

**Original Article**

# Comparative Effects of Hatha Yoga and Prenatal Exercise on Physiological and Psychological Outcomes in Primigravid Women: A Randomized Controlled Trial



Veronica Fernandez<sup>1</sup>, Ronny Lesmana<sup>2</sup>, Sofie R. Krisnadi<sup>3</sup>, Hadi Susiarno<sup>3</sup>, Shelly Iskandar<sup>4</sup>, Vita Muniarti Tarawan<sup>5</sup>

<sup>1</sup> Department of Midwifery, Faculty of Medicine, Padjajaran University, Bandung, West Java, Indonesia

<sup>2</sup> Department of Medicine, Faculty of Medicine, Padjajaran University, Bandung, West Java, Indonesia

<sup>3</sup> Department of Obstetrics and Gynecology, Faculty of Medicine, Padjajaran University, Bandung, West Java, Indonesia

<sup>4</sup> Department of Mental, Faculty of Mental Medicine, Hasan Sadikin Hospital, Bandung, West Java, Indonesia

<sup>5</sup> Department of Biomedical Sciences, Faculty of Medicine, Universitas Padjadjaran, Bandung, Indonesia

**ARTICLE INFO****Article History**

Submit : September 6, 2026

Accepted : November 8, 2025

Published : November 15, 2025

**Correspondence**

Veronica Fernandez;  
Departement of Midwifery,  
Faculty of Medicine, Padjajaran  
University, Bandung, West Java,  
Indonesia.

**Email:**

[veronica23001@mail.unpad.ac.id](mailto:veronica23001@mail.unpad.ac.id)

**Citation:**

Fernandez, V., Lesmana, R. ., Krisnadi, S. R. ., Susiarno, H., Iskandar, S., & Tarawan, V. M. . (2025). The Comparative Effects of Hatha Yoga and Prenatal Exercise on Physiological and Psychological Outcomes in Primigravid Women: A Randomized Controlled Trial. *Journal of Applied Nursing and Health*, 7(3), 604–614. <https://doi.org/10.55018/janh.v7i3.445>

**ABSTRACT**

**Background:** Primigravid women are prone to stress due to physical and psychological changes during pregnancy, which can lead to hypertension, preeclampsia, preterm birth, fetal growth restriction, and postpartum depression. While non-pharmacological interventions like hatha yoga and prenatal exercise are used to reduce stress, comparative evidence—especially on oxygen saturation (SpO<sub>2</sub>)—is limited. This study analyzes the effects of hatha yoga and prenatal exercise on stress, blood pressure, and SpO<sub>2</sub> among primigravid women, and compares both interventions across these outcomes.

**Methods:** This randomized controlled trial (RCT) followed the CONSORT 2010 guidelines. Forty-eight eligible primigravid women were selected using a probability sampling technique, specifically the simple random sampling method. Random numbers were generated using Microsoft Excel to determine participant selection from the maternal cohort register. Inclusion criteria were a normal singleton pregnancy at 24–28 weeks of gestation, maternal age 20–35 years, and normal Body Mass Index (BMI) (18.5–24.9 kg/m<sup>2</sup>). Exclusion criteria included regular exercise more than twice a week, abnormal fetal heart rate, and scheduled elective cesarean delivery. Participants were randomly assigned to either a hatha yoga group or a prenatal exercise group (24 each). Both interventions were conducted twice weekly for four weeks. Data were analyzed using the Wilcoxon and Mann-Whitney tests.

**Results:** Data were analyzed using the Wilcoxon and Mann-Whitney tests. Median stress scores decreased from 22 to 12 in the hatha yoga group and from 22 to 17 in the prenatal exercise group ( $p < 0.001$ ). Median SpO<sub>2</sub> increased from 96.88% to 98.38% and from 96.81% to 97.00%, respectively ( $p = 0.002$ ). Median systolic pressure changed from 120.06 to 121.31 mmHg and 118.75 to 117.44 mmHg ( $p = 0.009$ ), while diastolic pressure showed no significant difference ( $p = 0.076$ ). Overall, hatha yoga showed greater improvements in stress, SpO<sub>2</sub>, and blood pressure stability than prenatal exercise.

