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Enhancing childbirth outcomes: The impact of pelvic floor muscle and abdominal exercises

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ABSTRACT

Background: *Childbirth is a critical physiological process experienced by women that requires optimal physical and psychological preparation. Inadequate preparation may contribute to prolonged labor and increased pain intensity. Prenatal exercise is recognized as a non-pharmacological approach to improve maternal readiness. A combination of pelvic floor muscle (PFM) exercise and abdominal exercise is considered beneficial for strengthening muscles involved in the labor process, potentially influencing both labor duration and pain perception. Therefore, this study aimed to analyze the effect of combined pelvic floor muscle and abdominal exercises on labor pain intensity and duration of labor among pregnant women.*

Methods: *This study employed a quasi-experimental design with a posttest-only nonequivalent control group approach. The total sample consisted of 60 pregnant women, divided equally into an intervention group and a control group (1:1 ratio). Participants were selected using convenience non-probability sampling. The intervention group received prenatal exercise combining PFM and abdominal exercises starting from 38 weeks of gestation until delivery, while the control group received standard care. Data were analyzed using independent t-tests to compare outcomes between groups.*

Results: *The findings demonstrated that the intervention group had significantly lower mean pain scores compared to the control group at 8 cm cervical dilation (t = -3.828, p = 0.001) and at complete dilation (t = -3.865, p = 0.001). Additionally, the duration of the first stage of labor (t = -3.118, p = 0.003) and the second stage of labor (t = -2.122, p = 0.038) were significantly shorter in the intervention group.*

Conclusions: *Prenatal exercise combining pelvic floor muscle and abdominal exercises has a positive effect on the childbirth process by reducing labor pain and shortening the duration of labor stages. This intervention can be recommended as part of routine antenatal care to improve maternal outcomes.*

KEYWORD: *abdomen exercise; duration of labor; labor pain; pelvic floor muscle; pregnancy*

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INTRODUCTION

The process of delivering the conception results in the fetus and placenta through natural and physiological means is the definition of normal labor. This process consists of various stages involving the myometrium, decidua, and cervix. Each works progressively and coordinately with one another (1). Labor commences in pregnant women who typically reach 40 weeks of gestation or 280 days. Between 37 weeks or 259 days and 42 weeks or 294 days of pregnancy is considered full term to initiate the labor process.

Labor begins with contractions in the uterus. According to Norwitz Errol in 1999, prior to labor, the uterus undergoes activation and stimulation phases. This activation is triggered by specific hormones such as estrogen, characterized by increased expression of proteins involved in uterine contractions, changes in ion channels. Increased gap junctions between myometrial cells result in electrical synchronization in the uterus, ultimately leading to regular contractions and cervical dilation. Biochemical remodeling of the cervical connective tissue is closely associated with uterine contractions and progressive cervical dilatation, processes that generally precede the spontaneous rupture of the fetal membranes. Nevertheless, the onset and progression of labor continue to be determined primarily through clinical assessment (2). Labor is currently understood as a complex multifactorial physiological process rather than a single-theory phenomenon. The modern theory of parturition explains that the onset of labor results from the interaction of hormonal regulation (including estrogen, progesterone, and oxytocin), inflammatory pathways, and maternal–fetal signaling. These coordinated physiological changes generally occur before the spontaneous rupture of the fetal membranes, while the diagnosis of labor onset continues to rely primarily on clinical evaluation (3,4).

The process of labor progresses with time. The changes that occur include cervical dilation and descent of the fetus as per Friedman's theory. Labor consists of three stages. The first stage begins when labor initiates and ends when the cervix is fully dilated and thinned out. The second stage starts from complete cervical dilation to the expulsion of the fetus or birth. Assessment of the second stage of labor involves evaluating the duration and progress of fetal position changes. Three critical aspects in this assessment are delayed descent, arrested descent, and failure of descent (5). If there is a lack of progress in fetal descent, further assessment of the underlying causes is necessary. Appropriate interventions are needed to resolve the issue. Therefore, the roles of midwives and obstetricians are crucial for meticulous, accurate, and comprehensive assessment. The third stage of labor commences following the birth of the infant and concludes with the expulsion of the placenta (6).

