December 2025; 16(2): 120-133
Jurnal Kesehatan Reproduksi
DOI: 10.58185/jkr.v16i2.386
ISSN: 2354-8762 (Online)
https://journaliakmitangsel2.iakmi.or.id/index.php/kespro

THE IMPACT OF PRENATAL YOGA ON HIP PAIN AMONG THIRD-TRIMESTER PREGNANT WOMEN: A RANDOMIZED CONTROLLED TRIAL

Royani Chairiyah*, Mella Yuria R.A, Dinni Randayani Lubis

Midwifery Study Program, Faculty of Nursing and Midwifery, Universitas Binawan, Indonesia
Email: royani.chairiyah354@gmail.com
* Corresponding author

Article Info

Keywords:
Hip pain;
Pregnant women;
Prenatal Yoga;
Non-pharmacological intervention;
Randomized controlled trials;

Abstract

Background: Hip pain is a common musculoskeletal complaint during pregnancy and may reduce mobility and quality of life. Safe and effective non-pharmacological interventions are therefore needed. Prenatal yoga is commonly recommended to enhance physical comfort and well-being during pregnancy. **Objective**: To assess the effectiveness of prenatal yoga in reducing hip pain among pregnant women**. Method**: A randomized controlled trial was conducted at an independent midwifery practice from July to December 2023. A total of 240 pregnant women were randomly assigned to an intervention group (n = 120) and a control group (n = 120). The intervention group attended prenatal yoga sessions led by a certified instructor twice weekly for four weeks, with each session lasting 60 minutes. The control group received standard antenatal care only. Hip pain intensity was measured using the Visual Analogue Scale (VAS) before and after the intervention. Data were analyzed using the Wilcoxon, Mann–Whitney, and chi-square tests. **Results:** The prenatal yoga group showed a significantly greater reduction in hip pain compared to the control group (p = 0.030). Pain resolution occurred in 78.2% of the intervention group and 8.3% of controls (RR = 1.279) .**Conclusion:** Prenatal yoga is effective in reducing hip pain among pregnant women.

Received 23/09/2025 Revised 02/10/2025 Accepted 15/02/2026

How to Cite:

Chairiyah R, R.A Mella Yuria, Lubis D.R. THE IMPACT OF PRENATAL YOGA ON HIP PAIN AMONG THIRD-TRIMESTER PREGNANT WOMEN: A RANDOMIZED CONTROLLED TRIAL. J. Kesehat. Reproduksi [Internet]. 2025 Dec. 16(2):120-133. Available from: https://doi.org/10.58185/jkr.v16i2.386

INTRODUCTION

Pregnancy entails a multifarious convergence of complex anatomical, hormonal, and biomechanical transformations that recurrently eventuate in musculoskeletal distress, with particular salience during the third trimester. Within this oft cited constellation of somatic remonstrations, back and hip pain are habitually chronicled and may infiltrate and subvert daily activities, sleep quality,

emotional well being, and the overarching quality of life of pregnant women, propagating a pervasive burden that permeates functional, psychaffective, and lived experiential strata.[1,2] Enduring pain during pregnancy has comparably been correlated with heightened stress and anxiety, phenomena that may promulgate deleterious influences upon maternal health and fetal development, reverberating across intertwined psychophysiological and developmental trajectories.[3]

In Indonesia, pregnancy related musculoskeletal pain endures as a markedly ubiquitous yet recurrently under managed condition, situated within the structural milieu of routine antenatal care, where systemic attenuation and clinical under recognition converge to sustain its persistence. Evidence extrapolated from national and regional studies suggests that approximately 60–80% of pregnant women experience back or pelvic pain at one or more junctures across the course of pregnancy, reflecting a substantial epidemiological burden within this population.[4,5] Local reports emanating from midwifery practices in East Jakarta and Bekasi disclose that a considerable proportion of third trimester pregnant women articulate hip and lower back pain that restricts mobility, disrupts sleep, and attenuates participation in daily as well as occupational activities, thereby circumscribing functional autonomy during late gestation. However, pain management within these clinical settings remains largely delimited to rudimentary counseling centered on rest and posture, with only a limited presence of structured, evidence based, non pharmacological interventions being consistently or systematically enacted by midwives.

Hip pain during pregnancy is primarily ascribable to weight gain, postural alterations, ligament laxity, and modified pelvic alignment, factors that in concert intensify the mechanical stress exerted upon the lumbar spine and hip joints, thereby predisposing these structures to heightened biomechanical strain.[6] When insufficiently addressed, this condition may precipitate physical exhaustion, emotional distress, diminished preparedness for childbirth, and reduced maternal well being, thereby possessing the potential to influence pregnancy outcomes and maternal infant bonding.[7] In light of the potential risks associated with pharmacological pain management during pregnancy, the implementation of safe and effective non pharmacological interventions is strongly advocated.[8]

Prenatal yoga constitutes an adapted modality of physical exercise expressly structured for pregnant women, integrating components of stretching, strengthening, regulated breathing techniques, and guided relaxation. Prior empirical investigations have demonstrated that prenatal yoga is capable of attenuating stress, anxiety, and lower back pain, while concurrently enhancing physical comfort and readiness for labor.[9,10,11] Pelvic focused yoga movements are postulated to facilitate improved posture and more optimal weight distribution, thereby alleviating pressure exerted upon the hip joints and adjacent musculature.[12,13] Nevertheless, the majority of extant

DOI: 10.58185/jkr.v16i2.386
ISSN: 2354-8762 (Online)

investigations have employed quasi-experimental designs and have concentrated predominantly on lower back pain, rather than addressing hip pain as a distinct clinical outcome.

