SYSTEMATIC REVIEW

The effectiveness of pregnancy exercises for a smooth childbirth process

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ABSTRACT

Objective: Childbirth is the process of delivering the fetus, placenta, and membranes from the uterus through the birth canal. It requires both physical and psychological preparation to ensure a safe and smooth delivery. This study examined the effectiveness of pregnancy exercises in facilitating a smoother labor process.

Materials and Methods: This study employed a systematic review method, utilizing databases such as PubMed, ScienceDirect, ProQuest, Wiley Online Library, and EBSCO. Article selection followed the PICO framework, using keywords like "Prenatal Exercise" OR "pregnant* exercise" AND ("Length of labor" OR "stage* of childbirth") to identify relevant research.

Results: Out of 821 articles, 35 were identified as potentially relevant. Various study designs, including retrospective, observational, and experimental studies with control groups, indicated that prenatal exercise can not only facilitate a faster labor process but also accelerate postpartum involution and positively impact maternal and infant health. However, some cohort studies reported conflicting findings, showing no significant relationship between prenatal exercise and labor outcomes. These discrepancies may be attributed to factors such as maternal health status, prior childbirth experience, and the type and intensity of prenatal exercise performed.

Conclusion: The reviewed articles indicate that prenatal exercise significantly facilitates and optimizes the labor process. Therefore, it is essential to encourage pregnant women to engage in regular prenatal exercise starting in the third trimester, ensuring it is conducted safely and comfortably to maximize its benefits for both mother and baby.

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Highlights:

1. Pregnant women are prone to experiencing labor jams and tears during childbirth
2. Regular pregnancy exercises during the third trimester of pregnancy can help the delivery process run smoothly and reduce the occurrence of birth canal tears.

INTRODUCTION

Labor is the physiological process through which the fetus, placenta, and membranes are expelled from the uterus via the birth canal.[1] The mother's physical endurance and the progression of labor can be influenced by psychological factors. Approximately 97% of labor occurs naturally; however, maternal anxiety can lead to increased tension in smooth muscles and blood vessels, resulting in cervical rigidity and uterine hypoxia. Consequently, pain impulses travel to the cerebral cortex via the thalamo-limbic pathway, heightening fear and further inhibiting uterine contractions. This may prolong the second stage of labor and increase the likelihood of cesarean delivery.[2,3]

In Indonesia, there are approximately 5,082,537 pregnant women. Among those experiencing pregnancy and childbirth complications, 11% are attributed to prolonged labor. Pregnant women who engage in regular prenatal exercise, particularly during the last trimester, tend to experience reduced labor pain compared to those who do not participate in such activities. This reduction in pain is associated with increased levels of endorphins, which serve as natural analgesics.[4]

Prenatal exercise is widely recommended as part of antenatal care to prepare women for childbirth. While numerous studies have demonstrated its benefits in enhancing maternal fitness and alleviating pregnancy discomfort, its role in facilitating labor remains a subject of debate. This controversy stems from variations in research methodology, sample sizes, and differing definitions of labor ease.[4] Some studies suggest that excessive physical activity may lead to pregnancy-related complications, whereas others highlight that consistent prenatal exercise can mitigate such complications.[5,6] This study aims to evaluate the effectiveness of pregnancy exercises in promoting a smoother labor process.