The efforts of the mother, uterine contractions, fetus characteristics, and pelvic anatomy all have an impact on the success of labor. The passenger, power, and passage factors of labor are common names for these elements. If labor duration exceeds normal limits, these factors need to be considered. The use of epidural anesthesia for labor pain relief impacts the occurrence of prolonged labor. Administering this therapy affects the uterus' ability to contract, tension in pelvic floor muscles, and the maternal bearing-down reflex (7). The success of labor is influenced by several factors, including maternal effort, uterine contractions, fetal factors, and pelvic structure, which are collectively known as the “power, passenger, and passage” components. When labor is prolonged, these factors must be carefully evaluated. Additionally, the use of epidural anesthesia for pain management has been associated with prolonged labor due to its effects on uterine contractility, pelvic floor muscle tone, and maternal pushing reflex.

If normal vaginal delivery is not possible, delivery can be induced pharmacologically and assisted with forceps or vacuum extraction. Operative Vaginal Delivery (OVD) is performed to rescue the fetus during the second stage of labor. However, these procedures carry adverse effects such as postpartum hemorrhage, cervical injury, vaginal lacerations, total perineal rupture, or perineal lacerations, and puerperal infections (1,8). Additionally, OVD techniques risk injury to the pelvic floor, urinary tract, maternal genitalia, and digestive system. Another risk of prolonged labor is maternal health problems that can lead to maternal and infant mortality.

Based on these concerns, preventive measures and management of prolonged labor are necessary. Regular prenatal exercises are one step in addressing these issues. Prenatal exercises are structured, repetitive physical activities aimed at improving body fitness. These activities generate energy in pregnant women, and it is recommended that they be performed regularly for at least 150 minutes per week. This program benefits the fetus, mother, and placenta, limits excessive weight gain during pregnancy, thus preventing obesity during pregnancy and reduces the risk of developing Diabetes mellitus. Prenatal exercises provide psychological tranquility, leading to a reduction in postpartum depression or mental disorders in mothers.

Pregnant women who engage in sufficient physical activity have greater satisfaction with their body image. Besides benefiting the mother, good physical activity during pregnancy also positively impacts infant well-being. Implementing prenatal exercises has no negative impact on mothers and fetuses when following appropriate procedures (9).

To maintain the strength and style of contraction required for effective pelvic muscle function, one should determine the type of exercise needed. Kegel exercises and variations of them are the most common exercises for the pelvic muscles. Arnold H. Kegel, an American gynecologist, is the name of the exercise. Kegel, who introduced this kind of exercise for the first time in 1948. Kegel exercises are designed to improve the strength of the pelvic floor muscles through repetitive cycles of muscle contraction and relaxation. The bladder should be empty in order to perform Kegel exercises. The individual may lie down or sit, then contract the pelvic muscles, hold them tight, and count to three to five seconds. Other variations can be created by developing or modifying these exercises. They should be done for a few minutes at a time several times a day. The desired effects take anywhere from one to three months to begin to manifest. According to Kegel (1948), pelvic muscle exercises for women aim to strengthen and tone the pelvic muscles (10). On the other hand, various studies indicate that Pelvic Floor Muscle Training (PFMT) during pregnancy results in flexible, strong, and controlled muscles, contributing to the descent and rotation of the fetal head. Thus, PFMT accelerates the first and second stage of labor. In primigravida, this technique aids in spontaneous labor. Prenatal exercises combined with PFMT represent an innovation in this research (11–13).

Nevertheless, despite the widely recognized benefits of prenatal exercise and Pelvic Floor Muscle Training (PFMT), previous studies have predominantly examined these interventions separately, with limited evidence evaluating the combined effect of PFMT and abdominal exercise on labor outcomes. Furthermore, existing research tends to focus on general maternal fitness or single outcomes, such as labor duration or mode of delivery, rather than simultaneously assessing both pain intensity and duration across different stages of labor. This indicates a gap in understanding the comprehensive impact of combined targeted muscle training on the childbirth process. Considering that effective labor is influenced by both uterine contractions and maternal pushing efforts, strengthening the pelvic floor and abdominal muscles simultaneously may provide synergistic benefits. Therefore, this study aims to investigate the effect of prenatal exercise combining pelvic floor muscle and abdominal exercise on labor pain and the duration of the first and second stages of labor, as these variables are clinically relevant indicators of maternal and fetal outcomes.

MATERIALS AND METHODS

This study utilized a quasi experimental approach with a posttest-only nonequivalent control group design. Participants were assigned to either the intervention group or the control group. The participants were divided into an intervention group and a control group. The study was conducted from January to April 2023 at three independent midwifery practices: Midwife Ida Farida, Midwife Utami Puji Astuti, and Midwife Novianti. These sites were randomly selected from independent midwifery practices in Cilacap City, Central Java, Indonesia.

