focus underscores the potential for prevention through targeted interventions that address behavioral and environmental determinants of reproductive health (Wang *et al.*, 2025).

Women's lifestyles encompass a wide range of daily behaviors, including nutritional practices, levels of physical activity, sleep patterns, and the ability to manage stress. Each of these dimensions plays a critical role in reproductive physiology. Poor dietary intake, for example, can lead to deficiencies in essential micronutrients such as folate, vitamin D, and iron, which are vital for placental development and fetal growth (Zloto *et al.*, 2025). Similarly, a sedentary lifestyle has been associated with metabolic and hormonal disturbances that may compromise pregnancy viability, whereas regular moderate physical activity has been shown to improve placental perfusion and maternal well-being (Zheng *et al.*, 2026). Sleep deprivation and irregular sleep patterns have also emerged as risk factors, as they disrupt circadian rhythms and hormonal regulation essential for early pregnancy maintenance. Psychological stress represents another critical determinant, as elevated stress hormones such as cortisol can impair immune function, alter uterine receptivity,

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and increase the risk of miscarriage (Arnadottir *et al.*, 2025).

In addition to individual behaviors, broader psychosocial and environmental exposures also play a significant role in shaping pregnancy outcomes. Studies have demonstrated that secondhand smoke, occupational hazards, and exposure to environmental pollutants contribute to adverse reproductive outcomes (Cao *et al.*, 2025). These risks are often amplified in low-resource settings, where limited access to high-quality antenatal care constrains timely screening, counseling, and intervention (Podilyakina *et al.*, 2025). Therefore, examining lifestyle factors within their cultural and socioeconomic context is essential for developing effective, context-specific health strategies.

In Iraq, maternal and reproductive health continues to face substantial challenges. Decades of conflict, economic instability, and strained healthcare infrastructure have weakened the capacity to deliver consistent, high-quality prenatal services (Ibrahim & Ibrahim, 2025). Within this context, Mosul City represents a particularly important setting for study. Having endured years of armed conflict and displacement, the city remains in the process of rebuilding its health system (Hamarash *et al.*, 2025). Women in this setting encounter a complex interplay of stressors including psychological trauma, disrupted social support networks, economic hardship, and cultural constraints which may exacerbate the impact of unhealthy lifestyle behaviors on reproductive outcomes (Abdullah *et al.*, 2024). Previous studies in Iraq have reported high rates of miscarriage but have seldom explored the role of lifestyle factors within this context (Ibrahim *et al.*, 2020). Moreover, evidence from other Middle Eastern countries suggests that factors such as consanguinity, limited health literacy, and traditional gender roles may further compound these risks, underscoring the importance of context-specific research (Yaas *et al.*, 2023).

Given these challenges, nursing professionals are uniquely positioned to contribute to the prevention of spontaneous abortion through health education, lifestyle counseling, and psychosocial support (Almukhtar *et al.*, 2021). Nurses often serve as the first and most consistent point of contact for women during antenatal care, providing valuable opportunities to identify modifiable risk factors and deliver culturally appropriate interventions. However, evidence-based guidance tailored to the Iraqi context remains limited.

This study, therefore, seeks to explore the association between lifestyle factors nutrition, physical activity, psychological stress, sleep patterns, smoking, drug use, and environmental exposure—and spontaneous abortion among women attending teaching hospitals in Mosul City. By adopting a nursing perspective, the study emphasizes the importance of integrating lifestyle assessment into reproductive health care. It also aims to generate evidence that can inform culturally sensitive interventions and policy recommendations to reduce preventable pregnancy losses in Iraq.

METHODOLOGY

Study Design

A descriptive cross-sectional study was conducted to investigate the association between women's lifestyle factors and spontaneous abortion from a nursing perspective. This design was selected because it enabled the researchers to capture a snapshot of lifestyle behaviors and related outcomes among women who had experienced spontaneous abortion.

Study Setting and Duration

The study was conducted in three major teaching hospitals in Mosul City, Iraq: Al-Batool Teaching Hospital, Al-Salam General Hospital, and Medical Research Hospital. Data was collected over an eight-month period, from November 1, 2023, to June 24, 2024.

Sample and Sampling Technique

A non-probability purposive sampling technique was employed to recruit women with clinically confirmed spontaneous abortion. This approach was selected due to the sensitive and specific nature of the condition, which made random probability sampling challenging within the limited study period. Purposive sampling ensured that participants were directly aligned with the study objectives, focusing exclusively on

women with the condition under investigation.