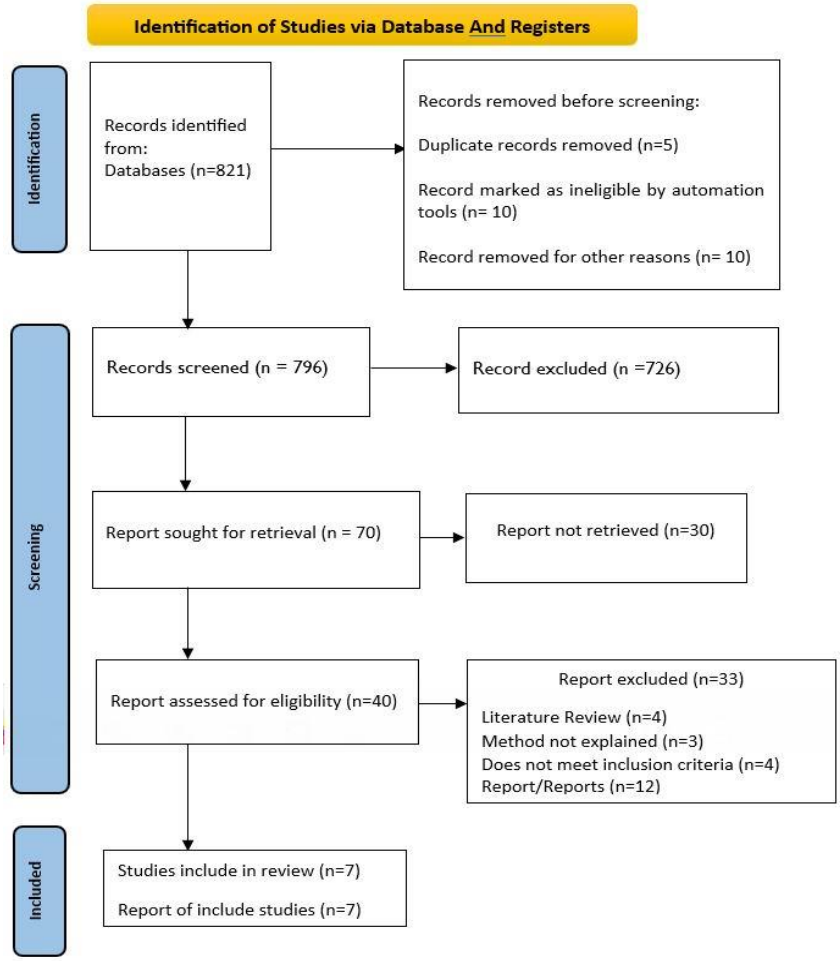

Figure 1. PRISMA flow chart

MATERIALS AND METHODS

This study was a systematic review by using databases for article search: PubMed, Science Direct, ProQuest, Wiley Online Library, EBSCO, Google Scholar. The keywords used in the article search are compiled based on the PICO framework, ((Prenatal Exercise) OR (pregnant* exercise)) AND (Length of labor)) OR (stage* of childbirth)).

The inclusion criteria for this study were as follows: articles published within the last five years, written in either English or Indonesian, original research articles, and studies specifically examining the impact of pregnancy exercises on the labor process. The exclusion criteria included literature reviews, books, reports, and articles unrelated to the research topic.

This scoping review identified a total of 821 articles from various databases: PubMed (107 articles), Wiley Online Library (141 articles), ScienceDirect (500 articles), ProQuest (38 articles), and EBSCO (35 articles). These articles were imported into Covidence software, where five duplicate articles were detected and subsequently removed. Following this, a systematic screening process was conducted by reviewing titles and abstracts to determine relevance based on the predefined inclusion and exclusion criteria. During this phase, 10 articles were identified as non-research studies, while 11 articles were inaccessible. After filtering the remaining 796 articles by title and abstract, 70 articles were selected for further evaluation based on completeness and relevance, while 726 articles were excluded for not meeting the criteria. Among the 70 selected articles, 40 had full-text availability. However, 33 of these were excluded as they did not directly address the research question. Ultimately, seven articles met all inclusion criteria and were included in this study.

A critical appraisal was conducted to systematically evaluate the quality and validity of the selected articles. The Joanna Briggs Institute (JBI) critical appraisal tool was used for this assessment, which was performed independently by two reviewers (Author One and Author Two). Each article was carefully examined to determine its suitability for inclusion as a reference for further research. The quality of the articles was graded using A, B, and C classifications, with final assessments presented in Table 1. This thorough evaluation ensured the inclusion of high-quality studies that directly contributed to the research objectives.

Table 1. Summary of journal literature search results

No	Titles	Countries	Aims	Data collection	Type of research	Participants/ Sample Size	Results	Grades
A1	The effectiveness of a Pilates exercise program during pregnancy on childbirth outcomes: a randomized controlled clinical trial.[7]	Iran	To find out the effectiveness of the pilates gymnastics program during pregnancy and during childbirth.	The instruments used to collect data were a two-part checklist, RPE, VAS and mackey birth satisfaction assessment scale.	Randomized Clinical Trial	This clinical study involved 110 primipara women in the intervention group (n = 55) and control (n = 55).	The results showed that doing pilates exercises during pregnancy significantly reduced the intensity of labor pain, the duration of the active phase, and the second phase of labor.	A
A2	Pregnancy exercise to smooth delivery process for maternal.[8]	Indonesia	To find out the relationship between pregnancy gymnastics and the delivery process in maternity at PMB Budi Ariani Siregar 2021	Data collection using questionnaires .	Cross sectional	The study involved 30 respondents, of which 15 of them did pregnancy exercises and 15 did not.	The results showed a significant relationship between Ahamil gymnastics and the delivery process of maternity at PBM Budi Ariani Siregar STR. Keb	A
A3	The effectiveness of pregnancy exercises on the smooth delivery of	Indonesia	To determine the effectiveness of pregnancy exercises on the smooth	Primary data using observation sheets.	Cross sectional	The respondents in this study were 35 people.	The results showed that there was a significant correlation between pregnancy exercises and smooth delivery	A