**Conclusion:** Hatha yoga proved more effective than prenatal exercise in reducing stress, increasing SpO<sub>2</sub>, and stabilizing systolic blood pressure among primigravid women, although no significant difference was found in diastolic pressure. These findings strengthen the evidence supporting yoga

as a safe, non-pharmacological approach to enhance maternal physiological and psychological well-being during pregnancy.

**Keywords:** Yoga; Exercise; Stress; Psychological; Blood Pressure; Oxygen Saturation; Pregnant Women.

### Implications for Practice:

- Hatha yoga is more effective than prenatal exercise in reducing stress and stabilizing systolic blood pressure, making it a safe, non-pharmacological intervention to promote maternal-fetal well-being in antenatal care.
- Integrating structured hatha yoga sessions into routine antenatal programs can enhance maternal physiological and psychological health while reducing pregnancy complications.
- Incorporating prenatal yoga training into midwifery curricula offers an evidence-based approach to stress management and maternal empowerment, especially valuable for Low- and Middle-Income Countries (LMICs) with limited healthcare resources.

### Introduction

Pregnancy is a critical period that requires physical, psychological, and social adaptation due to significant hormonal changes, including increased estrogen and progesterone levels (Rong, 2021). Stress during pregnancy, particularly among primigravidas, is influenced by sociodemographic, economic, and environmental factors (Wahyuni et al., 2018). Globally, antenatal stress affects 29–60% of women in low- and middle-income countries and up to 84% in the United States, while in Indonesia, the prevalence among primigravidas reaches 75% (Wahyuni et al., 2018). High maternal stress has been linked to increased risks of obstetric complications, neurobehavioral disorders in offspring, and maternal cardiometabolic diseases (Dhaliwal et al., 2023; Yu et al., 2014). Locally, maternal stress in East Flores has been associated with higher cesarean section rates and postdate pregnancies (District Health Office, 2024).

To address this issue, several non-pharmacological interventions, including hatha yoga and prenatal exercise, have been recommended by the Indonesian Ministry of Health to promote maternal well-being (Kemenkes, 2024; Kementerian Kesehatan

RI, 2023). However, comparative evidence on their physiological and psychological effects remains limited, particularly concerning oxygen saturation. Previous studies reported that hatha yoga effectively reduces systolic blood pressure but not diastolic pressure, whereas prenatal exercise lowers diastolic pressure without affecting systolic levels (Hamdiah et al., 2017; Hernawati, Yeti, 2017). These mixed findings highlight a research gap in determining which method more effectively reduces stress and enhances physiological stability in primigravid women.

This study applies Orem's Self-Care Deficit Theory, emphasizing maternal capacity for self-care through physical and psychological regulation. Hatha yoga integrates breathing, posture, meditation, and relaxation techniques to lower cortisol and stress levels while improving SpO<sub>2</sub> and cardiovascular function (Dietrich & Bidart, 2021; Susanti et al., 2024). Meanwhile, prenatal exercise focuses on muscle strengthening, posture correction, and emotional regulation (Hernawati & Yeti, 2017). These structured interventions aim to support homeostasis and enhance maternal-fetal well-being (Esencan et al., 2023; Fernandez et al., 2025).

Therefore, this study aims to compare the effects of hatha yoga and prenatal exercise on physiological (blood pressure, SpO<sub>2</sub>) and psychological (stress) outcomes among primigravid women. It is hypothesized that Hatha yoga will be more effective than prenatal exercise in reducing anxiety, stabilizing systolic blood pressure, and improving oxygen saturation.

## Methods

### Study Design

This quantitative interventional study employed a prospective Randomized Controlled Trial (RCT) design with a pre-test and post-test control group, following the CONSORT 2010 guidelines (Moher et al., 2010). Participants were randomly assigned to either the hatha yoga or prenatal gymnastic group using a simple random sampling method. The randomization sequence was generated with Microsoft Excel random numbers, and allocation concealment was maintained using sealed opaque envelopes to prevent selection bias. This design allowed for an objective comparison of their effects on stress, blood pressure, and SpO<sub>2</sub>.

