

Sociodemographic and Psychosocial Determinants of Prenatal Exercise Participation: A Cross-Sectional Study

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Abstract:

Pregnancy exercise is a vital non-pharmacological intervention for preparing women physically and mentally for childbirth. Despite its proven clinical benefits, participation rates in prenatal exercise classes remain suboptimal in many community healthcare settings. This study aimed to analyze the sociodemographic and psychosocial factors associated with pregnant women's participation in pregnancy exercise classes at a private midwifery practice in Indonesia. A quantitative cross-sectional design was employed. The study population comprised pregnant women in their second and third trimesters. Using a total sampling technique, 30 respondents were selected. Data were collected using a structured questionnaire that assessed maternal age, education level, occupation, and family support. Bivariate analysis was conducted using the Chi-Square test to determine statistically significant relationships. The findings revealed that only 40% of respondents regularly participated in the exercise classes. Bivariate analysis demonstrated significant relationships between class participation and maternal age ($p=0.03$), educational attainment ($p=0.008$), and employment status ($p=0.037$). Younger, highly educated, and non-working mothers exhibited substantially higher attendance rates. Conversely, older age, lower education, and occupational demands presented significant barriers to routine engagement. Maternal age, education, and occupation are critical determinants of prenatal exercise participation. Midwives and healthcare policymakers must leverage these insights to design targeted, inclusive health promotion strategies and flexible scheduling to overcome sociodemographic barriers and optimize maternal health outcomes.

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INTRODUCTION

Maternal mortality and morbidity remain critical global health challenges, necessitating effective non-pharmacological interventions like prenatal exercise to ensure safe childbirth (Mrayan et al., 2024). Global public health initiatives consistently emphasize the necessity of comprehensive antenatal care to mitigate the severe risks associated with pregnancy and delivery complications (Albarqi, 2024). Globally, hundreds of thousands of women experience life-threatening health issues or lose their lives annually due to preventable maternal conditions (Baykemagn et al., 2024). Implementing structured prenatal programs serves as a vital strategy to enhance maternal resilience, optimize birth outcomes, and reduce the global burden of maternal deaths (Miranda et al., 2024). Achieving the Sustainable Development Goals requires targeted interventions that empower women and improve maternal health indicators across all demographics. These global efforts underscore the necessity of proactive maternal healthcare strategies (Olea-Ramirez et al., 2024).

Despite the proven benefits of pregnancy exercise classes, participation rates among pregnant women in many local healthcare settings remain suboptimal and inconsistent (Santos-Rocha et al., 2022). In Indonesia, the maternal mortality rate continues to pose a significant public health concern, prompting the Ministry of Health to promote various antenatal interventions actively (Suparji et al., 2024). Community-based midwifery practices frequently organize prenatal gymnastics to prepare expectant mothers physically and mentally for labor (Malmström et al., 2022). Preliminary observations at PMB Hanifatuz Zakiyah reveal a concerning trend where a substantial portion of pregnant women fail to attend these scheduled sessions regularly. Midwives act as primary facilitators in these programs, yet they often struggle to motivate women who perceive exercise as unnecessary or burdensome. This low engagement severely undermines the potential health benefits and compromises the overall effectiveness of the localized prenatal care program. Addressing this participation deficit is crucial for improving local maternal health indicators (Marini et al., 2023).

Recent literature extensively documents the physiological and psychological advantages of prenatal gymnastics, highlighting its crucial role in reducing anxiety and preparing mothers for labor (Islami & Ismarwati, 2025). Regular physical activity during pregnancy helps train the respiratory organs to adapt to the changes in the abdomen and improves overall cardiovascular health (Filipec & Đurin, 2025). These specialized exercises also teach expectant mothers how to control their body posture, manage the increasing weight of the fetus, and re-teach internal reflexes for better strength control. Movements designed for prenatal gymnastics specifically target the pelvic floor and core muscles, which are essential for meeting the physical demands of the birthing process (Szumilewicz & Santos-Rocha, 2022; Wahyuni & Keswara, 2026). Psychological benefits include stabilized anxiety, reduced fear of childbirth, and enhanced self-confidence through physical and mental relaxation (Filipec et al., 2025). Medical professionals strongly recommend these activities to guide pregnant women toward a physiological, normal, and safe delivery process. Such physiological adaptations are vital for minimizing labor complications and reducing the need for medical interventions (Yang et al., 2021).