To the present juncture, substantive attestations derived from randomized controlled trials interrogating the modulatory influence of prenatal yoga upon hip pain within cohorts of third trimester pregnant women, particularly situated in urban Indonesian settings such as East Jakarta and Bekasi, persist in a state of evidentiary attenuation. In light of the axial custodianship exercised by midwives within antenatal care infrastructures in these localities, the discernment of an efficacious, fiscally parsimonious, and pragmatically deployable interventional modality constitutes a methodological imperative.

Therefore, the present inquiry is purposely oriented toward the evaluative elucidation of the efficacy of prenatal yoga in the attenuation of hip pain among third trimester pregnant women, operationalized through a randomized controlled trial design. The resultant outcomes are anticipated to yield empirically grounded substantiation in reinforcement of midwifery practice, while concurrently contributing to the amplification of maternal comfort and holistic well being throughout the gestational continuum.

METHODS

This investigation instantiated an experimental research design through the execution of a randomized controlled trial (RCT) configured via a parallel approach. The participant population consisted of third trimester pregnant women who were exposed to a structured prenatal yoga program across the temporal interval extending from July to December 2023. The Control Group was composed of third trimester pregnant women who remained unexposed to the prenatal yoga intervention, electing instead to comport themselves solely in accordance with standard pregnancy care protocols, herein maintained without adjunctive or deviational modulants. The data accretion procedures within this investigation were effectuated at independent midwifery practices situated in East Jakarta and Bekasi. The chronotaxic enactment of this investigatory enterprise pervaded the calendrical interval spanning July to December 2023. The independent variable was prenatal yoga, operationally hypostatized as a polyconfigurative assemblage of specialized yogic exercises for pregnant women, synergistically fusing pre-specified corporeal motilities with methodically regimented respiratory techniques. The evaluative indicants subsumed the iterative incidence, temporal extensivity, and categorical typology of prenatal yoga engagement effectuated by pregnant women. Measurement: Performed or not performed. The dependent variable comprised hip pain severity in third trimester pregnant women, operationally specified as the perceptual intensity of nociceptive sensation localized within the pelvic region during the third trimester of pregnancy. The designated indicator was the pain score derived from the visual analog scale (VAS). Quantitative

DOI: 10.58185/jkr.v16i2.386
ISSN: 2354-8762 (Online)

measurements were expressed as VAS scores, calibrated along a continuum from 0 = no pain to 10 = very severe pain.

Population: The investigatory cohort circumfused third trimester pregnant women availing obstetric services within independent midwifery practices situated in East Jakarta and Bekasi, who autonomously attested to the presence of mild to moderate hip pain. An aggregate enrollment of 240 participants was subsumptively integrated, with 120 apportioned to the experimental group and an equivalent 120 consigned to the control group. Inclusion Criteria were constituted by third trimester pregnant women bearing a formally inscribed chronicle of normal delivery, characterized by a nullification of all medical contraindications for physical exercise, an unequivocal nonmanifestation of chronic disease alongside the inexistence of concurrent therapeutic treatment, and an evidentiary exhibition of participatory volition, confirming complete engagement across the entirety of prearranged research sessions. Exclusion criteria encompassed pregnant women with a documented history of cesarean delivery, individuals with antecedent serious musculoskeletal disorders, and those presenting with chronic diseases or pregnancy complications necessitating medical intervention, including preeclampsia or placenta previa.