Inclusion Criteria

A total of 200 women were included in the final sample based on predefined eligibility criteria. Participants were eligible if they were aged between 18 and 45 years, had a clinically confirmed diagnosis of spontaneous abortion, and provided informed consent to participate.

Exclusion Criteria

To enhance the validity of the findings and minimize potential confounding, several exclusion criteria were applied. Women with induced abortions were excluded. Additionally, cases involving obstetric complications clearly unrelated to lifestyle factors—such as congenital fetal anomalies—were not considered. Furthermore, women with severe comorbid conditions, including uncontrolled diabetes, hypertension, or renal disease, were excluded to reduce the influence of underlying medical conditions on pregnancy outcomes (Alkhyatt *et al.*, 2012).

Data Collection Tool

Data was collected through structured face-to-face interviews using a pre-tested questionnaire. The instrument was adapted from internationally validated sources, including World Health Organization (WHO) reproductive health guidelines (Alneama & Ibrahim, 2025) and relevant prior studies, and was reviewed by a panel of subject experts to ensure content validity.

The questionnaire comprised three sections

Socio-Demographic and Reproductive History

Variables such as age, residence, education, occupation, income, Body Mass Index (BMI), consanguinity, parity, and gestational age at abortion.

Obstetrical and Medical History

Number of previous pregnancies and abortions, chronic illnesses, and medication use.

Lifestyle Factors

Nutrition habits, physical activity, sleep patterns, psychological stress, smoking, and environmental exposures.

Pilot Study and Reliability

A pilot study was conducted with 20 participants, who were excluded from the final analysis, to assess the clarity and reliability of the instrument. Cronbach's alpha for the lifestyle section was 0.81, indicating good internal consistency.

Data Analysis

Data was analyzed using the Statistical Package for the Social Sciences (SPSS), version 26. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize demographic and clinical characteristics. Chi-square tests were initially conducted to examine relationships between lifestyle variables and reproductive characteristics. Subsequently, multivariable binary logistic regression analysis was performed to identify independent associations between lifestyle factors and reproductive outcomes while controlling for potential confounding variables, including maternal age, BMI, parity, educational level, income status, and prior abortion history. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were calculated to estimate the strength of associations. A *p*-value of < 0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the Collegiate Committee for Medical Research Ethics at the University of Nineveh, Iraq, with reference number CCMRE-Nur-23-7 on 28th October 2024. Written informed consent was obtained from all participants prior to data collection. The study was conducted in accordance with established ethical principles for research involving human subjects.

RESULTS

A total of 200 women with clinically confirmed spontaneous abortion participated in the study.

Table 1: Demographic and Reproductive Characteristics of Women with Spontaneous Abortion (n = 200)

| Variable | Frequency (n) | Percentage (%) |
|-----------------------------------|---------------|----------------|
| Residence (Urban) | 113 | 56.5 |
| Age Group (25–34 years) | 87 | 43.5 |
| Income (Low) | 102 | 51.0 |
| Type of Abortion (Missed) | 108 | 54.0 |
| Gestational Age (First Trimester) | 142 | 71.0 |
| Consanguineous Marriage | 77 | 38.5 |

The majority of participants were urban residents (56.5%) and fell within the age group of 25–34 years (43.5%). More than half reported low income (51.0%), and 71.0% experienced abortion in the first trimester, most of which were classified as missed abortions (54.0%). Consanguineous marriage was reported by 38.5% of participants (Table 1).

Table 2: Distribution of Lifestyle Factors among Participants (n = 200)

| Lifestyle Factor | Frequency (n) | Percentage (%) |
|---------------------------|---------------|----------------|
| Poor Nutrition | 95 | 47.5 |
| Low Physical Activity | 105 | 52.5 |
| High Psychological Stress | 126 | 63.0 |
| Poor Sleep Pattern | 116 | 58.0 |
| Smoking | 13 | 6.5 |
| Drug Use | 16 | 8.0 |
| Environmental Exposure | 20 | 10.0 |

Analysis of lifestyle practices revealed that psychological stress (63.0%), poor sleep patterns (58.0%), and low physical activity (52.5%) were the most prevalent risk factors. In contrast, smoking (6.5%) and drug use (8.0%) were the least reported behaviors, while 47.5% of women reported poor nutrition (Table 2).