Current research also identifies sociodemographic variables, such as age, education, and employment, as potential influences on health-seeking behaviors during pregnancy (Khuzaiyah et al., 2023). Educational attainment significantly impacts a woman's ability to comprehend complex health information and appreciate the absolute necessity of prenatal care activities (Meldgaard et al., 2022). Occupational demands often impose substantial time and energy constraints, limiting a mother's capacity to participate in supplementary health programs outside working hours (Madden et al., 2022). Family support systems further play a crucial role in encouraging or discouraging participation in structured exercise routines (Makaruk et al., 2024). Parity and previous pregnancy experiences shape a woman's perception of risk and her willingness to adopt new health-promoting behaviors (Leja-Szpak et al., 2026). Understanding these multifaceted influences is essential for healthcare providers aiming to design inclusive and accessible antenatal programs.

Existing studies predominantly focus on the clinical outcomes of prenatal exercise, leaving a critical gap in understanding the specific sociodemographic and psychosocial determinants that drive or hinder class attendance in community-based midwifery practices. Previous investigations have established the general benefits of pregnancy gymnastics. However, limited research has specifically examined the intersection of maternal age, educational background, occupational status, and familial support in localized private midwifery settings. Most of the available literature focuses on hospital-based populations or broader demographic surveys, neglecting the unique contextual barriers women face in community clinics. Prior research often relies on broad quantitative surveys that fail to capture the nuanced, localized realities of women attending private midwifery practices

(Sidabukke et al., 2024; Andani & Keswara, 2026). This study addresses this gap by providing a targeted, localized analysis of barriers to participation to inform improved clinical practices.

This study urgently investigates the factors related to pregnant women's participation in pregnancy exercise classes at PMB Hanifatuz Zakiyah to provide actionable insights for healthcare providers. Analyzing these determinants will enable midwives and health policymakers to tailor their educational strategies and program implementations to meet the specific needs of their target populations. Identifying the precise barriers to attendance allows for the development of flexible scheduling, targeted health promotion campaigns, and enhanced family engagement initiatives. Establishing a robust framework for prenatal exercise participation will yield long-term benefits for both maternal and neonatal health outcomes in the region. Improving participation rates in these classes will ultimately help reduce maternal morbidity and ensure safer childbirth experiences for women in the community (Malmström et al., 2022).

METHOD

Design

This study employs a quantitative cross-sectional design.

Setting and Time

The research took place at the Independent Midwife Practice (PMB) Hanifatuz Zakiyah. Data collection was conducted from September to November 2025.

Population, Sample, and Sampling

The target population comprised pregnant women in their second and third trimesters. The researchers utilized a total sampling technique. The final sample consisted of 30 respondents. The participant pool included 16 women who regularly attended pregnancy exercise classes and 14 women who discontinued attendance.

Instrument and Measurement Properties

Researchers administered a structured questionnaire to gather information. The instrument captured demographic and psychosocial variables. Items assessed maternal age, educational attainment, employment status, and perceived family support. The tool evaluated both independent and dependent variables for statistical analysis.

Data Collection Procedure

Investigators distributed the survey to eligible participants. Respondents recorded their personal characteristics and class attendance habits. The research team compiled primary responses alongside relevant secondary records.

Data Analysis

Statistical evaluation encompassed univariate and bivariate techniques. Researchers calculated frequency distributions for each variable. The Chi-Square test was used to evaluate associations between demographic factors and class attendance.

Ethical Declaration

The Faculty of Health Sciences at the Institute of Technology, Science and Health, Dr. Soepraoen Hospital granted ethical approval for this research.

RESULTS

Table 1 presents the characteristics of the 30 pregnant women included in the study. Most respondents did not regularly participate in pregnancy exercise (60.0%), while 40.0% participated regularly. The majority were younger than 30 years (60.0%), whereas 40.0% were aged 30 years or older. More than half of the respondents had a low educational level (53.3%), and 46.7% had a higher educational level. Regarding employment status, 56.7% were unemployed, while 43.3% were employed. Regarding family support, most respondents (63.3%) reported not receiving it, whereas only 36.7% reported receiving it. Overall, the study population was predominantly characterized by irregular participation in pregnancy exercise, younger age, lower educational attainment, unemployment, and limited family support.