### Participants

The study was conducted in East Flores Regency, Indonesia, specifically at Nagi Primary Health Centre, Larantuka District, from May to August 2024. Participants were 48 primigravid women (24 in each group) aged 20–35 years with 24–28 weeks of gestation, recruited from antenatal care registers and randomly assigned to either the hatha yoga or prenatal gymnastic group using a simple random sampling method. The minimum sample size was calculated using the formula for comparing two independent means, with  $Z\alpha = 1.96$ ,  $Z\beta = 0.842$ , a significance level of 0.05, and 80% power, referring to standard deviation values from Nejati et al. (2015). Based on

this calculation, the required sample size per group was 22, and after adding a 10% anticipated dropout rate, the final sample included 24 participants per group. Inclusion criteria included: (1) normal singleton pregnancy, (2) literacy and normal BMI (18.5–24.9), and (3) ability to follow the intervention. Exclusion criteria included: (1) prior yoga or regular exercise experience (>2 times per week), (2) fetal abnormalities or elective cesarean section indication, and (3) dropout conditions such as bleeding, hypertension, or absence during the intervention sessions. A total of three participants (6.25%) dropped out due to incomplete attendance. Data were analyzed using an intention-to-treat approach, with missing data handled through mean substitution to maintain statistical validity.

### Instruments

Stress was measured using the Indonesian version of the Perceived Stress Scale (PSS-10), adapted through forward-backward translation following WHO guidelines. A pilot test among 30 primigravid women in East Flores confirmed its validity ( $r > r\text{-table}$ ,  $p < 0.05$ ) and reliability (Cronbach's  $\alpha = 0.706$ ). Blood pressure was assessed using a calibrated digital sphygmomanometer (Omron HEM-7130, Japan), and SpO<sub>2</sub> utilizing a pulse oximeter (Beurer PO30, Germany). Both devices were calibrated by the Nagi Primary Health Centre before data collection and operated under standard procedures.

### Intervention

The intervention was conducted for four weeks, with two 60-minute sessions per week. The hatha yoga group, guided by a certified instructor, practiced postures, breathing, and relaxation techniques, aiming to promote self-regulation of stress and physiological balance. The Prenatal exercise

group, led by a healthcare provider, followed movements adapted from the Indonesian Ministry of Health’s SOP from Kemenkes 2024 to improve circulation and muscle strength. Each session followed a standardized Standard Operating Procedure (SOP) to maintain intervention fidelity. Participants were monitored for adverse events such as dizziness or abnormal blood pressure, and attendance was recorded. The control condition received usual antenatal care only. Pre- and post-intervention measurements (blood pressure, SpO<sub>2</sub>, and PSS-10) were taken at baseline and 15 minutes after each session. A single-blind design was applied to minimize enumerator bias.

### Data Collection

Data collection was conducted at Nagi Public Health Centre, East Flores Regency, from April to May 2025 by four trained enumerators. This randomized controlled trial (RCT) followed the CONSORT 2010 guidelines (Trial Registration Number: 2501030086). A CONSORT flow diagram illustrates the stages of participant enrollment, allocation, follow-up, and analysis (picture 1). The study used a single-blind design, where the statistician analyzing the data was blinded to group allocation. Allocation concealment was ensured using sealed opaque envelopes prepared by an independent assistant. All 48 primigravida participants completed the study, so no missing data were excluded from the analysis. Effect sizes (r) were calculated for main outcomes to estimate the magnitude of between-group differences (Figure 1).