Table 3: Association between Lifestyle Factors and Spontaneous Abortion (n = 200)

| Lifestyle Factor | χ^2 (df = 1) | p-value | Significant (p < 0.05) | Odds Ratio (OR) | 95% CI |
|------------------------|-------------------|---------|------------------------|-----------------|-----------|
| Nutrition | 4.35 | 0.037 | Yes | 1.84 | 1.05–3.23 |
| Physical Activity | 4.71 | 0.030 | Yes | 1.92 | 1.06–3.47 |
| Psychological Stress | 7.25 | 0.007 | Yes | 2.34 | 1.26–4.32 |
| Sleep Pattern | 4.90 | 0.027 | Yes | 1.78 | 1.07–2.97 |
| Smoking | 1.72 | 0.190 | No | 1.21 | 0.62–2.35 |
| Drug Use | 0.65 | 0.420 | No | 1.15 | 0.55–2.40 |
| Environmental Exposure | 0.36 | 0.550 | No | 1.10 | 0.60–2.05 |

No significant associations were observed for smoking (OR = 1.21, 95% CI: 0.62–2.35), drug use (OR = 1.15, 95% CI: 0.55–2.40), or environmental exposure (OR = 1.10, 95% CI: 0.60–2.05), although the effect sizes suggest weak positive associations that did not reach statistical significance (Table 3).

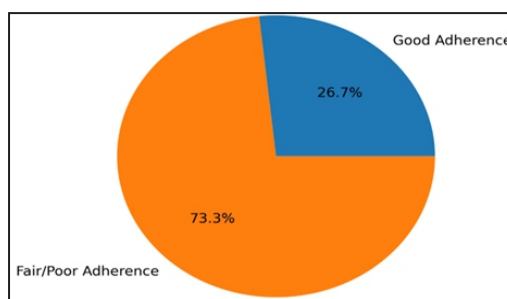


Figure 1: Overall Lifestyle Adherence among Participants (n=200)

Figure 1 illustrates the distribution of overall lifestyle adherence among participants. Only 26.7% of women demonstrated good adherence to healthy lifestyle practices, whereas the majority (73.3%) exhibited fair or poor adherence, indicating a substantial gap in health-promoting behaviors among women experiencing spontaneous abortion.

Table 4: Association Between Sociodemographic Characteristics and Lifestyle Adherence Among Participants (n = 200)

| Variable | Good Lifestyle Adherence n (%) | Fair/Poor Lifestyle Adherence n (%) | χ^2 | p-value |
|----------------------------------|--------------------------------|-------------------------------------|----------|---------|
| Age Group | | | 5.12 | 0.024* |
| 18–24 years | 18 (36.0) | 32 (64.0) | | |
| 25–34 years | 23 (26.4) | 64 (73.6) | | |
| ≥35 years | 12 (19.0) | 51 (81.0) | | |
| Educational Level | | | 6.45 | 0.011* |
| Primary or less | 10 (16.7) | 50 (83.3) | | |
| Secondary | 18 (25.7) | 52 (74.3) | | |
| College and above | 25 (35.7) | 45 (64.3) | | |
| Income Level | | | 4.89 | 0.027* |
| Low | 19 (18.6) | 83 (81.4) | | |
| Moderate/High | 34 (34.7) | 64 (65.3) | | |
| BMI | | | 5.76 | 0.016* |
| Normal BMI | 29 (35.4) | 53 (64.6) | | |
| Overweight/Obese | 24 (20.3) | 94 (79.7) | | |
| Parity | | | 3.98 | 0.046* |
| Primiparous | 27 (33.8) | 53 (66.2) | | |
| Multiparous | 26 (21.7) | 94 (78.3) | | |
| Previous Abortion History | | | 7.11 | 0.008* |
| No previous abortion | 31 (36.0) | 55 (64.0) | | |
| Previous abortion history | 22 (19.3) | 92 (80.7) | | |

*Statistically significant at $p < 0.05$, all the p-values are significant; BMI- Body Mass Index

Significant associations were observed between lifestyle adherence and several sociodemographic characteristics. Poor lifestyle adherence was more common among older women, participants with lower educational levels, low-income status, overweight or obesity, multiparity, and previous abortion history ($p < 0.05$). Women with higher educational attainment and normal BMI demonstrated better adherence to healthy lifestyle behaviors compared with their counterparts. These findings suggest that sociodemographic and reproductive characteristics may influence maternal health-related behaviors among women experiencing spontaneous abortion.