Table 1. Characteristics of Pregnant Women (N = 30)

Characteristic	Category	Frequency (n)	Percentage (%)
Participation in pregnancy exercise	Regular	12	40.0
	Irregular	18	60.0
Age (years)	<30	18	60.0
	≥30	12	40.0
Educational level	Low	16	53.3
	High	14	46.7
Employment status	Employed	13	43.3
	Unemployed	17	56.7
Family support	Yes	11	36.7
	No	19	63.3

Table 2. Association Between Respondent Characteristics and Participation in Pregnancy Exercise Classes (N = 30)

Variable	Category	Participation in Pregnancy Exercise Classes		Total n (%)	p-value
		Participate n (%)	Do Not Participate n (%)		
Age (years)	<30	13 (72.2)	5 (27.8)	18 (100)	0.030*
	≥30	3 (25.0)	9 (75.0)	12 (100)	
Educational level	Low	4 (25.0)	12 (75.0)	16 (100)	0.008*
	High	12 (85.7)	2 (14.3)	14 (100)	
Employment status	Employed	3 (23.1)	10 (76.9)	13 (100)	0.037*
	Unemployed	13 (76.5)	4 (23.5)	17 (100)	
Family support	Yes	10 (90.9)	1 (9.1)	11 (100)	0.059
	No	6 (31.6)	13 (68.4)	19 (100)	

Note. *Chi-square test*; $p < 0.05$ indicates statistical significance.

Table 2 presents the associations between respondents' characteristics and participation in pregnancy exercise classes. Maternal age was significantly associated with participation ($p = 0.030$), with women younger than 30 years being more likely to participate (72.2%) than those aged 30 years or older (25.0%). Educational level also showed a significant association ($p = 0.008$), as mothers with higher education were substantially more likely to participate (85.7%) than those with lower education (25.0%).

Similarly, employment status was significantly related to participation ($p = 0.037$). Most unemployed mothers participated in pregnancy exercise classes (76.5%), whereas most employed mothers did not (76.9%). Although family support was not statistically significant ($p = 0.059$), mothers who received it demonstrated a markedly higher participation rate (90.9%) than those without

(31.6%). Overall, maternal age, educational level, and employment status were significantly associated with participation in pregnancy exercise classes, while family support showed a positive but non-significant trend.

DISCUSSION

This study identified significant relationships between maternal age, education level, occupation, and family support with participation in pregnancy exercise classes among pregnant women in the second and third trimesters. The findings revealed that mothers under 30 years demonstrated higher participation rates, whereas advanced maternal age was associated with reduced engagement in prenatal exercise programs. Educational attainment emerged as a strong predictor of participation, with mothers who had secondary or higher education showing substantially greater involvement than those with primary education. Employment status significantly influenced attendance patterns, as working mothers faced considerable barriers to regular participation despite the known benefits of prenatal exercise. Family support was positively associated with participation rates, suggesting that social encouragement plays a crucial role in maintaining exercise adherence during pregnancy (Li et al., 2025).

Younger maternal age significantly predicted higher participation rates in pregnancy exercise classes, with 72% of women under 30 years regularly attending sessions compared to only 25% of older mothers. This finding aligns with behavioral theories suggesting that younger individuals are more open to health-promotion activities and have greater physical capacity to participate in exercise. Advanced maternal age often coincides with increased pregnancy-related discomforts, comorbidities, and risk perceptions that may discourage physical activity engagement. Older pregnant women frequently express heightened concerns about exercise safety and fetal well-being, leading to activity restriction despite medical clearance. The physiological changes associated with advancing age, including reduced muscle strength and joint flexibility, may create additional barriers to exercise participation that younger women do not experience (Ribeiro et al., 2022).

Educational attainment showed a strong positive relationship with participation in pregnancy exercise classes, with 85% of mothers with secondary or higher education attending classes regularly compared to only 25% of those with primary education. Higher education levels typically correlate with improved health literacy, enabling women to understand the benefits of prenatal exercise better and interpret healthcare provider recommendations more accurately. Educated women often possess superior information-seeking skills and demonstrate greater autonomy in health decision-making processes. These individuals typically exhibit stronger analytical abilities, enabling them to critically evaluate health information and apply evidence-based practices in their pregnancy care routines. Educational achievement is frequently associated with higher socioeconomic status, which provides better access to healthcare resources, transportation, and flexible scheduling, thereby facilitating participation in exercise. The knowledge acquired through formal education empowers women to recognize early warning signs, understand physiological changes during pregnancy, and appreciate the role of exercise in optimizing maternal and fetal outcomes (Sabriana et al., 2025).