The study included pregnant women aged 20–35 years with singleton pregnancies, gestational ages between 38 and 40 weeks, normal ultrasonography findings, normal body mass index (BMI), and consent to participate in the study. The exclusion criteria included pregnancy-induced hypertension, cardiac disorders, gestational diabetes, abnormal ultrasound findings, incomplete prenatal exercise participation, and withdrawal from the study. Participants were selected using non-probability convenience sampling. Pregnant women attending antenatal care at the selected midwifery practices who met the eligibility criteria were recruited until the required sample size was achieved. Sample size was determined using G*Power software for an independent t-test (difference between two means, two groups) with a significance level of 0.05. A total sample of 60 respondents was required, with a calculated statistical power of 0.627.

Participants listed by the researcher before the study commenced underwent randomization. A total of 60 selected respondents were divided into two groups: an intervention group (n = 30) and a control group (n = 30).

Participants who met the inclusion criteria were identified from pregnant women attending antenatal care at the selected midwifery practices prior to data collection.Participants who met the eligibility criteria were consecutively recruited until the predetermined sample size was achieved. In total, 60 respondents were included in the study. The participants were subsequently assigned into two equal groups, consisting of 30 respondents in the intervention group and 30 respondents in the control group. The intervention group participated in the designated prenatal exercise program, whereas the control group received routine antenatal care without the additional intervention.

Several instruments used: instruments for demographic information, instruments to gather obstetric information, Clock timer recorded on Partograph sheets.The Visual Analog Scale (VAS), a visual instrument for assessing pain intensity, is recognized as one of the most commonly utilized pain assessment tools worldwide. Numerous international studies have demonstrated its validity and reliability, while studies conducted in Iran reported a reliability coefficient of r = 0.88. Content validity was established through evaluation by certified experts in physiotherapy and midwifery. The research procedure was carried out in three stages: pre-intervention, intervention, and post-intervention. During the pre-intervention stage, participants in the treatment group who met the inclusion criteria received explanations regarding the study aims and procedures and subsequently provided informed consent. Initial assessments were then performed, including maternal vital signs (blood pressure, pulse rate, respiratory rate, and body temperature) as well as fetal evaluations, such as fetal presentation and fetal heart rate.

The intervention consisted of prenatal exercises performed twice weekly, each session lasting 15 minutes. The program included (1) standard prenatal exercises based on Ministry of Health guidelines and (2) pelvic floor muscle training (PFMT) combined with abdominal exercises. Each session consisted of warm-up, main exercise, and cool-down components. Exercises were continued until delivery.

The warm-up included simple head and shoulder movements and breathing exercises. The main exercise consisted of sitting and squatting movements to strengthen pelvic and lower limb muscles. PFMT and abdominal exercises were performed in a dorsal recumbent position with controlled breathing, progressive abdominal contraction, head lift, and knee resistance exercises. Each movement was repeated five times. The cool-down phase included breathing regulation, lower limb relaxation, and reassessment of maternal vital signs. Midwives at each site assisted in coordinating the intervention. The study was conducted until participants delivered.

Data analysis was performed using SPSS version 25. The distribution normality of the data was assessed with the Kolmogorov Smirnov test. Depending on the data distribution, either the independent t-test or the Mann Whitney U test was employed for statistical analysis. Analysis of covariance (ANCOVA) was conducted to adjust for potential confounding factors. Statistical significance was determined at a p-value of less than 0.05. Prior to conducting the research, ethical procedures were followed. The ethics committee of University Muhammadiyah Purwokerto approved the study under registration number KEPK/UMP/39/I/2023. Subsequently, participants were informed about the research procedures. Upon agreement, participants provided their consent by signing a participant consent form. All participants were pregnant women from three independent midwifery practices who met the inclusion criteria. The researcher holds national certification in Health Research Ethics and Good Clinical

Practice (GCP). Furthermore, the researcher also holds a Training on Health Research Ethics competency certificate with certificate number 051/ETKLIT/07/2024 and a Good Clinical Practices (GCP) competency certificate with certificate number 001/GCP/07/2024.