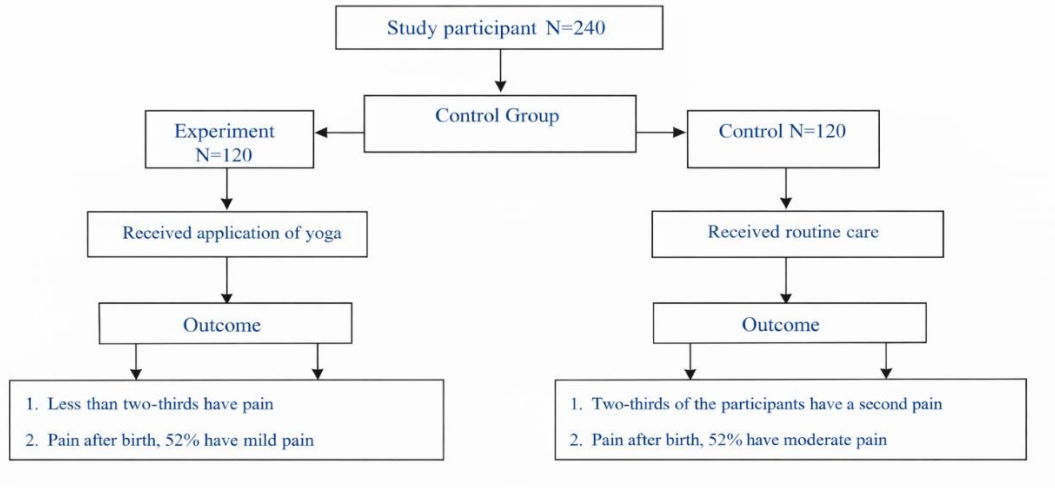

Figure 1 Sample recruitment flow

Sampling Technique: Block based randomization was used to maintain a balanced number of participants among groups. The sample size for this investigation was delineated as 240 third trimester pregnant women who satisfied the stipulated inclusion criteria. The entirety of eligible respondents was retained and subsequently subjected to equal randomization into two analytically discrete cohorts, namely the intervention group (prenatal yoga, n = 120) and the control group (n = 120). The sample size was calculated using the formula for comparing two independent means (two-

sample mean formula) by the following assumptions: standard deviation (σ) = 2, minimal clinically important difference (Δ) = 1, significance level 5% (α = 0.05; Zα/2 = 1.96), and power 80% (β = 0.20; Zβ = 0.84). The sample size calculation yielded a minimum requirement of 64 participants per group. With an actual sample constitution of 120 participants per group, this investigation possessed adequate statistical power to discern a mean differential in hip pain as minimal as 0.72 points on the VAS at 80% power, or 0.84 points at 90% power. Moreover, as the full complement of 240 eligible respondents present at the study site was incorporated, the investigation effectively subsumed the entire extant population, thereby substantively attenuating the potential for selection bias.

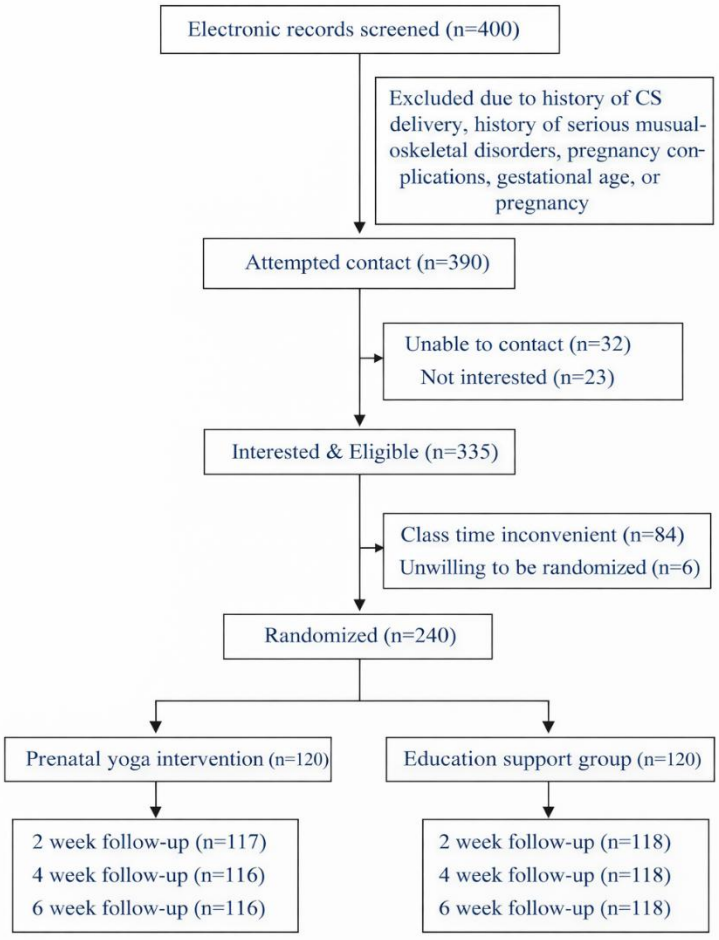

Figure 2 Consort Flow Diagram

Within the procedural sequence of this study, antecedent to the prenatal yoga intervention, investigators conducted a baseline appraisal of each participant's hip pain utilizing the designated study instrument. Thereafter, participants were subjected to stochastic allocation into either the prenatal yoga intervention group or a control group that did not receive the yoga based intervention. Outcome: Decreased hip pain intensity. Pain scale utilizing the VAS was stratified as follows: 1–3

DOI: 10.58185/jkr.v16i2.386
ISSN: 2354-8762 (Online)

denoting mild pain, 4–6 indicating moderate pain, and 7–10 signifying severe pain. The yoga material underpinning the prenatal yoga intervention comprised a sequenced assemblage of postural configurations engineered to elongate and fortify the pelvic muscles, in conjunction with structured breathing exercises and contemplative meditation practices. Each intervention session was facilitated by a certified yoga instructor possessing specialized experience in prenatal yoga. The program duration extended across 8 weeks, with a frequency of 2 times per week. Each intervention encounter was allocated a 60-minute temporal span, integratively comprising a preparatory warm up phase, a central core session, and a concluding cool down period. The intervention sessions were implemented within a comfortable room regulated at a temperature of 20–24°C and furnished with yoga mats alongside supportive adjuncts such as pillows and yoga blocks. Each session was structurally partitioned into a 10 minute warm up, a 40 minute core session, and a 10 minute cool down. Procedural documentation was systematically maintained by the instructor for each session, encompassing records of participants' level of participation and subjective comfort. Pose adjustments are made if the mother experiences difficulties.