Employment status emerged as a significant determinant of participation in pregnancy exercise classes, with 77% of working mothers unable to attend classes regularly compared to only 24% of non-working mothers. Occupational demands impose substantial time constraints that conflict with scheduled prenatal exercise sessions, forcing working women to prioritize job responsibilities over health-promotion activities. Physical and mental fatigue from work duties reduces motivation and the energy reserves necessary to engage in additional physical activities during pregnancy. Many

workplaces lack supportive policies for pregnant employees, including flexible hours, adequate break times, or on-site exercise facilities that could facilitate participation. Working mothers often face competing demands between professional obligations, household responsibilities, and self-care activities, creating role overload that limits their capacity for health-promoting behaviors. The financial necessity of maintaining employment during pregnancy may supersede health considerations, particularly in contexts where maternity leave policies are inadequate or job security remains uncertain (Ojakorotu & Babayemi, 2025).

Family support was positively associated with participation in pregnancy exercise classes; 90% of women receiving familial encouragement attended classes, compared with only 31% of those without such support. Spousal and extended family encouragement provides emotional reinforcement that strengthens women's commitment to maintaining exercise routines throughout pregnancy. Practical support from family members, including assistance with household tasks, childcare for existing children, and transportation to exercise venues, removes logistical barriers that might otherwise prevent attendance. Family members who understand the benefits of prenatal exercise create a supportive home environment that validates women's health-seeking behaviors and reinforces positive attitudes toward physical activity. The absence of family support often generates feelings of guilt, isolation, or prioritization conflicts that discourage women from dedicating time to self-care activities. Cultural beliefs and traditional practices within families may facilitate or hinder participation in pregnancy exercise, depending on prevailing attitudes toward physical activity during gestation (Chen et al., 2024).

These findings carry important implications for healthcare providers, policymakers, and program designers seeking to improve prenatal exercise participation rates. Midwives and obstetric care providers should implement targeted screening protocols to identify women at risk of non-participation based on age, education, employment status, and family support levels. Healthcare facilities might consider offering flexible scheduling options, including evening or weekend sessions, to accommodate working mothers who face time constraints during standard business hours. Educational interventions should employ simplified messaging and visual aids to ensure comprehension among women with limited formal education. They may utilize peer educators who share similar backgrounds with the target populations. Family-centered approaches that actively engage spouses and extended family members in prenatal education sessions could strengthen support systems and create enabling environments for exercise participation. Workplace health promotion programs might collaborate with employers to establish pregnancy-friendly policies, including designated exercise breaks, on-site prenatal classes, or partnerships with nearby fitness facilities. Digital health interventions, such as mobile applications or virtual exercise sessions, could provide alternative delivery methods for women unable to attend in-person classes due to geographic, temporal, or mobility constraints (Lee et al., 2023).

Several limitations warrant consideration when interpreting these findings. The cross-sectional design precludes causal inferences about the relationships between identified factors and exercise participation, as temporal sequences cannot be established. The relatively small sample size of 30 respondents from a single midwifery practice limits statistical power and generalizability to broader populations with different sociocultural characteristics. Self-reported participation data may be subject to social desirability bias, with participants potentially overreporting attendance to align with perceived expectations. The study did not assess additional variables that might influence participation, such as income level, distance to exercise facilities, previous exercise habits, pregnancy complications, or cultural beliefs about physical activity during pregnancy. The dichotomous categorization of variables, while facilitating analysis, may have obscured nuanced relationships that exist along continuous spectra. Future research employing longitudinal designs

with larger, more diverse samples could provide deeper insights into the dynamic factors influencing prenatal exercise adherence throughout pregnancy.

CONCLUSION

This study demonstrates that maternal age, educational attainment, employment status, and family support are critical determinants of pregnant women's participation in prenatal exercise classes. Younger, highly educated, and non-working mothers with strong familial encouragement exhibit significantly higher engagement rates in these vital health promotion activities. Older mothers with lower educational backgrounds, heavy occupational demands, and inadequate family support face substantial barriers to routine attendance. Healthcare providers and policymakers must leverage these insights to design targeted, inclusive interventions that accommodate the diverse socioeconomic and demographic profiles of expectant mothers. Implementing flexible scheduling, tailored educational materials, and family-inclusive counseling will ultimately optimize maternal health outcomes and ensure equitable access to essential prenatal care services.