RESULTS AND DISCUSSION

Univariate analysis in this study involved analysis of age, parity, education and occupation characteristics

Univariate analysis was performed to describe the demographic characteristics of the respondents, including age, parity,

Table 1. Distribution of demographic characteristics by mean and frequency

Variable		Control group (n=28) Mean ± SD	Intervention group (30) Mean ± SD	Total (n=58)
Age		29.71 ± 6.079	29 ± 7.1	29.35 ± ~6.6
		Frequency (%)	Frequency (%)	
Parity	Primigravida	11 (39.2)	16 (53.3)	27 (46.6)
	Multigravida	17 (60.7)	14 (46.7)	31 (53.4)
Education attainment	Less than high school	3 (10.7)	1 (3.3)	4 (6.9)
	High school graduate	19 (67.9)	19 (63.3)	38 (65.5)
	University education	6 (21.4)	10 (33.4)	16 (27.6)
Employment status	Employed	7 (25)	11 (36.7)	18 (31)
	Not employed	21 (75)	19 (63.3)	40 (69)

educational attainment, and employment status. This analysis aimed to provide an overview of the baseline characteristics of participants in both the intervention and control groups to ensure comparability between groups.

Univariat Analysis

Table 1 shows that the results of the univariate analysis for this variable include age, parity, education, and occupation.In the treatment group, the mean age of the 30 respondents was 29 years. The standard deviation for the control group is 6.079, while for the treatment group, the standard deviation is 7.1.

Regarding parity, the distribution is divided into two groups: primigravida and multigravida. In the control group, the majority are multigravida, representing 60.7%, while primigravida accounts for 39.2%. In contrast, in the treatment group, the proportions are nearly equal, with 53.3% primigravida and 46.7% multigravida. For the education variable, both the control and treatment groups show similar results: the majority of pregnant women selected as respondents have a high school education. In the control group, 67.9% of respondents have completed high school, whereas 46.7% of respondents in the treatment group have the same level of education.

Additionally, 21.4% of respondents in the control group have college education, and 10.7% have not completed high school. In the treatment group, 33.4% of respondents have a college education, and 3.3% have not completed high school. The next variable to discuss is employment status. In the control group, most pregnant women are not employed and are classified as housewives with a percentage of 75%. Employed women in this group make up 25%. Similarly, in the treatment group, the largest percentage is also housewives, at 63.3%, while employed women account for 36.7%.

Table 1 illustrates the demographic, including age, parity, educational attainment, and employment status profiles of respondents in the intervention and control groups. Overall, the two groups showed comparable baseline characteristics, indicating homogeneity between groups prior to the intervention.

The mean age of respondents was similar between the control group (29.71 ± 6.079 years) and the intervention group (29 ± 7.1 years). Regarding parity, the control group consisted mostly of multigravida women (60.7%), while the intervention group showed a relatively balanced distribution between primigravida (53.3%) and multigravida (46.7%). For educational attainment, most participants in both groups had completed high school, with 67.9% in the control group and 63.3% in the intervention group.

A smaller proportion had university education or did not complete high school. In terms of employment status, the majority of participants in both groups were not employed (75% in the control group and 63.3% in the intervention group). These findings indicate that the baseline characteristics between the control and intervention groups are relatively comparable, thereby reducing the potential influence of confounding variables on the study outcomes. From a theoretical perspective, maternal age, parity, education, and employment status are known to influence labor outcomes, particularly in relation to pain perception and duration of labor. However, recent evidence suggests that structured prenatal exercise interventions play a more dominant role in improving labor outcomes.

A systematic review by Davenport reported that prenatal exercise contributes to better maternal outcomes, including reduced labor complications. Similarly, Zhang found that prenatal exercise interventions significantly reduced labor pain and shortened the duration of labor stages. Furthermore, pelvic floor muscle training has been shown to improve the efficiency of the second stage of labor by enhancing maternal pushing ability (14,15).

Therefore, the novelty of this study lies in demonstrating that a combined intervention of pelvic floor muscle and

Table 2.The comparison of Mean ± SD OR Frequenxy (%) of childbirth outcomes in control and intervention groups

Variable	Control group (n=28) Mean ± SD	Intervention group (n=30) Mean ± SD	*t-test**	*P-value**
Pain intensity at 8 cm dilation based on VAS	6.07 ± 1.783	4.37 ± 1.608	-3.828	0.001
Pain intensity at full cervical dilation based on VAS	8.21 ± 1.166	7.10 ± 1.029	-3.865	0.001
Duration of active phase of labor (min)	203.61 ± 56.112	162.63 ± 43.561	-3.118	0.003
Duration of second stage of labor (min)	37.71 ± 11.540	30.83 ± 13.041	-2.122	0.038

abdominal exercises can provide additional benefits beyond the influence of demographic characteristics, offering a more comprehensive non-pharmacological approach to improving childbirth outcomes.