To conceal the allocation sequence until the intervention was assigned, sealed envelopes were used. After participants met the inclusion criteria and provided informed consent, the administrative officer opened the sealed envelope according to the numbered sequence. Research members not directly involved in recruitment, intervention implementation, or outcome analysis created the random allocation sequence. The principal investigator executed the participant enrollment, whereas the administrative officer responsible for assigning participants to the intervention remained procedurally dissociated and operationally uninvolved in the enrollment process.

Control Group (Standard Care): Participants apportioned to this cohort were recipients of standard pregnancy care, a care paradigm that comprehensively encompassed the ensuing constituent elements: 1) Pregnancy health education was systematically dispensed by midwives at a weekly cadence, mediated through routine consultation sessions functioning as the primary instructional interface. The educational content incorporated guidance on the maintenance of appropriate body posture, strategies for body weight management, and the encouragement of light physical activity, such as walking. 2) Physical activity suggestions: Participants were advised to engage in light activities such as walking for 20–30 minutes per day, absent any specialized or structured guidance such as yoga. 3) Algometric documentation: Enrollees were solicited to inscribe the magnitude of their hip pain on a weekly cadence through the Visual Analog Scale (VAS), integrated within standardized procedural appraisals. 4) Care documentation: Every health facility attendance and consultation interval was archivally inscribed by midwives and nurses, thereby safeguarding the uninterrupted dispensation of standard care to all participants with procedural uniformity. Yoga instructors: Two certified female yoga instructors will facilitate all face to face yoga sessions. Data

DOI: 10.58185/jkr.v16i2.386
ISSN: 2354-8762 (Online)

analysis: Univariate analysis will be used to describe respondents' characteristics, including age, parity, TBJ, and occupation. Bivariate Analysis: Wilcoxon, Mann-Whitney, and chi-square tests. Ethical approval: Binawan University Health Research Ethics Committee Permit ethical approval number: 208/KEPK-UBN/X/2024.

RESULTS

Before further analysis was carried out, the basic characteristics of respondents in both groups are presented in Table 1.

Table 1 Characteristics of Respondents

Characteristics	Experiment n=120			Control n=120			p-value
	n	%	95% CI	n	%	95% CI	
Age							
< 20 years or > 35 years	14	11.7	5.9–17.4	10	8.3	3.4–13.2	0.875
20 to 35 years old	106	88.3	5.9–17.4	110	91.7	86.8–96.6	
Estimated Fetal Weight							
Abnormal <2500 gr, >4000 gr	5	4.2	0.6–7.8	2	1.7	0–4.1	0.216
Normal (2500 gr-4000 gr)	115	95.8	92.2-99.4	118	98.3	95.9–100	
Parity							
Risk	48	40	31.2–48.8	45	37.5	28.7–46.3	2.159
No risk	72	60	51.2–68.8	75()	62.5	53.7–71.3	
Employment							
Not Working	80	66.7	58.1–75.3	70	58.3	49.2–67.4	4.611
Working	40	33.7	24.7–41.9	50	41.7	32.6–50.8	

Table 1 shows the characteristics of respondents in the experimental group. The majority of participants (88.3%) were aged 20–35 years. Most respondents had a normal TBJ (95.5%), were not at parity risk (60%), and were working housewives (IRT) (66.7%). In the control group, 91.7% of the respondents were among the ages of 20 and 35, the majority of normal TBJ was 98.3%, the majority of parity not at risk 62.5%, and the majority of jobs was 58.3% housewives (IRT). The comparative exegesis delineates that the experimental and control groups exhibit structural homogeneity. Dispersional co-equivalency between the two cohorts is epistemically buttressed by p-values exceeding 0.05 across age, TBJ, parity, and occupation. This inferential synchronicity bespeaks the nullification of statistically meaningful divergences between the groups, thereby authorizing their epistemic fitness for direct analytical comparison.