	phase II in inpartu mothers at the Bulupoddo Health Center, Sinjai Regency. [9]		delivery of phase II in inpartu mothers at the Bulupoddo Health Center, Sinjai Regency.				in the second trimester of inpartu mothers	
A4	Influence of a Water-Based Exercise Program in the Rate of Spontaneous Birth: A Randomized Clinical Trial.[10]	USA	To evaluate the prevalence of spontaneous birth among women participating in a water-based physical exercise program	Participant data was collected at health centers. Recruitment of participants began in the first half of April 2016, when the ultrasound examination was performed at the 12th week of pregnancy, and ended at six weeks	Randomized Clinical Trial	The respondents in this study were 129 people.	The results showed that women who participated in water-based exercise programs experienced weight loss during pregnancy.	B
A5	The Effectiveness of Pregnancy Gymnastics Exercises on the Childbirth Process at the Pancoran Mas Depok Health Center.[11]	Indonesia	To find out the effectiveness of pregnancy gymnastics exercises on the delivery process at the Pancoran Mas Depok Health Center	Data were collected using primary data.	Quasi experimental	The respondents in this study were 50 respondents	The results of the bivariate study showed a P value of 0.003; OR = 9.333 (p0.05) and has no chance of process quality	A
A6	The effect of the combination of prenatal yoga and pregnancy exercises on the level of anxiety and the duration of labor in the first trimester of pregnancy in pregnant women in the third trimester.[12]	Indonesia	To find out the effect of the combination of prenatal yoga and pregnancy exercises on the level of anxiety and the duration of labor in the first trimester of pregnant women	Data collection using primary data	Quasi experimental	The respondents in this study were 30 pregnant women in the third trimester	The results of the study showed that the combination of prenatal yoga and pregnancy exercises had an impact on the anxiety of pregnant women in the third trimester when facing childbirth.	A
A7	The Effect Of Pregnancy Exercise On Third Trimester Primigravida Anxiety In Dealing With Childbirth.[13]	Indonesia	This study analyzes the effect of pregnancy exercises on primigravida anxiety in the third trimester in facing childbirth.	This study uses the Hamilton Rating Scale Anxiety (HRS-A) Instrument which will be studied for respondents' anxiety.	Design of quasi-experiments with nonrandomized pretest-postest control groups	The respondents in this study were 34 respondents	The results of this study show that in the third trimester, pregnancy exercises have an impact on pregnant women's anxiety.	A

RESULTS AND DISCUSSION

As outlined in Table 1, a total of seven articles were analyzed, comprising two cross-sectional studies, two randomized controlled trials (RCTs), and three quasi-experimental studies. The findings from these studies identified several benefits of prenatal exercise in facilitating the labor process. These benefits include improved maternal and fetal health, enhanced physical preparedness for childbirth, better management of labor discomfort and associated health risks, reduced anxiety levels, improved maternal psychological well-being, strengthened pelvic muscle function, and support for the postpartum involution process.

Among the initial 821 articles reviewed, 35 were regarded potentially relevant. Various study designs, including retrospective, observational, and experimental studies with control groups, demonstrated that prenatal exercise not only facilitates a smoother labor process but also accelerates postpartum uterine involution. Additionally, prenatal exercise has been shown to have a positive impact on maternal and neonatal health following delivery. However, findings from cohort studies yielded conflicting results, indicating no significant association between prenatal exercise and labor outcomes. These discrepancies may be attributed to multiple influencing factors, such as maternal health status, prior childbirth experience, as well as the type and intensity of prenatal exercise performed.