Table 5: Multivariable Logistic Regression Analysis of Lifestyle Factors and Reproductive Outcomes

| Variable | AOR | 95% CI | p-value |
|---------------------------|------|-----------|---------|
| Poor nutrition | 1.82 | 1.04–3.18 | 0.034 |
| Low physical activity | 1.76 | 1.01–3.06 | 0.041 |
| High psychological stress | 2.21 | 1.19–4.10 | 0.011 |
| Poor sleep pattern | 1.69 | 1.02–2.81 | 0.039 |

Adjusted Odds Ratios (AOR) for: maternal age; BMI; parity; education; income; prior abortion history

After adjusting for maternal age, BMI, parity, educational level, income, and prior abortion history, high psychological stress remained the strongest independently associated lifestyle factor (AOR = 2.21, 95% CI: 1.19–4.10, $p = 0.011$). Poor nutrition, low physical activity, and poor sleep patterns also remained significantly associated in the adjusted model.

DISCUSSION

This study explored lifestyle characteristics among women experiencing spontaneous abortion in Mosul City and identified several unhealthy lifestyle behaviors commonly reported by participants (Catak *et al.*, 2016; Podilyakina *et al.*, 2025). Poor nutrition, low physical activity, high psychological stress, and irregular sleep patterns were prevalent among the study population and demonstrated significant relationships with reproductive health indicators (Liu *et al.*, 2025; Zhang *et al.*, 2026). In contrast, smoking, drug use, and

environmental exposure were less frequently reported and did not demonstrate statistically significant associations. Overall, the findings suggest that modifiable lifestyle behaviors may represent important considerations in maternal nursing assessment and health promotion among women of reproductive age (Guo *et al.*, 2026).

Poor nutritional practices were commonly observed among participants, with nearly half of the women reporting inadequate dietary habits. Maternal nutrition plays a fundamental role in maintaining hormonal balance, placental development, and fetal growth during early pregnancy. Deficiencies in essential micronutrients such as folate, iron, and vitamin D have been associated with adverse pregnancy outcomes in previous studies. Economic hardship limited dietary diversity, and insufficient nutritional awareness may contribute to unhealthy eating patterns among women in low-resource settings. These findings highlight the importance of integrating nutritional assessment and counseling into routine maternal nursing care, particularly during preconception and early antenatal periods (Cheng & Lai, 2026).

Psychological stress and poor sleep patterns were among the most frequently reported lifestyle concerns in this study. High stress levels may negatively affect reproductive health through neuroendocrine and hormonal mechanisms, including increased cortisol secretion and immune dysregulation. Similarly, inadequate or irregular sleep may disrupt circadian rhythms and hormonal regulation essential for healthy pregnancy maintenance (Arnadottir *et al.*, 2025). The coexistence of stress and sleep disturbance among many participants suggests a potentially interconnected effect on maternal well-being. These findings emphasize the need for nursing interventions that incorporate psychological support, stress reduction strategies, and sleep hygiene education as part of comprehensive maternal healthcare services (Zhang *et al.*, 2026).

The association between low physical activity and spontaneous abortion observed in this study is consistent with international literature (Alkhalaf *et al.*, 2026). In Mosul, cultural restrictions on women's mobility, combined with urban insecurity and limited access to safe recreational spaces, may further contribute to sedentary lifestyles (Hamarash *et al.*, 2025). Addressing these barriers requires not only clinical guidance but also community-based initiatives that promote safe and culturally acceptable forms of physical activity for women (Edrees & Ibrahim, 2020).

Psychological stress emerged as the strongest predictor of spontaneous abortion, in line with evidence from Asia and Europe linking stress and anxiety to miscarriage (Adiyaman *et al.*, 2025). In the context of Mosul, stress levels may be further amplified by displacement, ongoing security concerns, and financial hardship. These findings underscore the importance of integrating mental health screening and stress management programs into maternal nursing care. Irregular sleep patterns were also significantly associated with spontaneous abortion, consistent with global evidence highlighting the role of sleep in hormonal regulation and placental function (Madlala & Kassier, 2018). Nurses can play a pivotal role in counseling women on sleep hygiene; however, interventions must account for contextual challenges such as crowded living conditions and persistent psychosocial stressors common in post-conflict settings (Chaves *et al.*, 2024).