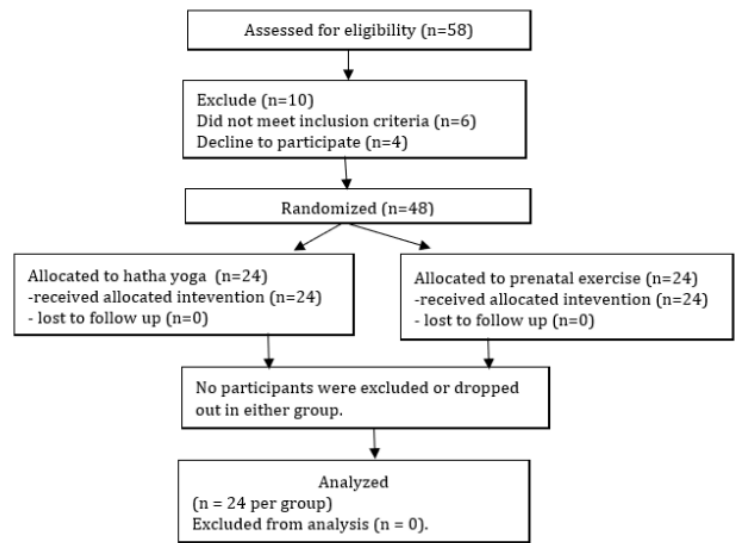


Figure 1. The flow diagram illustrates the stages of participant

### Data Analysis

Data analysis included editing, coding, entry, and tabulation. All analyses were performed using SPSS version 27. Data normality was assessed using the Shapiro–Wilk test, which showed  $p < 0.05$ , indicating that the data were not normally distributed. Therefore, non-parametric tests were applied: the Wilcoxon signed-rank test was used for within-group comparisons, and the Mann–Whitney U test was used for between-group comparisons. The Chi-square test was employed for categorical variables. A significance level of  $p < 0.05$  was considered statistically significant. The effect size (r) was calculated using the formula  $r = Z / \sqrt{N}$  (Cohen, 1988), where Z represents the test statistic and N the total sample size. Effect sizes were interpreted as small ( $r = 0.1$ ), medium ( $r = 0.3$ ), and large ( $r \geq 0.5$ ).

### Ethical Considerations

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of Universitas Padjadjaran (No.

240/UN6.KEP/EC/2025), and the East Flores Investment Office and the Head of Nagi Primary Health Center granted official permissions. All participants received a clear explanation of the study objectives, procedures, potential benefits, and risks before participation, and each provided written informed consent before data collection. Participant confidentiality and anonymity were strictly maintained throughout the study.

## Results

The study involved 48 primigravid women (24 in each group). Both groups were homogeneous in age, education, occupation, and BMI ( $p > 0.05$ ), with an average age of approximately 26.5 years, most having secondary or higher education, the majority being unemployed, and with a normal BMI (**Table 1**)

**Table 1.** Characteristic of Participants (n=48) (Chi-square test)

Characteristics	Group		*p-value
	Hatha yoga (n=24)	Prenatal exercise(n=24)	
1 Age (years)			0.706
20	1 (4.2%)	3 (12.5%)	
21-25	9 (37.5%)	8 (33.3%)	
26-30	9 (37.5%)	7 (29.2%)	
31-35	5 (20.8%)	6 (25.0%)	
Mean (SD)	26.63 (4.063)	26.54 (4.899)	
Median	26.00	26.00	
Range	20-35	20-35	
2 Education			0.464
Elementary School	0 (0.0%)	2 (8.3%)	
Junior High School	1 (4.2%)	2 (8.3%)	
Senior High School	12 (50.0%)	10 (41.7%)	
College/University	11 (45.8%)	10 (41.7%)	
3 Occupation			0.383
Employed	9 (37.5%)	12 (50.0%)	
Unemployed/Housewife	15 (62.5%)	12 (50.0%)	
4 BMI (18.5-24.5)	22.41	22.58	0.684

Note : \*) chi-square test

**Table 2.** Comparison of Stress Levels Within and Between Groups (Wilcoxon and Mann-Whitney Tests)

Stress (score data)	Groups		p value
	Hatha yoga (n=24)	Prenatal exercise (n=24)	
Before intervention			0.216*)
Median	22.00	22.00	
Range	10-29	8-28	
After intervention			<0.001*)
Median	12.00	17.00	
Range	5-25	7-25	
Comparison before and after intervention	<0.001**)	0.001**)	
Stress reduction			
Median	10.00	0	
Range	4-12	3 - 8	

Note: \*) Mann-Whitney test; \*\*) Wilcoxon test.