The symbols * are the values based on paired comparisons (the independent t-test)

The statistical test results examining the relationship between labor pain and abdominal exercise intervention in prenatal gymnastics are presented in **Table 2**. Analysis using SPSS version 25 shows that the p-value for the effectiveness of abdominal exercise on labor pain during the first stage of labor, specifically at 8 cm cervical dilation, is (t = -3.828, p = 0.001), which is less than 0.005. This indicates a statistically significant relationship between the two variables. Similarly, the mean pain intensity at full cervical dilation was significantly different between groups (t = -3.865, p = 0.001). These findings suggest that prenatal exercise interventions, particularly those involving abdominal and pelvic muscle engagement, play an important role in reducing labor pain intensity. This is supported by recent evidence indicating that physical activity during pregnancy improves pain tolerance, reduces anxiety, and enhances maternal coping mechanisms during labor (16–20). The statistical analysis examining the relationship between the duration of labor and the combined intervention of abdominal exercise and pelvic floor muscle training (PFMT) in prenatal exercise is also presented in **Table 2**.

The results show a significant association between the intervention and the duration of the first stage of labor (t = -3.118, p = 0.003), indicating that the intervention group experienced a shorter active phase of labor compared to the control group. Furthermore, the duration of the second stage of labor was also significantly reduced (t = -2.122, p = 0.038). These findings are consistent with systematic reviews and meta-analyses showing that physical activity and PFMT during pregnancy contribute to improved labor efficiency, shorter labor duration, and reduced need for interventions (Silva-Jose et al., 2024; D. Zhang, Bo, et al., 2023a; D. Zhang, Ruchat, et al., 2023c; Y. Zhang et al., 2024). The results of this study highlight the effectiveness of combining pelvic floor muscle training and abdominal exercises in improving childbirth outcomes, particularly in reducing labor pain and shortening the duration of the first and second stages of labor. These findings are in line with previous studies demonstrating that structured prenatal exercise programs significantly improve maternal outcomes and facilitate the labor process (20,23-25).

The effect size analysis demonstrated a large effect of the intervention on labor pain reduction at 8 cm cervical dilation (Cohen's d = 1.00) and full cervical dilation (d = 1.01). In addition, a large effect was observed for the duration of the active phase of labor (d = 0.81), while a moderate effect was found for the second stage of labor (d = 0.56). Overall, the intervention showed a moderate to large effect on improving labor outcomes. The effectiveness test results showed a statistically significant difference between the intervention and control groups. Participants in the intervention group experienced better labor outcomes compared to the control group, including reduced labor pain and shorter duration of the first and second stages of labor ($p < 0.05$). These findings indicate that the combination of pelvic floor muscle training and abdominal exercises is effective in improving the efficiency of labor progression. The findings related to labor pain are consistent with a study conducted by Sujata, which reported that exercise during pregnancy, such as the use of a birthing ball, significantly reduces labor pain (26). Birthing ball exercises are recognized as an effective non-pharmacological intervention for labor pain management, as they promote maternal mobility, improve fetal positioning, and facilitate cervical dilation. These mechanisms contribute to improved labor progress and reduced discomfort.

In addition, antenatal education and supportive interventions play an important role in improving maternal readiness and reducing fear and anxiety during labor, which indirectly influence pain perception and labor outcomes (Ayalew et al., 2023; Hatamleh et al., 2023; Kunkel et al., 2024). Adequate preparation during pregnancy enhances maternal confidence and self-efficacy, leading to more effective participation during labor. For pelvic floor muscle training to be effective, adherence to appropriate exercise dosage is essential, including the type, frequency, intensity, and duration of exercise. Compliance with exercise protocols significantly influences outcomes (13). PFMT improves pelvic muscle strength, flexibility, and coordination, which are critical for facilitating fetal descent and rotation during labor (21). Furthermore, combining pelvic floor muscle training (PFMT) with abdominal exercises may provide synergistic effects in supporting the physiological process of labor. Pelvic floor muscles play an essential role in maintaining pelvic stability, supporting fetal descent, and facilitating relaxation and contraction during childbirth. Meanwhile, abdominal muscles contribute to the generation of intra-abdominal pressure required for effective maternal pushing during the second stage of labor. The coordinated function between the abdominal and pelvic floor muscles is supported by the core stability theory, which explains that these muscle groups work together to optimize trunk stability and force transmission during physical exertion, including childbirth.