Table 2 Effect of yoga on hip pain before and after intervention in both groups

Pain Level Score		Group Experiment (n = 120)	Control (n = 120)	p-value
Pretest	Mean (SD)	1.96 (0.40)	1.97 (0.39)	0.000**
	Median	2.00	2.00	
	Range	2 (1-3)	2 (1-3)	
Posttest	Mean (SD)	1.20 (0.40)	1.94 (0.32)	0.000**
	Median	1.00	2.00	
	Range	1(1 -2)	2(1 -3)	
p-value		0.000*	0.157*	
Moving to the pretest post (reduction)	Mean (SD)	1.93(0.93)	0.09(0.28)	0.000**
	Median	2.00	0.00	
	Range	2 (0-2)	1 (0-1)	
Mean Difference (MD)		1.93 (95% CI 1.76–2.10)	0.09 (95% CI 0.04–0.14)	

Information:*) uji Wilcoxon **) uji Mann Whitney

Table 2 elucidates the presence of a statistically consequential divergence in the mean pretest pain scores between the control and experimental groups (p = 0.000). A parallel inferential distinction is likewise observed in the mean posttest pain score when contrasting the control cohort with the experimental cohort, indicating a meaningful post intervention separation between the two groups (p=0.000), and there was a difference in the mean pretest and posttest pain score in the experimental group (p=0.000), in the control group, there was no significant difference among the mean pretest and posttest pain scores (p = 0.157). Conversely, a statistically salient transformation in the mean pretest and posttest pain scores was detected within both the experimental and control groups (p = 0.000). The attenuation of hip pain within the prenatal yoga group quantified at 1.93 (95% CI 1.76–2.10), whereas the corresponding decrement in the control group was markedly attenuated at 0.09 (95% CI 0.04–0.14). The intergroup mean differential in change registered 1.84 on the VAS scale, signifying a superior magnitude of pain diminution within the prenatal yoga group relative to the control group.

Table 3 Effect of posttest pain level among the two groups

Group	Pain				Total		p-value	RR
	No pain		Mild pain				0.030	1.279 CI (1.141–1.159)
	n	%	n	%	n	%		
Experiment	96	78.2	24	21.8	120	100		
control	10	8.3	110	91.7	120	100		

Information : *) chi-square test

Table 3 shows a significant difference among the control and experimental groups, by a p-value of 0.030. It can be seen that of the 120 mothers who participated in prenatal yoga in the experimental group, 96 respondents (78.2%) had no pain. The control group had no pain, 10 respondents (8.3%). The RR value of 1.279 indicates that mothers who participate in prenatal yoga

are 1.279 times more likely to experience a reduction in hip pain compared to those who do not participate in prenatal yoga.

DISCUSSION

Respondents' Characteristics and Their Relationship by Hip Pain in the Third Trimester

This investigation furnishes a synoptic portrayal of hip pain encountered by third trimester pregnant women, stratified according to pivotal maternal attributes, encompassing age, employment status, parity, and estimated fetal weight. In lieu of mere comparing the characteristics per previous studies, the outcomes elucidariate the manner whereby each factor might contributively actuate the development or exacerbation of musculoskeletal discomfort throughout late pregnancy. Pregnancy related hip and pelvic girdle pain is pervasively cognized as a multifactorial condition morphogenetically contouracted by a conjunctive interlacing of biomechanical, hormonal, and lifestyle factors.[14,15,16,17]

Age of Pregnant Women

The majority of participants in the intervention group were aged 20–35 years, that is considered the optimal reproductive age. Although this age group is generally associated by lower obstetric risk, third-trimester pregnancy inside of this range is still marked by significant biomechanical changes that can intensify hip and lower back pain. Increased maternal weight, anterior displacement of the center of gravity, and progressive ligament laxity occur regardless of maternal age, placing increased stress on the lumbopelvic region.[18,19] Women aged 20–35 years are often physically active and socially engaged, that may further increase mechanical loading on the spine and pelvis, thereby exacerbating pain symptoms. These outcomes support previous research indicating that musculoskeletal pain during pregnancy is not confined to high risk age groups but is instead part of the normal physiological adaptations of late gestation.[9,20]

Employment Status

The preponderance of respondents were extrainstitutionally unengaged or functionally designated as housewives. Notwithstanding that the nullity of formal employment may attenuate occupational physical strain, domestic responsibilities including prolonged standing, repetitive bending, lifting, and household chores remain capable of imponing substantial mechanical stress upon the lumbar spine and hip joints. Prolonged static or suboptimal postures have been shown to increase the risk of pregnancy-related musculoskeletal pain.[21,22] Conversely, greater time flexibility among non-working pregnant women may allow increased participation in antenatal programs, such as prenatal exercise or yoga, that have been shown to reduce pregnancy related pain and functional

limitations.[23] Thus, employment status may influence both exposure to physical stressors and access to preventive interventions rather than acting as a protective factor on its own.

Parity

Most participants had parity inside of the non-risk category; however, parity remains an important determinant of musculoskeletal adaptation during pregnancy. Repeated pregnancies can outcome in cumulative stretching of abdominal muscles and pelvic ligaments, reducing core stability and increasing susceptibility to hip and lower back pain.[24] Even among multiparous women by non risk parity, residual biomechanical changes by previous pregnancies may persist and contribute to pain in subsequent pregnancies. Conversely, primigravida women may experience pain due to a lack of prior musculoskeletal adaptation to rapid anatomical changes. These outcomes are consonant with antecedent evidentiary strata proposing that parity modulates pregnancy related pain via biomechanistic conduits rather than through obstetric pathways alone.[17]

Estimated Fetal Weight (EFW)