**Table 3.** Comparison of Blood Pressure and SpO<sub>2</sub> Between Groups (Mann-Whitney Test).

Parameter	Groups	Pre (Mean ± SD, Min-Max)	Post (Mean ± SD, Min-Max)	Δ Median	p-value between groups
Systolic Blood Pressure (mmHg)	Hatha yoga	120,06 ± 7.32 (110-135)	121,31 ± 6.89 (111-136)	+1,25	*0,009
	Prenatal exercise	118,75 ± 6.45 (107-132)	117,44 ± 5.88 (105-130)	-1,31	
Diastolic Blood Pressure (mmHg)	Hatha yoga	71,31 ± 5.62 (63-84)	74,25 ± 6.02 (65-87)	+2,94	*0,076
	Prenatal exercise	70,00 ± 6.01 (62-83)	70,94 ± 5.97 (63-85)	+0,94	
SpO <sub>2</sub> (%)	Hatha yoga	96,88 ± 1.12 (95-99)	98,38 ± 0.88 (97-100)	+1,50	*0,002
	Prenatal exercise	96,81 ± 1.10 (95-99)	97,00 ± 0.95 (96-99)	+0,19	

Note: \*) Mann-Whitney test

Both groups were homogeneous in baseline characteristics ( $p > 0.05$ ). Median stress scores significantly decreased from 22.00 to 12.00 in the hatha yoga group and from 22.00 to 17.00 in the prenatal exercise group ( $p < 0.001$ ). Mean SpO<sub>2</sub> increased from 96.88 ± 1.12% to 98.38 ± 0.88% in the hatha yoga group and from 96.81 ± 1.10% to 97.00 ± 0.95% in the prenatal exercise group ( $p = 0.002$ ). Systolic blood pressure showed a significant difference between groups ( $p = 0.009$ ), while diastolic blood pressure did not ( $p = 0.076$ ) (Table 2 and Table 3).

## Discussion

The characteristics of subjects in the hatha yoga and prenatal exercise groups were relatively balanced in terms of age, education, occupation, and BMI ( $p > 0.05$ ), indicating comparability between groups. The average age was 26 years, with most participants having completed high school or higher education and possessing a normal BMI, which supports their ability to understand health information and cope with stress (Ariasih et al., 2024; Parayiwa et al., 2023).

Hatha yoga was effective in reducing stress among primigravid women (median

from 22 to 12;  $p < 0.001$ ), consistent with the findings of Bershinsky et al. (2014) and Nadholta et al. (2023) ([Bershinsky et al., 2014](#); [Nadholta, 2023](#)). Physiologically, yoga activates the parasympathetic nervous system through slow breathing and meditative focus, leading to decreased sympathetic tone, regulation of the hypothalamic pituitary adrenal (HPA) axis, and enhancement of GABAergic inhibitory mechanisms. These processes collectively reduce cortisol production, stabilize cardiovascular activity, and promote psychological calmness ([Streeter et al., 2012](#); [Yekefallah, 2021](#)). Blood pressure exhibited an adaptive pattern, with a slight increase at the beginning of the sessions followed by a significant decrease by the eighth session ( $p < 0.05$ ), consistent with Guyton and Hall's theory of homeostasis. ([Guyton & Hall, 2014](#)) and the findings of Murdiningsih et al. (2023) and Zainiyah (2024) ([Murdiningsih et al., 2023](#); [Zainiyah et al., 2024](#)). SpO<sub>2</sub> increased significantly across all sessions ( $p < 0.05$ ), with the greatest improvement observed in the sixth session (+3.0), supported by pulmonary ventilation and parasympathetic relaxation mechanisms described by Bhavanani et al. (2011) and Sengupta (2012) ([Kuppusamy et al., 2016](#)), along with individual factors such as breathing technique and physical fitness. ([Coffman et al., 2017](#); [Eid et al., 2022](#)).

Prenatal exercise significantly reduced stress levels (median 17;  $p = 0.001$ ) ([Noviani, 2020](#); [Susanti et al., 2024](#)). The effect on diastolic blood pressure was significant in several sessions ( $p < 0.05$ ) ([Nascimento et al., 2012](#); [Zhu et al., 2022](#)). However, it had no effect on SpO<sub>2</sub> ( $p > 0.05$ ).

Between-group comparisons showed that hatha yoga was superior in reducing stress, increasing SpO<sub>2</sub>, and stabilizing systolic blood pressure due to its holistic approach through pranayama and

meditation that integrates physical, mental, and emotional aspects ([Dewi et al., 2016](#); [Mohyadin et al., 2021](#)). In contrast, prenatal exercise is less intensive in breathing training ([Elsisi et al., 2022](#)).