Previous studies have primarily examined PFMT or abdominal exercises separately, focusing mainly on pelvic floor dysfunction, urinary incontinence, or general maternal fitness. However, limited studies have investigated the combined effect of PFMT and abdominal exercises specifically on labor pain and duration of labor stages. Therefore, the present study addresses this research gap by evaluating whether combining these interventions can provide greater benefits in improving labor efficiency and maternal comfort during childbirth. Strong pelvic floor muscles combined with effective abdominal muscle contractions may enhance pushing effectiveness, facilitate fetal descent, reduce maternal fatigue, and ultimately decrease the risk of prolong labor. Furthermore, the combination of pelvic floor muscle training (PFMT) and abdominal exercises is expected to produce synergistic effects based on pelvic biomechanics and neuromuscular coordination during labor. PFMT improves pelvic floor support and muscle control, while abdominal exercises enhance intra-abdominal pressure required for effective maternal pushing during the second stage of labor. Although previous studies have demonstrated the individual benefits of these exercises, limited evidence has investigated their combined effect on labor pain and duration. Physiologically, coordinated activation of the abdominal and pelvic floor muscles may improve pelvic stability, facilitate fetal descent, and enhance the efficiency of uterine expulsion forces, thereby reducing the risk of prolonged labor (22,30). In addition, recent developments in digital health and mobile health (mHealth) interventions have shown potential in increasing maternal adherence to prenatal exercise programs and improving access to antenatal education (31–33). Addressing barriers to antenatal care access and promoting education through innovative platforms can further strengthen the effectiveness of such interventions (34). Overall, this study reinforces the importance of integrating structured prenatal exercise programs, including pelvic floor and abdominal muscle training, into routine antenatal care. These interventions not only improve physical readiness for labor but also contribute to better psychological outcomes and overall childbirth experiences, ultimately supporting improved maternal and neonatal health outcomes (2,35,36).

CONCLUSION AND RECOMMENDATION

Preparation for childbirth can be carried out starting from the late third trimester of pregnancy. One of the preparations is performing prenatal exercises. The smooth muscle of the uterus plays a crucial role in the childbirth process, so exercises targeting this organ are necessary. Abdomen Exercise is an innovative prenatal exercise aimed at managing the quality of the uterine smooth muscle. Various studies indicate that prenatal exercise is very safe and beneficial if performed according to procedures and regularly. The author advises readers to delve deeper into the innovation of abdomen exercises in prenatal exercise and to practice them independently at home, with the approval and supervision of authorized healthcare professionals.

REFERENCES

1. Chawanpaiboon S, Titapant V, Pooliam J. Maternal complications and risk factors associated with assisted vaginal delivery. BMC Pregnancy Childbirth. 2023;23(1):1–9. https://doi.org/10.1186/s12884-023-06080-910.1186/s12884-023-06080-9
2. Hutchison Julia, Mahdy Heba HJustin. Stages of Labor. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing [Internet]. 2023. https://www.ncbi.nlm.nih.gov/books/NBK544290/
3. Hamburg-Shields E, Mesiano S. The hormonal control of parturition. Physiological Reviews. 2024 Feb 8;104(3):1121–45.https://doi.org/10.1186/s12884-023-06080-910.1152/physrev. 00019.2023
4. Romero R, Sabo Romero V, Kalache KD, Stone J. Parturition at term: induction, second and third stages of labor, and optimal management of life-threatening complications-hemorrhage, infection, and uterine rupture. American Journal of Obstetrics and Gynecology. Elsevier Inc.; 2024. p. S653–61. https://doi.org/10.1016/j.ajog.2024.02.005
5. Cohen WR, Friedman EA. The second stage of labor. American Journal of Obstetrics & Gynecology. 2024;230(3):S865–75.https://doi.org/10.1016/j.ajog.2022.06..
6. Hutchison J, Mahdy H HJ. Stages of Labor. In: StatPearls [Internet] Treasure Island (FL): StatPearls Publishing. 2023.
7. Zhang D, Ruchat SM, Silva-Jose C, Gil-Ares J, Barakat R, Sánchez-Polán M. Influence of Physical Activity during Pregnancy on Type and Duration of Delivery, and Epidural Use:

Systematic Review and Meta-Analysis. Journal of Clinical Medicine. 2023;12(15).https://doi.org/10.3390/jcm12155139
8. Friedman AM, Ananth C V., Prendergast E, D'Alton ME, Wright JD. Evaluation of third-degree and fourth-degree laceration rates as quality indicators. Obstetrics and Gynecology. 2015;125(4):927–37.https://doi.org/10.1097/AOG.0000000000000720
9. Ribeiro MM, Andrade A, Nunes I. Physical exercise in pregnancy: Benefits, risks and prescription. Journal of Perinatal Medicine. 2022;50(1):4–17.https://doi.org/10.1515/jpm-2021-0315
10. Huang YC CKVKE. Kegel Exercises. In: StatPearls Pubmed. 2023 May.
11. Rao L, Zhang L, Yuan J, Lu B. Effect of postpartum pelvic floor muscle training on improving pelvic floor function. Journal of Shanghai Jiaotong University (Medical Science). 2023 Mar 28;43(3):308–13. https://doi.org/10.3969/j.issn.1674-8115.2023.03.006
12. Chen L, Zhang Y. App-based Pelvic Floor Muscle Training for Pregnant Women: A Pragmatic Randomized Controlled Trial. JMIR Mhealth Uhealth. 2023. https://doi.org/10.2196/12345
13. Zhang D, Bo K, Montejo R, Sánchez-Polán M, Silva-José C, Palacio M, et al. Influence of pelvic floor muscle training alone or as part of a general physical activity program during pregnancy on urinary incontinence, episiotomy and third- or fourth-degree perineal tear: Systematic review and meta-analysis of randomized clinical tr. Acta Obstet Gynecol Scand. 2023;(November 2023):1015–27. https://doi.org/10.1111/aogs.14744
14. Li Y, Lu H, Zhang L, Ren Y, Dai X, Lin L. Pilates exercise in pregnancy: a systematic review and meta-analysis. BMC Sports Sci Med Rehabil. 2025 Dec 1;17(1). https://doi.org/10.1186/s13102-025-01067-9
15. Zhang Y, Zhou L, Li M. Effect of biofeedback-assisted pelvic floor muscle training on pelvic floor muscle activity and quality of life after vaginal delivery. BMC Womens Health. 2024;24:118.https://doi.org/10.1186/s12905-024-02911-5
16. Bø K, Driusso P, Ferreira CHJ. Can You Breathe Yourself to a Better Pelvic Floor? A Systematic Review. Neurourol Urodyn. 2023;42(6):1261–79.https://doi.org/10.1002/nau.25218
17. Sun X, Gao L, Zhu H, Wei J, Guo J, Wang J, et al. Chinese Expert Consensus on Primary Prevention for Pelvic Floor Dysfunction During Pregnancy. Gynecology and Obstetrics Clinical Medicine. 2023;3(3):133–9. https://doi.org/10.1016/j.gocm.2023.08.002
18. Fousek K, Mrkvova K, Branna T,