All participants in the intervention group had a normal estimated fetal weight. Nevertheless, fetal growth during the third trimester contributes substantially to maternal weight gain and anterior loading, thereby increasing lumbar lordosis and pelvic compression.[25, 26] Even within ostensibly normative fetal weight spectra, the aggregate gravito biomechanical impress of fetal mass, amniotic fluid volume, and uterine enlargement can potentiate structural load intensification upon the hip joints and their periarticular musculature. This substantiates the evidentiary corpus indicating that pregnancy related hip pain is not delimited exclusively to instances of macrosomia, but can additionally manifest as an epiphenomenon of the normative physiophysiologic recalibrations characterizing late pregnancy.[27]

Effect of Prenatal Yoga on Hip Pain

Physiological and biomechanical recalibrations emergent in the third trimester, encompassing ligament laxity, altered posture, and reduced joint stability, coalesce to constitute a temporally critical susceptibility window for the genesis of hip pain.[28,29,30] Prenatal yoga engages these gestational alterations via low impact motory sequences that potentiate pelvic mobility, core strength, postural alignment, and musculobalance across stabilizing groups. The outcomes of this study demonstrate that prenatal yoga significantly reduced hip pain compared by routine antenatal care alone. This outcome is consistent by previous studies and systematic reviews showing that yoga and other structured exercise programs effectively reduce pregnancy related musculoskeletal pain and improve functional capacity.[9,24] Through improved neuromuscular control and reduced mechanical stress on the hip and lumbar regions, prenatal yoga represents a safe and effective non-pharmacological intervention.

DOI: 10.58185/jkr.v16i2.386
ISSN: 2354-8762 (Online)

Novelty and Clinical Implications

This study furnishes novative evidentiary substance by centrating explicitly upon hip pain, a symptomicity that has historically garnered diminished scholarly salience relative to lower back pain within pregnancy related research. By evidentiating the efficacious capacity of prenatal yoga in attenuating hip pain among third trimester pregnant women, the outcomes substantiate the incorporative assimilation of prenatal yoga into routinized midwifery led antenatal care. Such incorporative alignment may amplificatively advance maternal comfort, circumscribe functional limitations, and cultivate holistic maternal well being without subjectively implicating mothers or fetuses in pharmacological risks, consonant with international recommendations for physical activity during pregnancy.[31]

CONCLUSION

This investigation terminatively infers that prenatal yoga demonstrates analgesic efficaciousness in the attenuative modulation of hip pain within pregnant women, with salience intensification manifesting most conspicuously throughout the third trimester. The randomized controlled trial architecture corroboratively undergirds the epistemic legitimacy of these findings, evidencing that women who engaged in structured prenatal yoga manifested statistically substantive diminutions in pain levels relative to counterparts who remained non participatory. Prenatal yoga may, on this basis, be advocatively endorsed as a safety congruent, non-pharmacological interventional modality for the ameliorative elevation of maternal comfort and holistic well being across the gestational continuum of pregnancy.

Prospective scholarly inquiry is exhortatively prompted to incorporate numerically amplified and heterogeneously constituted participant cohorts, alongside methodical regulation of supplementary confounding variables, thereby fortifying and expansively elaborating the evidentiary corpus endorsing prenatal yoga within the framework of antenatal care.

RECOMMENDATION

Based on the study outcomes, prenatal yoga is recommended as a non-pharmacological intervention in routine antenatal care to help reduce hip pain in pregnant women. Midwives and nurses are encouraged to facilitate structured prenatal yoga sessions to support maternal comfort and mobility.

Future studies should better control potential confounding factors such as daily activity, sleep patterns, nutrition, and pre-existing health conditions to strengthen the validity of outcomes. Research by larger and more diverse samples is also suggested to improve generalizability. Additionally, incorporating qualitative approaches may provide deeper insight into pregnant women's experiences and help refine the implementation of prenatal yoga in antenatal services.

DOI: 10.58185/jkr.v16i2.386
ISSN: 2354-8762 (Online)

ACKNOWLEDGEMENT

We want to thank our pregnant women sincerely for participating in this study. We also thank the practices of independent midwives Ida, Syfa and Lina for their support during the study's conduct. We would like to thank all the trial participants for giving their valuable time to our research and yoga instructors.