To ensure a structured analysis, the selected articles were categorized based on their original characteristics, including research methodology, study design, and country-specific factors such as healthcare infrastructure and maternal care practices. This scoping review encompasses studies from the United States, representing developed countries with advanced healthcare systems, and from Indonesia and Iran, representing developing nations where maternal health programs and access to prenatal care may differ significantly. By including studies from diverse healthcare settings, this review provides a broader perspective on the impact of prenatal exercise across different socioeconomic and medical environments.

The findings from this review indicate that prenatal exercise is significantly effective in promoting a smoother labor process. Engaging in prenatal exercise has been associated with reduced labor pain, shorter labor duration, and increased maternal satisfaction with the childbirth experience. The seven selected articles provide various perspectives on the benefits of prenatal exercise, reinforcing its importance in maternal health. These findings align with research conducted by Rahayu & Fitria (2019), which highlights prenatal exercise as a method for maintaining or enhancing maternal physical stability. It is a form of exercise therapy recommended from 28 weeks of gestation until delivery, aiming to facilitate a safe, efficient, and less painful labor process. The recommended frequency for prenatal exercise is two to three times per week to maximize its benefits.[14]

Prenatal exercise plays a crucial role in promoting maternal health and reducing the risk of complications associated with postural changes during pregnancy. However, for optimal benefits, prenatal exercise should follow a structured and systematic approach. Properly regulated prenatal exercise is essential for maintaining smooth blood circulation, which is critical for both maternal and fetal well-being. Midwives and healthcare providers can incorporate prenatal exercise into routine prenatal care by educating pregnant women on its benefits and guiding them through safe and effective exercise routines. Regular prenatal exercise helps expectant mothers prepare physically for childbirth while also alleviating labor pain.[15-17]

The childbirth process requires both mental and physical preparedness from the mother to ensure a safe and smooth delivery. Engaging in regular pregnancy exercises is an effective strategy to enhance physical endurance, improve mental resilience, reduce stress levels, promote relaxation, and facilitate a smoother and more efficient labor experience.[18]

Prenatal exercise has been shown to provide significant health benefits for both the mother and fetus. When a baby begins to breathe independently at birth, oxygen transfer occurs through the placenta from the maternal bloodstream to the fetal circulation. Pregnancy exercises improve maternal oxygenation, thereby enhancing oxygen supply to the fetus via the placenta.[19] Additionally, prenatal exercise strengthens and maintains the elasticity of key muscle groups involved in labor, including the abdominal wall, ligaments, and pelvic floor muscles. One of the common complications during childbirth is perineal rupture or tearing. Pregnancy exercises, particularly those targeting the pelvic floor, may reduce the likelihood of such injuries. Beyond its physiological benefits, prenatal exercise helps alleviate common pregnancy discomforts and prepares women both physically and mentally for labor.[20]

Findings from this review also highlight that participation in prenatal exercise enhances self-confidence, positively influencing the overall childbirth experience. This is consistent with research by Nikmah et al. (2021),[20] which emphasizes that prenatal exercise strengthens core muscles, improves physical endurance, and fosters a sense of comfort and confidence. By

reducing pregnancy-related complaints and anxiety, prenatal exercise contributes to a more positive and manageable labor experience.[21]

The World Health Organization (WHO) recommends that adults aged 18 to 64 engage in at least 150 minutes of moderate-intensity physical activity or 75 minutes of high-intensity physical activity per week. A sedentary lifestyle is a significant risk factor for major global causes of mortality, including cardiovascular disease, stroke, and diabetes mellitus. Reduced physical activity contributes to these conditions, underscoring the importance of maintaining an active lifestyle.[22-25]

Prenatal exercise offers numerous benefits for pregnant women, including alleviating common pregnancy-related discomforts such as aches, pains, and muscle tension. It also improves cardiovascular and respiratory function, enhances muscle tone, and promotes better sleep. Engaging in relaxation exercises during pregnancy aids in deep breathing techniques, helping expectant mothers maintain overall health and prepare for a smoother childbirth experience. Pregnant women who incorporate regular physical activity into their routine, along with increased awareness and mental preparedness, tend to experience greater comfort, calmness, and a positive outlook during pregnancy.[26] Although 85% of deliveries occur without complications, approximately 15% require medical intervention. Proper antenatal care, including prenatal exercise, can significantly reduce the risk of labor complications. In contrast, physical inactivity during pregnancy may lead to increased fatigue, heightened pain perception, and prolonged labor, particularly in the second stage, which elevates the risk of fetal distress.[27] Therefore, adequate physical preparation for childbirth is essential to optimize maternal and fetal outcomes.[28]