### Implications and limitations

This study provides three main implications. Scientifically, hatha yoga effectively reduces stress, increases SpO<sub>2</sub>, and stabilizes blood pressure in primigravid women, adding to the evidence of non-pharmacological prenatal interventions. Theoretically, it supports Guyton & Hall's homeostasis theory and the biopsychosocial model, and for future research, it opens opportunities for studies with larger samples, longer durations, and additional physiological variables.

The limitations of this study include its short intervention duration, small sample size, limited external control factors, and focus on primigravidas aged 24–28 weeks in a single region, which may limit generalizability.

### Relevance to Practice

Hatha yoga is more effective than prenatal exercise in reducing stress, increasing SpO<sub>2</sub>, and stabilizing blood pressure in primigravid women. These findings can be applied in midwifery and antenatal care practices, with midwives and nurses trained as prenatal yoga instructors. Integration into health service standards and policies is recommended to enhance maternal and fetal well-being.

### Conclusion

Hatha yoga is proven to be more effective than prenatal exercise among primigravid women, significantly reducing stress, increasing SpO<sub>2</sub>, and stabilizing systolic blood pressure. This finding highlights the importance of incorporating hatha yoga as a safe, non-pharmacological

intervention to enhance maternal physical and psychological well-being. The take-home message is that regular, structured hatha yoga practice can serve as a practical approach to improve pregnancy outcomes. Future studies should explore the long-term effects, adherence patterns, and scalability of hatha yoga programs across diverse populations and healthcare settings.

### Funding

This research received no external funding.

### CrediT Authorship Contributions Statement

**Veronica Fernandez:** Conceptualization, Methodology, Supervision, Writing - Original Draft

**Ronny Lesmana:** Validation, Formal Analysis, Writing - Review & Editing

**Sofie R. Krisnadi:** Investigation, Resources, the work's design, and Conceptual aspects of cardiovascular on pregnant women

**Hadi Susiarno:** Writing - Original draft, Visualization, finished the abstract and added to the overall elements

**Shelly Iskandar:** Conceptual aspects of psychological management, mental well-being, and the dynamics of health professions

**Vita Muniarti Tarawan:** Conceptual aspects of cardiovascular and physical health of pregnant women who exercise

### Conflicts of Interest

There is no conflict of interest.

### Acknowledgments

We would like to thank Universitas Padjajaran for helping us review this article. We also thank our supervisors and everyone who supported and participated in this study.

### Supplementary Materials

Supplementary File S1: Questionnaire contains the full questionnaire used for data collection.

### References

- Ariasih, A., Besral, Budiharsana, M., & Ronoatmodjo, S. (2024). Common Mental Disorders and Associated Factors During Pregnancy and the Postpartum Period in Indonesia: An Analysis of Data From the 2018 Basic Health Research. *Journal of Preventive Medicine and Public Health*, 57(4), 388–398.  
<https://doi.org/10.3961/jpmph.24.082>
- Bershadsky, S., Trumpfheller, L., Kimble, H. B., & ... (2014). The effect of prenatal Hatha yoga on affect, cortisol, and depressive symptoms. *Therapies in Clinical* <https://www.sciencedirect.com/science/article/pii/S1744388114000127>
- Coffman, K. E., Carlson, A. R., Miller, A. D., Johnson, B. D., & Taylor, B. J. (2017). The effect of aging and cardiorespiratory fitness on the lung diffusing capacity response to exercise in healthy humans. *Journal of Applied Physiology*, 122(6), 1425–1434.  
<https://doi.org/10.1152/jappphysiol.00694.2016>
- Dewi, E. S., Suwondo, A., & Wahyuni, S. (2016). Pengaruh Kombinasi Yoga Kortisol Dan Lama Persalinan. *JURNAL ILMIAH BIDAN*, 3, 7–13.  
 DOI: <https://doi.org/10.61720/jib.v1i3.12>
- Dhaliwal, S. K., Dabelea, D., & Perng, W. (2023). Maternal psychosocial stress during pregnancy and offspring neurobehavioral outcomes during early childhood in the Healthy Start Study. *Annals of Epidemiology*, 86, 16–24.e3.