REFERENCES

1. Rahmawati NA, Rosyidah T, Marharani A. Hubungan Pelaksanaan Senam Hamil dengan Ketidaknyamanan Ibu Hamil Trimester III. J Involusi Kebidanan. 2018;7(12):42.
2. Fitriani L. Efektivitas senam hamil dan yoga hamil terhadap penurunan nyeri punggung pada ibu hamil trimester III di Puskesmas Pekkabata. J-Kesmas. 2018;4(2):1–9. Available from: https://doi.org/10.35329/jkesmas.v4i2.246
3. Septi Tri, Imanah NDN. Usia kehamilan sebagai faktor yang berhubungan denagn kejadian anemia pada ibu hamil. J Kebidanan Indones. 2022;13(1):94–102. Available from: https://doi.org/10.36419/jki.v13i1.569
4. Purnamasari KD. Nyeri punggung bawah pada ibu hamil trimester II dan III. J Midwifery Public Heal. 2019;1(1):9. Available from: http://dx.doi.org/10.25157/jmph.v1i1.2000
5. Rejeki ST, Fitriani Y. Pengaruh yoga prenatal terhadap nyeri punggung pada ibu hamil trimester II dan III di Lia Azzahra Mom & Baby. Indones J Kebidanan. 2019;3(2):67–72. Available from: https://doi.org/10.26751/ijb.v3i2.756
6. Widiarti, IR, Yulviana R. Pendampingan senam hamil pada ibu hamil trimester III untuk mengurangi nyeri punggung di PMB Rosita, S.Tr, Keb tahun 2021. J Kebidanan Terkini. 2022;1(2):153–60. Available from: https://doi.org/10.25311/jkt/Vol1.Iss2.463
7. Suryani P, Ina H. Senam hamil dan ketidaknyamanan ibu hamil trimester ketiga. Midwifery J. 2018;5(01):33–9.
8. Ridawati ID, Feri J, Basdafa APT. Penerapan prenatal yoga untuk mengatasi nyeri punggung akut pada ibu hamil trimester III. J Keperawatan Merdeka. 2024;4(November):89–95. Available from: https://doi.org/10.36086/jkm.v4i2.2275
9. Styles A, Loftus V, Nicolson S, Harms L. Prenatal yoga for young women a mixed methods study of acceptability and benefits. BMC Pregnancy Childbirth. 2019;19(1):1–12. Available from: https://doi.org/10.1186/s12884-019-2564-4
10. Wulandari P, Retnaningsih D, Aliyah E. The effect of prenatal yoga on primigravida trimester II and III in Studio Qita Yoga District South Semarang Indonesia. 2018;9:25–34.
11. Oktavia N, Pramesti AP, Setyani RA. The effectiveness of prenatal yoga on back pain intensity of third trimester pregnant women in Surakarta. J Community Empower Heal. 2023;6(3):139. Available from: https://doi.org/10.22146/jcoemph.83276
12. Syahrul S, Yulianti I, Purnamasari A. Effectiveness of prenatal yoga in reducing lower back pain and sciatica in pregnant women. Indones J Glob Heal Res. 2024;6(6):3435–42. Available from: https://doi.org/10.37287/ijghr.v6i6.3715
13. Akarsu RH, Kocak DY, Akarsu GD. Experiences of pregnant women participating in antenatal yoga: a qualitative study. Altern Ther Heal Med. 2022;May 28(4):18–23. PMID: 34653024.
14. Gantt A, Metz TD, Kuller JA, Louis JM, Cahill AG, Turrentine MA. Pregnancy at Age 35 Years or Older. Obstet Gynecol. 2022;140(2):348–66. Available from: https://doi.org/10.1097/AOG.0000000000004873
15. Patiyah P, Carolin BT, Dinengsih S. Pengaruh senam prenatal yoga terhadap kenyamanan ibu hamil trimester III. J Ilm Kesehat. 2021;13(2):174–83. Available from: https://doi.org/10.37012/jik.v13i2.463
16. Supiani S, Yusuf NN, Yanti EM. Pengaruh senam hamil menggunakan audio visual terhadap keterampilan ibu hamil di wilayah kerja Puskesmas Sesela Kabupaten Lombok Barat. J