Anxiety disorders are common during pregnancy, with affected women frequently experiencing excessive worry, whether minor or significant. This persistent anxiety can manifest as restlessness, fatigue, difficulty concentrating, irritability, muscle tension, tremors, heightened startle responses, sleep disturbances, excessive sweating, nausea, diarrhea, shortness of breath, or tachycardia. To break the cycle of prenatal anxiety, relaxation techniques such as yoga and pregnancy exercises have been identified as effective interventions. Pregnancy gymnastics, in particular, exerts a calming effect, reducing stress and promoting emotional well-being.[29]

A study conducted by Aktas et al. (2021)[30] demonstrated that pregnancy exercises not only alleviate pain in the final stages of pregnancy but also improve uterine blood flow through pelvic muscle relaxation. The use of birth ball exercises enhances maternal comfort by facilitating proper pelvic positioning and reducing pain perception. Additionally, these exercises promote flexibility and strengthen the core muscles, further aiding in labor preparation. By focusing on movement and posture, pregnant women can divert attention from discomfort, enhance body awareness, and improve their overall labor experience, leading to a more positive childbirth outcome.

For low-risk pregnancies, pregnancy exercises are recommended due to their positive impact on cervical readiness and Bishop's score, increasing the likelihood of spontaneous labor while decreasing the need for labor induction or cesarean section. These exercises allow pregnant women to regulate their body movements and breathing, effectively managing anxiety and tension.[31] When performed consistently and correctly, prenatal exercise strengthens uterine contractions, enhances pelvic floor and abdominal muscle endurance, and facilitates a shorter, more natural labor process. Thus, pregnancy exercises play a crucial role in promoting maternal well-being and optimizing birth outcomes.[8]

Prenatal exercises play a crucial role in strengthening and preserving the elasticity of the abdominal wall muscles, ligaments, and pelvic floor, all of which are essential for the labor process. Engaging in these exercises regularly, at least once a week for a minimum of 30 minutes, yields optimal benefits and contributes to a more positive childbirth experience for expectant mothers. Fundamentally, prenatal exercises are designed to enhance muscle strength and maintain flexibility, particularly in the abdominal wall, pelvic muscles, and pelvic floor. Pregnant women who do not engage in such exercises are more susceptible to both emotional and physical stress, which can result in muscle stiffness and joint discomfort.[9]

During the second stage of labor, prenatal exercises aid in relaxation, breathing control, and contraction regulation, while also strengthening the abdominal wall and pelvic floor muscles to facilitate a smoother delivery. Additionally, during the third and fourth stages of labor, these exercises help in reducing excessive postpartum bleeding and contribute to a normal labor duration. A structured regimen of pregnancy exercises is essential in preparing expectant mothers physically by maintaining the condition of muscles and joints critical to the childbirth process, while also fostering mental readiness and boosting maternal confidence. Studies have identified a correlation between regular prenatal exercise and timely, uncomplicated deliveries.[32]

Prenatal exercise provides numerous benefits, including alleviating labor-related pain and reinforcing the

strength of the abdominal and pelvic floor muscles, both of which are essential during childbirth. For a more comprehensive approach, prenatal exercises are often combined with prenatal yoga. Prenatal yoga integrates elements of traditional yoga into a specialized regimen tailored for pregnancy. It represents a holistic approach encompassing physical, mental, and spiritual well-being through muscle stretching, breathing techniques, and meditative practices aimed at enhancing maternal health and emotional balance.[33]

The findings of this study strongly support the integration of pregnancy exercises into antenatal care programs to promote a smoother and more positive birthing experience. Based on the review of seven selected studies, it is evident that prenatal exercise is a highly beneficial intervention that should be widely encouraged among pregnant women. Special emphasis should be placed on its promotion in remote areas, where access to structured antenatal programs may be limited, ensuring that expectant mothers in all regions receive the necessary preparation for childbirth.

Strength and limitations

This study provides a comprehensive review of prenatal exercise, incorporating diverse research methodologies and evidence from both developed and developing countries. An important strength is its focus on various prenatal exercises, including pregnancy gymnastics, birth ball exercises, and prenatal yoga, highlighting their physical and psychological benefits for maternal well-being and labor outcomes.