Interestingly, smoking, drug use, and environmental exposure were not significantly associated with spontaneous abortion in this study. Several factors may explain these findings. The low prevalence of self-reported smoking and drug use likely influenced by cultural norms may have limited the statistical power to detect significant associations (Guo *et al.*, 2026). Additionally, underreporting due to social desirability bias may have obscured the true extent of these behaviors. Regarding environmental exposures, the lack of significant association may reflect limitations in measurement within the questionnaire, highlighting the need for more objective assessment methods in future research (Aghda *et al.*, 2026; Saidi *et al.*, 2025).

Taken together, these findings indicate that while some risk factors align with global evidence, others reflect the unique cultural, social, and post-conflict context of Mosul. Notably, only 26.7% of women demonstrated good lifestyle adherence, revealing a substantial gap in preventive maternal health practices. This underscores the urgent need for nursing-led, culturally sensitive, and community-based interventions to improve maternal outcomes in Iraq (Habow & Ibrahim, 2024).

Sociocultural Context in Mosul

The demographic profile of participants—predominantly urban women aged 25–34 years with low socioeconomic status represents a population at increased risk of adverse reproductive outcomes. Similar associations between low income, limited education, and increased miscarriage risk have been reported in China (Zeng *et al.*, 2007) and Turkey (Catak *et al.*, 2016). In Mosul's post-conflict context, these risks are likely exacerbated by disrupted healthcare infrastructure, economic instability, and psychosocial stressors. Together, these factors may intensify the impact of unhealthy lifestyle behaviors on pregnancy outcomes. This context underscores the need for culturally tailored nursing interventions that address not only clinical factors but also broader social determinants of health.

Nutritional deficiencies—particularly in micronutrients such as folate, iron, and vitamin D—have long been associated with an increased risk of miscarriage (Pérez-Castillo *et al.*, 2020; Polanek *et al.*, 2025). The high prevalence of poor dietary practices observed in this study is consistent with findings from Middle Eastern contexts, where economic hardship and limited access to balanced diets often contribute to suboptimal maternal nutrition. These findings reinforce the critical role of nurses in delivering targeted nutritional counseling as an integral component of antenatal care (Hajek & König, 2022).

The findings of this study have important implications for nursing practice and maternal healthcare planning. Nurses play a central role in identifying unhealthy lifestyle behaviors during antenatal and reproductive health assessments. Routine screening for nutritional status, psychological stress, sleep disturbances, and physical inactivity should be incorporated into maternal care protocols to enable early recognition of potentially modifiable concerns. In addition, nurses can provide culturally appropriate health education focused on healthy nutrition, stress management, sleep hygiene, and safe physical activity during pregnancy. Given the psychosocial challenges faced by many women in Mosul, nursing care should also include emotional support and referral pathways for women requiring psychological or social assistance. Strengthening nurses' competencies in lifestyle counseling and preventive maternal care may contribute to improving women's health awareness and promoting healthier pregnancy outcomes in underserved and post-conflict communities.

Limitations

The absence of a comparison group comprising women with ongoing or uncomplicated pregnancies limits the ability of the study to ascertain whether the observed lifestyle behaviors were disproportionately prevalent among women experiencing spontaneous abortion relative to the general pregnant population.

Future Scope

Future research should prioritize longitudinal and multi-center designs to establish causal relationships between lifestyle factors and spontaneous abortion and to enhance the generalizability of findings across diverse populations. Expanding the evidence base through prospective studies and incorporating objective measures of lifestyle behaviors would provide more robust insights into the temporal and causal pathways influencing pregnancy outcomes. At the policy level, there is a pressing need for the Iraqi Ministry of Health to integrate structured lifestyle assessment tools into routine antenatal care, enabling early identification of modifiable risk factors among pregnant women. In addition, the development of national, evidence-based guidelines addressing maternal nutrition, stress management, sleep hygiene, and safe physical activity is essential to standardize care and improve maternal health outcomes.