- <https://doi.org/10.1016/j.annepidem.2023.06.001>
- Dietrich, K. M., & Bidart, M. G. (2021). Hatha Yoga Improves Psychophysiological Responses of College Students in Both Indoor and Outdoor Environments. *OBM Integrative and Complementary Medicine*, 06(04), 1–1. <https://doi.org/10.21926/obm.icm.2104046>
- Eid, J., Stahl, D., Costantine, M. M., & Rood, K. M. (2022). Oxygen saturation in pregnant individuals with COVID-19: time for re-appraisal? *American Journal of Obstetrics and Gynecology*, 226(6), 813–816. <https://doi.org/10.1016/j.ajog.2021.12.023>
- Elsisi, H. F. E. M., Aneis, Y. M., El Refaye, G. E., & Ghareeb, H. O. (2022). Blood oxygenation response to aerobic exercise combined with breathing exercises in pregnant women: a randomized controlled trial. *Bulletin of Faculty of Physical Therapy*, 27(1). <https://doi.org/10.1186/s43161-022-00073-z>
- Esencan, Y., Yilmaz Esencan, T., & Rathfisch, G. (2023). The spiritual effects of yoga during the birth process. *Indian Journal of Traditional Knowledge*, 22(4), 891–898. <https://doi.org/10.56042/ijtk.v22i4.7245>
- Fernandez, Veronica, Ronny Lesmana, Sofie Riyani Krisnadi, Hadi susiarno, Vita Muniarti Tarawan, S. I. (2025). Hatha Yoga vs Prenatal gymnastic: The Perfect Choice to Reduce Stress and Improve Health for Primigravid. *Jurnal Kebidanan*, 15(1), 45–53. DOI: 10.31983/jkb.v15i1.12677
- Guyton, A. C., & Hall, J. E. (2014). *Buku Ajar Fisiologi Kedokteran* (Edisi 12). EGC.
- Hamdiah, H., Suwondo, A., Hardjanti, T. S., Soejoenoes, A., Anwar, M. C., & ... (2017). Effect of prenatal yoga on anxiety, blood pressure, and fetal heart rate in primigravida mothers. *Belitung Nursing Journal*, 3(3), 246–254. <https://doi.org/10.33546/bnj.99>
- Hernawati, Yeti, I. S. (2017). Pengaruh Senam Hamil Pada Primigravida Terhadap Perubahan Psikofisiologi Ibu Dan Berat Badan Lahir Di Puskesmas Pagarsih Dan Padasuka Kota Bandung. *JURNAL SEHAT MASADA*, XI, 31–38. DOI: 10.24198/ijemc.v2i3.69
- Kemenkes, R. (2024). *Olahraga bagi Ibu Hamil*. Sehat Negeriku, Sehat Bangsaanku, Kemenkes RI. <https://sehatnegeriku.kemkes.go.id/baca/blog/20240626/4445835/olahraga-bagi-ibu-hamil/>
- Kementerian Kesehatan RI. (2023). *Buku Kesehatan Ibu dan Anak: Mother - Child Relation, Maternal - Child Nursing, Maternal Health Services* (Kementerian Kesehatan RI (ed.)). Kementerian Kesehatan RI.
- Kuppusamy, M., Kamaldeen, D., Pitani, R., & Amaldas, J. (2016). Immediate effects of Bhramari pranayama on resting cardiovascular parameters in healthy adolescents. *Journal of Clinical and Diagnostic Research*, 10(5), CC17–CC19. <https://doi.org/10.7860/JCDR/2016/19202.7894>
- Moher, D., Hopewell, S., Schulz, K. F., Montori, V., Gøtzsche, P. C., Devereaux, P. J., Elbourne, D., Egger, M., & Altman, D. G. (2010). CONSORT 2010 Explanation and Elaboration: updated guidelines for reporting parallel group randomised trials. *Journal of Clinical Epidemiology*, 63(8), e1–e37. <https://doi.org/10.1016/j.jclinepi.2010.03.004>
- Mohyadin, E., Ghorashi, Z., & Molamomanaei, Z. (2021). The effect of practicing yoga during pregnancy on labor stages length, anxiety and pain: A randomized controlled trial.