However, limitations exist. Variability in study designs and sample sizes introduces inconsistencies, and some findings rely on self-reported data, which may be biased. Additionally, conflicting results from cohort studies suggest that maternal health, previous childbirth experience, and exercise intensity influence labor outcomes. The study primarily focuses on low-risk pregnancies, limiting its applicability to high-risk cases. Lastly, differences in exercise frequency and adherence make it challenging to define a standardized prenatal exercise regimen. Future research should focus on large-scale trials to establish more definitive guidelines for prenatal exercise benefits.

CONCLUSION

Pregnancy gymnastics has been shown to not only facilitate the labor process but also accelerate postpartum involution, contributing to improved maternal and neonatal health. Considering these advantages, it is essential to encourage pregnant women to engage in regular pregnancy gymnastics, particularly from the third trimester onward. Emphasis should be placed on ensuring that exercises are performed safely, comfortably, and under appropriate guidance to maximize their effectiveness.

DISCLOSURE

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Conflict of interest

There is no conflict of interest in this systematic review.

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Author contributions

All authors have contributed to all of this systematic review process, including the preparation, data collection and data analysis, as well as the preparation and approval of this publication.

REFERENCES

1. Ulya Y, Devitasari ANI. Efektifitas senam hamil terhadap lama persalinan kala II [Effectiveness of pregnancy exercise in the length of the second stage of labor]. J Fundus. 2023;3(2):37–45. doi: 10.57267/fundus.v3i2.258.
2. Forest G, Sabourin C, Pétrin R, et al. Dream content and depressive symptoms during pregnancy and postpartum. J Affect Disord Reports. 2023;11:100480. doi: 10.1016/j.jadr.2023.100480.
3. Novitasari R, Nufus H. Hubungan senam hamil ibu hamil trimester III dengan lama proses persalinan [The relationship between pregnancy exercise in third-trimester pregnant women and the duration of labor]. J Kebidanan. 2023;13(2):160–5. doi: 10.35874/jib.v13i2.1287.
4. Lubis M. Gambaran tingkat pengetahuan senam hamil tentang manfaat senam hamil di wilayah kerja Puskesmas Simarpinggan Kecamatan Angkola tahun 2021 [Overview of knowledge levels regarding the benefits of pregnancy exercise