CONCLUSION

This study demonstrated that modifiable lifestyle factors—particularly poor nutrition, low physical activity, high psychological stress, and poor sleep—were significantly associated with spontaneous abortion among women in Mosul. In contrast, smoking, drug use, and environmental exposures were not significantly associated, likely due to their low prevalence in the sample. These findings highlight the essential role of nurses in integrating lifestyle screening, counseling, and education into maternal healthcare practice.

Furthermore, strengthening community-based education programs can play a vital role in raising awareness of healthy reproductive lifestyles, particularly in underserved and post-conflict settings. Capacity building is equally important; therefore, targeted training programs should be implemented to equip nurses and midwives with the skills required to deliver culturally sensitive and context-specific lifestyle counseling across both hospital and primary healthcare settings. By addressing lifestyle-related risk factors through coordinated clinical and public health strategies, Iraqi health authorities can substantially reduce preventable pregnancy losses and promote improved maternal and reproductive health outcomes.

CRedit Authorship Contribution Statement

N.Q.Y: Conceptualization, methodology, data curation, investigation, formal analysis, writing – original draft, writing – review and editing, S.H.A.M: Supervision, validation, methodology, writing – review and editing, project administration.

AI Assistance Declaration

During the preparation of this manuscript, the authors utilized ChatGPT to assist with language refinement, grammar correction, and improving the clarity of the text. All content generated with the assistance of this tool was carefully reviewed, revised, and validated by the authors. The authors take full responsibility for the accuracy, integrity, and originality of the final manuscript.

Conflict of Interests

The authors declares no competing interests.

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REFERENCES

- Abdullah, M.K., Abdulghani, M.F., Ibrahim, R.H., Mahmood, H.J., Mohsen, O.A., & Jassim, R.S. (2024). Nurses' attitudes, knowledge, and practices concerning evidence-based practice: A cross-sectional study. *Malaysian Journal of Nursing*, 15(4), 4–11. <https://doi.org/10.31674/mjn.2024.v15i04.002>
- Adiyaman, D., Korzoum, A., Lukac, S., Hüner, B., Lato, C., Burkert, L., Schmid, A., Janni, W., & Lato, K. (2025). Auswirkungen der Schwangerschaft auf die Sexualität, körperliche Aktivität und das Wohlbefinden von Frauen während der Schwangerschaft [Effects of pregnancy on sexuality, physical activity, and well-being of women during pregnancy]. *Zeitschrift für Geburtshilfe und Neonatologie*, 229(4), 239–248. <https://doi.org/10.1055/a-2607-7766>
- Aghda, S.A. F., Langarizadeh, M., Mangoli, E., & Sayadi, M. (2026). Determining risk factors predicting miscarriage among couples undergoing assisted reproductive treatment: A systematic review. *BMC Pregnancy and Childbirth*, 26, 315. <https://doi.org/10.1186/s12884-026-08819-6>
- Alkhalaf, Z.M., Mumford, S.L., Schisterman, E.F., Silver, R.M., & Thoma, M.E. (2026). Periconception maternal vitamin D status on nausea and vomiting symptoms in early pregnancy among women with a history of pregnancy loss. *Nutrients*, 18(4), 692. <https://doi.org/10.3390/nu18040692>
- Alkhyatt, M.K., Abdullah, E.K., Ibraim, R.H., Al Anee, B., & Al Raho, J. (2012). Post-traumatic stress in women with breast cancer. *Jordan Medical Journal*, 46(4), 315–319. https://applications.emro.who.int/imemrf/Jordan_Med_J/Jordan_Med_J_2012_46_4_315_319.pdf
- Almukhtar, S.H., Hassan, J.M., & Abdulkareem, Y.Z. (2021). The impact of maternal obesity on newborn and