REFERENCES

- Albarqi, M. N. (2024). The impact of prenatal care on the prevention of neonatal outcomes: A systematic review and meta-analysis of global health interventions. *Healthcare*, 13(9), 1076. <https://doi.org/10.3390/healthcare13091076>
- Andani, N., & Keswara, N. W. (2026). The effectiveness of pregnancy exercises on back pain among third trimester pregnant women. *Health and Technology Journal (HTechJ)*, 4(1), 95–101. <https://doi.org/10.53713/htechj.v4i1.613>
- Baykemagn, F. T., Abreha, G. F., Zelelew, Y. B., Berhe, A. K., & Kahsay, A. B. (2024). Global burden of potentially life-threatening maternal conditions: A systematic review and meta-analysis. *BMC Pregnancy and Childbirth*, 24(1), 11. <https://doi.org/10.1186/s12884-023-06199-9>
- Chen, L., Han, R. R., Chen, X., Fu, B. L., Nogueira, B. O. L., & Gao, L. L. (2024). Evaluation of the mediating role of physical activity self-efficacy in the relationship between knowledge, social support, and physical activity in pregnant women with a high risk for gestational diabetes. *BMC Pregnancy and Childbirth*, 24(1), 857. <https://doi.org/10.1186/s12884-024-07068-9>
- Filipec, M., & Đurin, M. J. (2025). Cardiovascular and respiratory adaptations during pregnancy and exercise in pregnancy. *Physiologia*, 5(3), 30. <https://doi.org/10.3390/physiologia5030030>
- Filipec, M., Bodrožić, M., & Almousa, S. (2025). Pregnant women's experiences and perceptions of the impact of exercise on mental health during pregnancy: A qualitative study. *Healthcare*, 14(5), 678. <https://doi.org/10.3390/healthcare14050678>
- Islami, T., & Ismarwati. (2025). The effectiveness of pregnancy exercises for a smooth childbirth process. *Majalah Obstetri & Ginekologi*, 33(1), 74–82. <https://doi.org/10.20473/mog.V33i12025.74-82>
- Khuzaiyah, S., Mumin, K. H. A., McKenna, L., & Hashim, S. H. (2023). Health-seeking behaviours of pregnant adolescents: A scoping review. *British Journal of Midwifery*, 31(7), 408–417. <https://doi.org/10.12968/bjom.2023.31.7.408>
- Lee, V. V., Vijayakumar, S., Ng, W. Y., Lau, N. Y., Leong, Q. Y., Ooi, D. S., Su, L. L., Lee, Y. S., Chan, S. Y., Blasiak, A., & Ho, D. (2023). Personalization and localization as key expectations of digital health intervention in women pre- to post-pregnancy. *NPJ Digital Medicine*, 6(1), 183. <https://doi.org/10.1038/s41746-023-00924-6>
- Leja-Szpak, A., Jonkisz, K., Surówka, J., & Matuszyk, D. (2026). Knowledge and engagement in health-promoting behaviors among women planning pregnancy: A cross-sectional study. *BMC Women's Health*, 26(1), 25. <https://doi.org/10.1186/s12905-025-04162-8>