in the working area of Simarpinggan Community Health Center, Angkola District, in 2021] [repository]. Surabaya: Universitas Airlangga, 2022.
5. Pohan RA, Siregar MS. Pelaksanaan senam hamil sebagai upaya persiapan menghadapi persalinan di Puskesmas Semula Jadi Kota Tanjungbalai [Implementation of pregnancy exercise as a preparation for childbirth at Semula Jadi Community Health Center, Tanjungbalai City]. J Pengabdi Masy Aufa. 2022;4(1):15. doi: 10.51933/jpma.v4i1.725.
6. Zaleha S, Idris H. Implementation of stunting program in indonesia: a narrative review. Indones J Heal Adm. 2022;10(1):143–51. doi: 10.20473/jaki.v10i1.2022.143-151.
7. Ghandali NY, Iravani M, Habibi A, et al. The effectiveness of a Pilates exercise program during pregnancy on childbirth outcomes: a randomised controlled clinical trial. BMC Pregnancy Childbirth. 2021;21(1):480. doi: 10.1186/s12884-021-03922-2. PMID: 34215198; PMCID: PMC8253242.
8. Fitiriani N, Suswati, Nasution EM, et al. Senam hamil untuk kelancaran proses persalinan pada ibu bersalin [Pregnancy exercise for smooth delivery process for mothers]. Jambura Heal Sport J. 2023;5(2):122–30. doi: 10.37311/jhsj.v5i2.20052.
9. Azis M, Alza N, Triananinsi N, et al. Efektivitas senam hamil terhadap kelancaran persalinan kala II pada ibu inpartu di Puskesmas Bulupoddo Kabupaten Sinjai [Effectiveness of pregnancy exercise on the smooth progression of second-stage labor in intrapartum mothers at Bulupoddo Community Health Center, Sinjai Regency]. Med Alkhairaat. J Penelit Kedokt dan Kesehat. 2020;2(2):70–4. doi: 10.31970/ma. v2i2.54.
10. Rodríguez-Blanque R, Aguilar-Cordero MJ, Marín-Jiménez AE, et al. Influence of a water-based exercise program in the rate of spontaneous birth: A randomized clinical trial. Int J Environ Res Public Health. 2020;17(3):795. doi: 10.3390/ijerph17030795. PMID: 32012841; PMCID: PMC7037928.
11. Daifa D, Sari MHN, Rasumawati, et al. Efektivitas latihan senam hamil terhadap proses persalinan di Puskesmas Pancoran Mas, Depok [Effectiveness of pregnancy exercise on the labor process at Pancoran Mas Community Health Center, Depok]. J Ilm Bidan. 2019;IV(3):1–8. doi: 10.61720/jib.v4i3.138.
12. Lestari, Putri RA, Listiyaningsih MD. Pengaruh kombinasi prenatal yoga dan senam hamil terhadap tingkat kecemasan dan lama persalinan kala I pada ibu hamil trimester III [The effect of combining prenatal yoga and pregnancy exercise on anxiety levels and duration of the first stage of labor in third-trimester pregnant women]. Indones J Midwifery. 2019;2(2):72–8. doi: 10.35473/ijm.v2i2.271.
13. Astuti IP, Sugita S, Mulati TS. Effect of pregnancy exercise on third trimester primigravida anxiety in dealing with childbirth. J Kebidanan dan Kesehat Tradis. 2021;06(1):76–83. doi: 10.37341/jkkt.v0i0.227.
14. Rahayu R, Fitriyya M. J Rahayu R, Fitriyya M. Efektivitas senam hamil terhadap ruptur perineum pada ibu bersalin primigravida [The effectiveness of pregnancy exercise on perineal rupture in primigravida mothers during labor]. Jurnal Keperawatan Sisthana. 2019;4(1). doi: 10.55606/sisthana.v4i1.229
15. Pane HW, Gunarmi, Yulivantina EV. Pelaksanaan senam hamil sebagai upaya mempersiapkan persalinan di Klinik Nining Ka. Asahan [The implementation of pregnancy exercise as a preparation for childbirth at Nining Ka Clinic, Asahan]. Jurnal Pengabdian kepada Masyarakat Nusantara. 2022;3(2):1008-11. Available from https://ejournal.sisfokomtek.org/index.php/jpkm/article/view/540.
16. Beyene MM, Shimbre MS, Ukke GG, et al. Factors associated with antenatal exercise in Arba Minch town, Southern Ethiopia: A community-based cross-sectional study. PLoS One. 2022;17(2): e0260840. doi: 10.1371/journal.pone.0260840. PMID: 35192634; PMCID: PMC8863279.
17. Fahriani M, Astini RY, Oktarina M. Hubungan senam hamil dengan proses persalinan kala I dan II pada primigravida di PMB wilayah kerja Puskesmas Sidorejo [The relationship between pregnancy exercise and the first and second stages of labor in primigravida at PMB, Sidorejo Health Center working area]. An-Nadaa J Kesehat Masy. 2020;6(2). doi: 10.31602/ann.v6i2.2679.
18. Sari RDP, Sutarto S, Utama WT, et al. Rutinitas senam hamil dengan melahirkan spontan [The routine of pregnancy exercise and spontaneous delivery]. J Ilmu Medis Indones. 2023;2(2):85–93. doi: 10.35912/jimi.v2i2.1376.
19. Nurlaelah S. Hubungan senam hamil dengan kelancaran proses persalinan pada ibu bersalin di Klinik Masitah Muara Jawa. Politeknik Kesehatan Kalimantan Timur [The relationship between pregnancy exercise and the smooth delivery process in mothers giving birth at Masitah Clinic, Muara Jawa, East Kalimantan Health Polytechnic] [Repository]. Samarinda: Politeknik Kesehatan, Kementerian Kesehatan Kalimantan Timur Indonesia, 2020.
20. Nikmah K, Ningsih ES, Yushofa V. peningkatan pengetahuan ibu hamil terhadap senam hamil sebagai upaya mengurangi kejadian ruptur perineum [Increasing pregnant women's knowledge of pregnancy exercise as an effort to reduce the