- Journal of Complementary and Integrative Medicine*, 18(2), 413–417. <https://doi.org/10.1515/jcim-2019-0291>
- Murdiningsih, Rohaya, Hindun, S., Franciska, Y., Ocktariyana, & Article, O. (2023). Effect of yoga practice in reducing blood pressure, platelet blood count, and proteinuria in pregnant women with mild preeclampsia. *Journal of Integrative Nursing*, 5(1), 33–36. [https://doi.org/10.4103/jin.jin\\_69\\_22](https://doi.org/10.4103/jin.jin_69_22)
- Nadholt, P. (2023). Mind-body practice as a primer to maintain psychological health among pregnant women—YOGESTA—a randomized controlled trial. *Frontiers in Public Health*, 11. <https://doi.org/10.3389/fpubh.2023.1201371>
- Nascimento, S. L., Surita, F. G., & Cecatti, J. G. (2012). Physical exercise during pregnancy: A systematic review. *Current Opinion in Obstetrics and Gynecology*, 24(6), 387–394. <https://doi.org/10.1097/GCO.0b013e328359f131>
- Noviani, N. W. (2020). Pengaruh Senam Hamil Terhadap Tingkat Stres Ibu Hamil Trimester III Di Kecamatan Sukawati Tahun 2020 Ni. *Dinamika Kesehatan Jurnal Kebidanan Dan Keperawatan*, 11(2). <https://doi.org/10.33859/dksm.v11i2.630>
- Parayiw, C., Clark, R., Harley, D., Lal, A., & Behie, A. (2023). Current Research in Ecological and Social Psychology Factors influencing perceived stress in pregnant women during cyclones in. *Current Research in Ecological and Social Psychology*, 4(July 2022), 100079. <https://doi.org/10.1016/j.cresp.2022.100079>
- Rong, L. (2021). Efficacy of yoga on physiological and psychological discomforts and delivery outcomes in Chinese primiparas. *Complementary Therapies in Clinical Practice*, 44. <https://doi.org/10.1016/j.ctcp.2021.101434>
- Streeter, C. C., Gerbarg, P. L., Saper, R. B., Ciraulo, D. A., & Brown, R. P. (2012). Effects of yoga on the autonomic nervous system, gamma-aminobutyric-acid, and allostasis in epilepsy, depression, and post-traumatic stress disorder. *Medical Hypotheses*, 78(5), 571–579. <https://doi.org/10.1016/j.mehy.2012.01.021>
- Susanti, Hassan, H. C., & Aljaberi, M. A. (2024). Pregnancy exercise effectiveness on anxiety level among pregnant women. *Journal of Public Health Research*, 13(2). <https://doi.org/10.177/22799036241246701>
- Wahyuni, S., Anies, Soejoenoes, A., & Putra, S. T. (2018). Perceived stress dan sindrom depresi pada ibu primigravida. *Jurnal Ilmiah Bidan*, 3(2), 21–28. <https://rep.ositor.y.ac.id/jspui/bitstream/123456789/1851/1/document%283%29.pdf> DOI: <https://doi.org/10.61720/jib.v3i2.74>
- Yekefallah, L. (2021). The effect of yoga on the delivery and neonatal outcomes in nulliparous pregnant women in Iran: a clinical trial study. *BMC Pregnancy and Childbirth*, 21(1). <https://doi.org/10.1186/s12884-021-03794-6>
- Yu, Y., Zhang, S., Mallow, E. B., Wang, G., Hong, X., Walker, S. O., Pearson, C., Heffner, L., Zuckerman, B., & Wang, X. (2014). The Combined Association of Psychosocial Stress and Chronic Hypertension with Preeclampsia. *Am J*

*Obstet Gynecol*, 209(5), 1–16.  
<https://doi.org/10.1016/j.ajog.2013.07.003>.The

Zainiyah, Z., Susanti, E., & Wulandari, N. (2024). The impact of yoga in pregnancy on placental growth factor levels and mean arterial pressure in pre-eclampsia: A randomized controlled trial. *Journal of Pharmacy and Pharmacognosy Research*, 12(3), 414–422. [https://doi.org/10.56499/jppres23.1820\\_12.3.414](https://doi.org/10.56499/jppres23.1820_12.3.414)

Zhu, Z., Xie, H., Liu, S., Yang, R., Yu, J., Yan, Y., Wang, X., Zhang, Z., & Yan, W. (2022). Effects of physical exercise on blood pressure during pregnancy. *BMC Public Health*, 22(1), 1–13. <https://doi.org/10.1186/s12889-022-14074-z>