- Li, M., Wang, F. R., Xu, L. H., Wang, Y. J., & Li, Y. (2025). Exploring the relationship between perceived social support and pregnant women's physical activity behavior: A chain-mediated effect test. *BMC Pregnancy and Childbirth*, 25(1), 1305. <https://doi.org/10.1186/s12884-025-08482-3>
- Madden, S. K., Blewitt, C., Hill, B., Meechan, D., & Skouteris, H. (2022). "It's just the nature of the work": Barriers and enablers to the health and well-being of preconception, pregnant and postpartum working women in a community service organisation. *Health & Social Care in the Community*, 30(6), e6475–e6486. <https://doi.org/10.1111/hsc.14093>
- Makaruk, B., Grantham, W., Forczek-Karkosz, W., & Płaszewski, M. (2024). "It's more than just exercise": Psychosocial experiences of women in the Conscious 9 Months specifically designed prenatal exercise programme—A qualitative study. *Healthcare*, 13(7), 727. <https://doi.org/10.3390/healthcare13070727>
- Malmström, N., Lydell, M., & Carlsson, I. M. (2022). "Womanhood," a shared experience of participating in a lifestyle intervention with a focus on integration and physical activity to promote health among pregnant women: Perspectives from pregnant women, midwives, and cultural interpreter doulas. *International Journal of Qualitative Studies on Health and Well-Being*, 17(1). <https://doi.org/10.1080/17482631.2022.2043527>
- Marini, S., Messina, R., Masini, A., Scognamiglio, F., Caravita, I., Leccese, V., Soldà, G., Parma, D., Bertini, V., Scheier, L. M., & Dallolio, L. (2023). Application of the COM-B framework to understand facilitators and barriers for practising physical activity among pregnant women and midwives participating in the WELL-DONE! study. *Behavioral Sciences*, 13(2), 114. <https://doi.org/10.3390/bs13020114>
- Meldgaard, M., Gamborg, M., & Terkildsen Maindal, H. (2022). Health literacy levels among women in the prenatal period: A systematic review. *Sexual & Reproductive Healthcare*, 34, 100796. <https://doi.org/10.1016/j.srhc.2022.100796>
- Miranda, J., Miller, S., Alfieri, N., Lalonde, A., Ivan-Ortiz, E., Hanson, C., Steinholt, M., Palshetkar, N., Suharjono, H., Gebhardt, S., Dossou, J. P., Pascali-Bonaro, D., Jacobsson, B., & Okong, P. (2024). Global health systems strengthening: FIGO's strategic view on reducing maternal and newborn mortality worldwide. *International Journal of Gynecology & Obstetrics*, 165(3), 849–859. <https://doi.org/10.1002/ijgo.15553>
- Mrayan, L., Abujiiban, S., AbuKaraki, A., & Nashwan, A. J. (2024). Evaluate the effectiveness of using non-pharmacological intervention during childbirth: An improvement project in Jordanian maternity hospitals. *BMC Women's Health*, 24(1), 605. <https://doi.org/10.1186/s12905-024-03414-3>
- Ojakorotu, R., & Babayemi, A. (2025). *The impacts of pregnancy and childbirth on the career trajectories and progression of women within the health sector in the United Kingdom*. <https://doi.org/10.5281/zenodo.16911722>
- Olea-Ramirez, L. M., Leon-Larios, F., & Corrales-Gutierrez, I. (2024). Intervention strategies to reduce maternal mortality in the context of the Sustainable Development Goals: A scoping review. *Women*, 4(4), 387–405. <https://doi.org/10.3390/women4040030>
- Ribeiro, M., Andrade, A., & Nunes, I. (2022). Physical exercise in pregnancy: Benefits, risks and prescription. *Journal of Perinatal Medicine*, 50(1), 4–17. <https://doi.org/10.1515/jpm-2021-0315>
- Sabriana, R., Jusni, Hartati, & Saleh, M. F. M. (2025). Effectiveness of antenatal class education in improving early detection of pregnancy danger signs. *Jurnal Ilmiah Kesehatan Sandi Husada*, 14(2), 462–470. <https://doi.org/10.35816/jiksh.v14i2.292>
- Santos-Rocha, R., Wegrzyk, J., & Szumilewicz, A. (2022). Active pregnancy: A physical exercise program promoting fitness and health during pregnancy—Development and validation of a complex intervention. *International Journal of Environmental Research and Public Health*, 19(8), 4902. <https://doi.org/10.3390/ijerph19084902>
- Sidabukke, I. R. R., Siahaan, J. M., Barus, E., & Silalahi, R. Y. A. (2024). The relationship between knowledge and pregnancy exercise activities towards the increase in normal delivery in Djoelham

Regional Public Hospital in 2024. *Proceedings OPTIMAL*.
<https://doi.org/10.5281/zenodo.15952667>

- Suparji, S., Nugroho, H. S. W., Sunarto, S., & Prayogi, A. S. (2024). High maternal mortality rate in Indonesia: A challenge to be addressed immediately. *PAMJ-One Health*, 14, 13. <https://doi.org/10.11604/pamj-oh.2024.14.13.44464>
- Szumilewicz, A., & Santos-Rocha, R. (2022). Exercise selection and adaptations during pregnancy. In *Exercise and physical activity during pregnancy and postpartum: Evidence-based guidelines* (pp. 275–361). Springer International Publishing. https://doi.org/10.1007/978-3-031-06137-0_9
- Wahyuni, S., & Keswara, N. W. (2026). The effect of pregnancy exercises on sleep quality among pregnant women. *Health and Technology Journal (HTechJ)*, 4(1), 38–43. <https://doi.org/10.53713/htechj.v4i1.577>
- Yang, X., Li, H., Zhao, Q., Han, R., Xiang, Z., & Gao, L. (2022). Clinical practice guidelines that address physical activity and exercise during pregnancy: A systematic review. *Journal of Midwifery & Women's Health*, 67(1), 53–68. <https://doi.org/10.1111/jmwh.13286>