incidence of perineal rupture]. J Community Engagem Heal. 2021;4(2):295–7. doi: 10.30994/jceh.v4i2.234.
21. Ravaldi C, Carelli E, Frontini A, et al. The BLOSSoM study: Burnout after perinatal LOSS in Midwifery. Results of a nation-wide investigation in Italy. Women Birth. 2022;35(1):48-58. doi: 10.1016/j.wombi.2021.01.003. Epub 2021 Jan 26. PMID: 33509735.
22. Chan CWH, Au Yeung E, Law BMH. Effectiveness of physical activity interventions on pregnancy-related outcomes among pregnant women: a systematic review. Int J Environ Res Public Health. 2019;16(10):1840. doi: 10.3390/ ijerph16101840. PMID: 31126153; PMCID: PMC6571580.
23. Sinaga L. SR. MS. Pelaksanaan senam hamil sebagai upaya mempersiapkan fisik dan psikologis dalam menghadapi persalinan di BPM Mariana Kecamatan Sunggal Kabupaten Deli Serdang Tahun 2019 [Implementation of Pregnancy Exercise as an Effort to Physically and Psychologically Prepare for Childbirth at BPM Mariana, Sunggal District, Deli Serdang Regency, 2019]. J Healthc Technol Med. 2020;6(1):95–100. Available from: https://jurnal.uui.ac.id/index.php/JHTM/article/view/670
24. Rygh P, Asklund I, Samuelsson E. Real-world effectiveness of app-based treatment for urinary incontinence: a cohort study. BMJ Open. 2021;11(1):e040819. doi: 10.1136/bmjopen-2020-040819. PMID: 33397664; PMCID: PMC7783523.
25. Nurlitawati ED, Aulya Y, Widowati R. Efektivitas senam hamil terhadap penurunan nyeri punggung pada kehamilan Trimester III di RSUD Ciawi [Effectiveness of pregnancy exercise in reducing back pain in third trimester pregnancy at Ciawi Regional Hospital]. J Akad Baiturrahim Jambi. 2022;11(2):237. doi: 10.36565/jab.v11i2.525.
26. Hunter AR, Heiderscheit A, Galbally M, et al. The effects of music-based interventions for pain and anxiety management during vaginal labour and caesarean delivery: a systematic review and narrative synthesis of randomised controlled trials. Int J Environ Res Public Health. 2023;20(23):7120. doi: 10.3390/ijerph20237120. PMID: 38063550; PMCID: PMC10706633.
27. Rsia DI, Maris S. Hubungan senam hamil dengan lama persalinan kala II di RSIA Stela Maris Medan [The relationship between pregnancy exercise and the duration of second stage labor at RSIA Stela Maris Medan]. J Darma Agung Husada. 2021; 8 (2021):1–9. Available from: https://jurnal.darmaagung.ac.id/index.php/darmaagunghusada/article/view/943
28. Sobhgol SS, Smith CA, Dahlen HG. The effect of antenatal pelvic floor muscle exercises on labour and birth outcomes: a systematic review and meta-analysis. Int Urogynecol J. 2020;31(11):2189-203. doi: 10.1007/s00192-020-04298-1. Epub 2020 Jun 6. PMID: 32506232.
29. Istiqomah A. Pengaruh senam prenatal yoga terhadap trimester III dalam menghadapi persalinan [The effect of prenatal yoga exercise on third-trimester pregnant women in preparing for labor]. [Repository]. Bengkulu; Politeknik Kesehatan Kemenkes Bengkulu, 2020.
30. Aktaş D, Kolsuz S, Ertuğrul M, et al. Effect of Birth Ball Exercising for the Management of Childbirth Pain in Turkish Women. Bezmialem Science. 2021 ;9(1):46-52. doi:10.14235/bas.galenos.2020.3898.
31. Okafor UB, Goon DT. Physical activity and exercise during pregnancy in Africa: a review of the literature. BMC Pregnancy Childbirth. 2020; 20(1):732. doi: 10.1186/s12884-020-03439-0. PMID: 33238920; PMCID: PMC7691114.
32. Kurniati N, Hadisaputro S, Sri R, et al. The effect of Maryam prenatal exercise on labor duration: a systematic review Int J Nurs Heal Serv. 2020;3(1): 169–83. doi: 10.35654/ijnhs.v3i1.265.
33. Susanti NY, Madhav N. Exercise for pregnancy and pregnant women back pain. Str J Ilm Kesehat. 2022;11(1):15–9. doi: 10.30994/sjik.v11i1.886.