Kewarganegaraan [Internet]. 2022;6(2):4520–30. Available from: http://journal.upy.ac.id/index.php/pkn/article/view/3810/0
17. Rafika R. Efektifitas prenatal yoga terhadap pengurangan keluhan fisik pada ibu hamil trimester III. J Kesehat. 2018;9(1):86–92. Available from: https://doi.org/10.26630/jk.v9i1.763
18. Widowati R, Kundaryanti R, Julian DA, Raushanfikri A. Pregnancy and work stress: investigation of factors relating stress level of pregnant working women in Indonesia. Gac Sanit. 2021;35:S38–41. Available from: https://doi.org/10.1016/j.gaceta.2020.12.011
19. Anggraini D, Abdollahian M, Marion K. The development of an alternative growth chart for estimated fetal weight in the absence of ultrasound: Application in Indonesia. PLoS One [Internet]. 2020;15(10 October):1–24. Available from: http://dx.doi.org/10.1371/journal.pone.0240436
20. Hadianti DN, Ferina F, Indrayani D, Handayani DS. The Insler and Johnson formulas for determining estimated fetal weight to baby's birth weight. J Kesehat Ibu dan Anak. 2023;17(1):21–8. Available from: https://doi.org/10.29238/kia.v17i1.1687
21. Conder R, Zamani R, Akrami M. The biomechanics of pregnancy: a systematic review. J Funct Morphol Kinesiol. 2019;4(4). Available from: https://doi.org/10.3390/jfmk4040072
22. Morino S, Ishihara M, Umezaki F, Hatanaka H, Yamashita M, Aoyama T. Pelvic alignment changes during the perinatal period. PLoS One. 2019;14(10):1–11. Available from: https://doi.org/10.1371/journal.pone.0223776
23. Walters C, West S, A Nippita T. Pelvic girdle pain in pregnancy. Aust J Gen Pract. 2018;47(7):439–43. Available from: https://doi.org/10.31128/AJGP-01-18-4467
24. Holden SC, Manor B, Zhou J, Zera C, Davis RB, Yeh GY. Prenatal yoga for back pain, balance, and maternal wellness: a randomized, controlled pilot study. Glob Adv Heal Med. 2019;8:1–11. Available from: https://doi.org/10.1177/2164956119870984
25. Situmorang RB, Rossita T, Rahmawati DT. Hubungan senam prenatal yoga dengan tingkat kecemasan ibu hamil primigravida trimester III. J Ilmu Kesehat Masy. 2020;9(03):178–83. Available from: https://doi.org/10.33221/jikm.v9i03.620
26. Corrigan L, Moran P, McGrath N, Eustace-Cook J, Daly D. The characteristics and effectiveness of pregnancy yoga interventions: a systematic review and meta-analysis. BMC Pregnancy Childbirth [Internet]. 2022;22(1):1–21. Available from: https://doi.org/10.1186/s12884-022-04474-9
27. Shidhaye R, Bangal V, Bhargav H. Feasibility, acceptability and preliminary e cacy of yoga to improve maternal mental health and immune function during the COVID- crisis (Yoga-M trial): a pilot randomized controlled trial. Front Hum Neurosci. 2023; Available from: https://doi.org/10.3389/fnhum.2023.1115699
28. Holden SC, Manor B, Zhou J, Zera C, Davis RB, Yeh GY. Prenatal Yoga for Back Pain, Balance, and Maternal Wellness: A Randomized, Controlled Pilot Study. Glob Adv Heal Med. 2019;8:1–11. Available from: https://doi.org/10.1177/2164956119870984
29. Camalia N, Sukesi, Pipitcahyani TI, Harumi AM. The effect of prenatal yoga on back pain in third trimester of pregnant women. J Kebidanan. 2021;10(1):12–6. Available from: https://doi.org/10.1177/2164956119870984
30. Kuder L, Dinevski D, Dinevski IV, Takač I, Mujezinović F, Elvedi Gašparović V. Benefits of yoga in pregnancy: a randomised controlled clinical trial. J Perinat Med [Internet]. 2025;53(3):350–7. Available from: https://doi.org/10.1515/jpm-2024-0422
31. Vleeming A, Albert HB, Ostgaard HC, Sturesson B SB. European guidelines for the diagnosis and treatment of pelvic girdle pain. Eur Spine J. 2008;17(6):794–819. Available from: https://doi.org/10.1007/s00586-008-0602-4
32. Wu WH, Meijer OG, Uegaki K, Mens JM, van Dieën JH, Wuisman PI OH. Pregnancy-related pelvic girdle pain (PPP), I: Terminology, clinical presentation, and prevalence. Eur Spine J. 13(7):575–89. Available from: https://doi.org/10.1007/s00586-003-0615-y
33. Yong-Chao Qiao, Yan Xu , Dong-Xiang Jiang , Xiao Wang, Feng Wang, Jun Yang YSW. Epidemiological analyses of regional and age differences of HIV/AIDS prevalence in China, 2004-2016. Int J Infect Dis. 2019;81:215–20. Available from: https://doi.org/10.1016/j.ijid.2019.02.016

34. Gutke A, Östgaard HC, Öberg B. Predicting Persistent Pregnancy-Related Low Back Pain. Spine (Phila Pa 1976). 33(12):E386–93. Available from: https://doi.org/10.1097/BRS.0b013e31817331a4
35. Mens JM, Pool-Goudzwaard A SH. Mobility of the pelvic joints in pregnancy-related lumbopelvic pain: a systematic review. Obstet Gynecol Surv. 2009 Mar;64(3):200-8. Available from: https://doi.org/10.1097/OGX.0b013e3181950f1b
36. Davenport MH, Marchand A anne, Mottola MF, Poitras VJ, Gray CE, Garcia AJ, et al. Exercise for the prevention and treatment of low back , pelvic girdle and lumbopelvic pain during pregnancy : a systematic review and meta-analysis. J Sport Med. 2019;53(90–98):90–8. Available from: https://doi.org/10.1136/bjsports-2018-099400
37. Artal R, O'Toole M. Guidelines of the American College of Obstetricians and Gynecologists for exercise during pregnancy and the postpartum period. Br J Sport Med. 37(1):6-12 discussion 12. Available from: https://doi.org/10.1136/bjsm.37.1.6

Declarations

Author contribution	:	Royani Chairiyah was responsible for the entire research project. She also led the writing of the manuscript and the collaboration with the second author. Mella Yuria RA and Dinni Randayani Lubis participated in the data collection, transcription, and analysis. He also revised the manuscript. Both authors approved the final manuscript.
Funding statement	:	This research did not receive any funding.
Conflict of interest	:	Third authors declare that they have no competing interests.
Additional information	:	No additional information is available for this paper.