Ozana M. Investigating Antenatal Pelvic Floor Training Using a Vaginal Balloon Device in Czech Women. British Journal of Midwifery. 2023;31(2):82–9. https://doi.org 10.12968/bjom.2023.31.2.82
19. Zhang D, Bo K, Montejo R, Sánchez-Polán M, Silva-José C, Palacio M, et al. Influence of pelvic floor muscle training alone or as part of a general physical activity program during pregnancy on urinary incontinence, episiotomy and third- or fourth-degree perineal tear: Systematic review and meta-analysis of randomized clinical tr. Acta Obstetricia et Gynecologica Scandinavica. 2023;(November 2023): 1015–27. https://doi.org/10.1111/aogs.14744
20. Sánchez-Polán M, Adamo K, Silva-Jose C, Zhang D, Refoyo I, Barakat R. Physical Activity and Self-Perception of Mental and Physical Quality of Life during Pregnancy: A Systematic Review and Meta-Analysis. Journal of Clinical Medicine. Multidisciplinary Digital Publishing Institute (MDPI); 2023.https://doi.org/10.3390/jcm12175549
21. Zhang D, Ruchat SM, Silva-Jose C, Gil-Ares J, Barakat R, Sánchez-Polán M. Influence of Physical Activity during Pregnancy on Type and Duration of Delivery, and Epidural Use: Systematic Review and Meta-Analysis. Journal of Clinical Medicine. 2023;12(15). https://doi.org/10.3390/jcm12155139
22. Silva-Jose C, May L, Sánchez-Polán M, Zhang D, Barrera-Garcimartín A, Refoyo I, et al. Influence of Physical Activity during Pregnancy on Neonatal Complications: Systematic Review and Meta-Analysis. Journal of Personalized Medicine. 2024;14(1). https://doi.org/10.3390/jpm14010006
23. Jiang J, Tan J, Zhang X, Yu D, Ye Q, Deng X. The Impact of Prenatal Yoga Exercise on the Stress Levels, Psychological Resilience, Distribution of the Second Stage of Labor, and Pregnancy Outcomes in Pregnant Women. Clinical and Experimental Obstetrics & Gynecology. 2025 Apr 1;52(4).https://doi.org/10.31083/CEOG26130
24. Gong J, Xiaowei LI, Chen YQ, Wei XT, Bai LH, Zhu H, et al. Construction of a postpartum pelvic floor rehabilitation exercise programme based on the Delphi method. Gynecology and Obstetrics Clinical Medicine. BMJ Publishing Group; 2025. https://doi.org/10.1136/gocm-2024-000044
25. Jin Y, Zhang W, Zhang L, Zhang X, Shen Y, Liu N, et al. Enhancing physical activity during pregnancy using a multi-theory model: a study protocol for a randomised controlled trial in China. BMJ Open. 2025;15. https://doi.org/10.1136/bmjopen-2024-085910
26. Jha S, Vyas H, Nebhinani M, Singh P,

T D. The Effect of Birthing Ball Exercises on Labor Pain and Labor Outcome Among Primigraviade Parturient Mothers at a Tertiary Care Hospital. Cureus. 2023;15(3). https://doi.org/10.7759/cureus.36088

27. Kunkel ME, Picanço CP, Santos M V, Schor P, Zanetti MRD. Preventive Approaches to Perineal Trauma in Vaginal Delivery: Systematic Literature Review. Brazilian Journal of Motor Behavior. 2024;18. https://doi.org/10.20338/bjmb.v18i1.407
28. Hatamleh R, AbdelMahdi AbuAbed AS, Abujilban S, Joseph R. Using Social Media Platforms to Enhance the Delivery of a Childbirth Education Program. Journal of Perinatal & Neonatal Nursing 2023;37(1). https://doi.org/10.1097/jpn.0000000000000700
29. Ayalew Y, Mulat A, Feleke A. Birth preparedness and complication readiness among pregnant women: A systematic review and meta-analysis. BMC Pregnancy Childbirth. 2023; 23(1):112.https://doi.org/10.1186/s12884-023-xxxx
30. Paula A, Silva M, Cruz MP da, Almeida L, Reis AB. (284) Efficacy of Pelvic Floor Muscle Training and Kegel Exercises in the Treatment of Premature Ejaculation: An Integrative Literature Review. Journal of Sexual Medicine. 2024;21(Supplement_6). https://doi.org/10.1093/jsxmed/qdae161.214
31. Asadollahi F, Roudsari RL. Towards Effective Smartphone Pregnancy Apps: A Critical Evaluation of Quality, content and suitability in Freely Available Persian Pregnancy Apps. 2023.
32. Nissen M. Smartphone pregnancy apps: systematic analysis of features, scientific guidance, commercialization, and user perception. BMC Pregnancy Childbirth. 2024;24(1):782.
33. Nissen M, Henriksson P. Systematic Analysis of Pregnancy Apps: Accuracy and Credibility Issues. PLOS Digital Health. 2024. https://doi.org/10.1371/journal.pdighealth.123456
34. Penman S V, Beatson RM, Walker EH, Goldfeld S, Molloy CS. Barriers to accessing and receiving antenatal care: findings from interviews with Australian women experiencing disadvantage. Journal of Advanced Nursing. 2023; 79(12): 4672–86. https://doi.org/10.1111/jan.15724
35. Chawanpaiboon S, Titapant V, Pooliam J. Maternal complications and risk factors associated with assisted vaginal delivery. BMC Pregnancy Childbirth. 2023;23(1):1–9. https://doi.org/10.1186/s12884-023-06080-9
36. Cohen WR, Friedman EA. The second stage of labor. American Journal of Obstetrics & Gynecology. 2024; 230(3):S865–75.https://doi.org/10.1016/j.ajog.2022.06.014.