- maternal health status. *Ожирение и метаболизм*, 18(4), 417–424. <https://doi.org/10.14341/OMET12772>
- Alneama, R.M.J., & Ibrahim, R.H. (2025). An integration of Benner's theory to explore learning styles and motivation as predictors of academic achievement among nursing students in Iraq. *Journal of Holistic Nursing Science*, 12(1), 95–104. <https://doi.org/10.31603/nursing.v12i1.13324>
- Arnadottir, G.A., Jonsson, H., Schlaikjaer Hartwig, T., Gruhn, J. R., Møller, P. L., Gylfason, A., Westergaard, D., Chan, A. C.-H., Oddsson, A., Stefansdottir, L., le Roux, L., Steinthorsdottir, V., Moore, K. H. S., Olafsson, S., Olason, P. I., Eggertsson, H. P., Halldorsson, G. H., Walters, G. B., Stefansson, H., ... Stefansson, K. (2025). Sequence diversity lost in early pregnancy. *Nature*, 642(8068), 672–681. <https://doi.org/10.1038/s41586-025-09031-w>
- Cao, Y., Ding, M., Chen, J., Zhang, C., He, F., Li, X., Jiang, C., Sun, X., Zou, Y., Yang, D., & Zhao, X. (2025). The relationship between insulin resistance and recurrent pregnancy loss in assisted reproductive technology: A retrospective case-control study. *Medicine*, 104(22), e42373. <https://doi.org/10.1097/md.00000000000042373>
- Catak, B., Oner, C., Sutlu, S., & Kilinc, S. (2016). Effect of socio-cultural factors on spontaneous abortion in Burdur, Turkey: A population-based case-control study. *Pakistan Journal of Medical Sciences*, 32(5), 1257–1262. <https://doi.org/10.12669/pjms.325.10078>
- Chaves, A.V.L., Carreira, N.P., Lima, M.C., Sartorelli, D.S., & Crivellenti, L.C. (2024). Association of sociodemographic, obstetric characteristics, lifestyle, and food consumption with life satisfaction and optimism among overweight pregnant women. *British Journal of Nutrition*, 132(8), 1052–1064. <https://doi.org/10.1017/S0007114524001764>
- Cheng, I.N., & Lai, T.H. (2026). Risk factors and diagnostic challenges in a nullipara with spontaneous uterine rupture during vaginal delivery. *Taiwanese Journal of Obstetrics and Gynecology*, 65(1), 119–122. <https://doi.org/10.1016/j.tjog.2025.07.029>
- Edrees, T., & Ibrahim, R.H. (2020). Seroprevalence of toxoplasma gondii among pregnant women visiting antenatal clinic at Mosul City, Iraq. *Pakistan Journal of Medical and Health Sciences*, 14(2), 1046–1049. <https://applications.emro.who.int/imemrf/369/Pak-J-Med-Health-Sci-2020-14-2-1046-1049-eng.pdf>
- Guo, W., Yang, H., Feng, B., Chen, H., Zhong, Z., Li, K., Yang, X., & Zhang, Y. (2026). Mendelian randomization reveals associations between modifiable risk factors and spontaneous abortion. *BMC Pregnancy and Childbirth*, 26(1), 149. <https://doi.org/10.1186/s12884-025-08628-3>
- Habow, H.D., & Ibrahim, R.H. (2024). Investigating the dynamics of women's health information on social media: A nursing perspective. *Malaysian Journal of Nursing*, 16(2), 191–200. <https://doi.org/10.31674/MJN.2024.V16I02.019>
- Hajek, A., & König, H.H. (2022). The association between the number of live births and certain frailty dimensions. *Archives of Gerontology and Geriatrics*, 102, 104759. <https://doi.org/10.1016/j.archger.2022.104759>
- Hamarash, M. Q., Ibrahim, R.H., Yaas, M.H., Almushhadany, O.I., & Al Mukhtar, S.H. (2025). Using peerassisted learning to enhance clinical reasoning skills in undergraduate nursing students: A study in Iraq. *Advances in Medical Education and Practice*, 16, 651–662. <https://doi.org/10.2147/AMEP.S507996>
- Ibrahim, E.K., & Ibrahim, R.H. (2025). The nexus of emotional intelligence, empathy, and moral sensitivity: Enhancing ethical nursing practices in clinical settings. *Journal of Nursing Management*, 2025, 9571408. <https://doi.org/10.1155/jonm/9571408>
- Ibrahim, R.H., Ghanim, A.K., & Alkhaderjameel, H.A. (2020). Impact of electronic games on the behavior of children and their academic achievement upon schools in Mosul City. *Indian Journal of Forensic Medicine and Toxicology*, 14(1), 374–379. <https://doi.org/10.37506/v14/i1/2020/ijfmt/192926>
- Liu, J., Zhao, M., Zhuan, J., Song, Y., Han, Z., Zhao, Y., Ma, H., & Yang, X. (2025). Depression with risks for spontaneous abortion: A meta-analysis. *BMC Psychology*, 13(1), 1148. <https://doi.org/10.1186/s40359-025-03484-4>

- Madlala, S.S., & Kassier, S.M. (2018). Antenatal and postpartum depression: Effects on infant and young child health and feeding practices. *South African Journal of Clinical Nutrition*, 31(1), 1–7. <https://doi.org/10.1080/16070658.2017.1333753>
- Pérez-Castillo, Í. M., Rivero-Blanco, T., León-Ríos, X. A., Expósito-Ruiz, M., López-Criado, M. S., & Aguilar-Cordero, M. J. (2020). Associations of vitamin D deficiency, parathyroid hormone, calcium, and phosphorus with perinatal adverse outcomes: A prospective cohort study. *Nutrients*, 12(11), 3279. <https://doi.org/10.3390/nu12113279>
- Podilyakina, Y., Stabayeva, L., Kulov, D., Kamyshanskiy, Y., Amirbekova, Z., Stundžienė, R., & Zhamantayev, O. (2025). Risk factors for first-trimester spontaneous abortion and the role of preconception care. *Frontiers in Global Women's Health*, 6, 1615983. <https://doi.org/10.3389/fgwh.2025.1615983>
- Polanek, E., Ráosi, F., Béky, C. F., Molnár, R., Németh, G., Orvos, H., Paulik, E., & Szabó, A. (2025). Beyond the pill: Unveiling the characteristics of prenatal micronutrient consumption among Hungarian pregnant women according to different levels of adherence. *Nutrients*, 17(17), 2732. <https://doi.org/10.3390/nu17172732>
- Saidi, H., Bounihi, A., Benbaibech, H., Benhedouga, A., Saiah, W., & Koceir, E.A. (2025). Dietary diversity and low/moderate physical activity are associated with gestational diabetes mellitus: A cross-sectional study. *Nutrition Bulletin*, 50(4), 604–616. <https://doi.org/10.1111/nbu.70036>
- Taher, M.I.M., & Ibrahim, R.H. (2023). Knowledge, attitudes, and practice of university employees about complementary and alternative medicine (CAM). *Informatics in Medicine Unlocked*, 37, 101184. <https://doi.org/10.1016/j.imu.2023.101184>
- Wang, B., Li, Q., Li, C., & Li, S. (2025). The trends of changes in monitoring indicators related to the risk of recurrent spontaneous abortion. *Medicine*, 104(31), e43604. <https://doi.org/10.1097/md.00000000000043604>
- Yaas, M.H., Hamarash, M.Q., Almushhadany, O.I., Ibrahim, R.H., & Jassim, R.S. (2023). Assessing the effectiveness of clinical rotations in preparing undergraduate nursing students for practice: Mixed study. *Malaysian Journal of Nursing*, 15(2), 87–99. <https://doi.org/10.31674/mjn.2023.v15i02.010>
- Zeng, L.X., Yan, H., & Chen, Z.J. (2007). Study on the current status and risk factors of spontaneous abortion of women at reproductive age in rural areas of Xianyang district, Shaanxi Province. *Zhonghua Liu Xing Bing Xue Za Zhi*, 28(1), 19–23. <https://scholar.xjtu.edu.cn/en/publications/study-on-the-current-status-and-risk-factors-of-spontaneous-abortion/>
- Zhang, H., Luo, R., Fang, Y., Wang, H., & Li, Y. (2026). Sleep disruption and shift work associate with increased risk of reproductive endocrine disorders: Evidence from UK Biobank and Mendelian randomization. *International Journal of Women's Health*, 18, 571454. <https://doi.org/10.2147/IJWH.S571454>
- Zheng, W., Zhang, L., Ning, J., Yuan, S., Song, M., Li, W., Xu, H., & Wang, S. (2026). Recent research progress on pathophysiological mechanism and clinical treatment of recurrent spontaneous abortion and prethrombotic state. *Journal of Reproductive Immunology*, 173, 104822. <https://doi.org/10.1016/j.jri.2025.104822>
- Zloto, K., Segal, G., Shaham, L., Blumenfeld, S., Brenner, N., Steinberg, S., Mashiah, R., Admon, D., Sivan, E., & Weissmann-Brenner, A. (2025). Spontaneous abortion during wartime: A retrospective comparative study. *Israel Medical Association Journal*, 27(7), 419–423. <https://www.ima.org.il/Medicine/IMAJ/viewarticle.aspx?year=2025&month=07&page=419>