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THE EFFECT OF PHYSICAL ACTIVITY INTERVENTION ON THE WELL-BEING OF PREGNANT WOMEN: LITERATURE REVIEW

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ABSTRACT

Physical activity during pregnancy needs to be considered because it will have a positive impact in reducing medical interventions during childbirth, such as: amniocentesis, labor induction, and the risk of cesarean section. Low physical activity in pregnant women causes adverse effects, such as: excess weight during pregnancy, diabetes, and hypertension. This study aimed to identify physical exercise that is effective in improving the welfare of pregnant women. Literature review research design. Literature search assisted by Pubmed, Science Direct, and Ebsco databases using the keywords "Pregnant women" OR "Pregnancy" OR "Pregnant" AND "Exercise" OR "Exercises" OR "Physical Activity" AND "Well-being" OR "Life satisfaction" OR "Life quality" by considering the inclusion criteria including: fultex on physical exercise interventions in pregnant women published from 2014-2024, in English, primary research with Randomized Controlled Trial, Clinical Trial, quasi-experiment designs.This study found 10 articles that met the requirements for analysis, which were then analyzed using JBI. The results of the study found six themes of the influence of physical activity during pregnancy on the welfare of pregnant women, namely: improving sleep quality and maternal-fetal attachment, reducing pain during pregnancy, affecting labor, improving fetal well-being and intrauterine safety, optimal weight gain, and preventing postpartum depression. Based on the results of the study, it was concluded that there are various types of physical exercise in improving maternal well-being during pregnancy, so it is recommended that pregnant women do physical activity during their pregnancy to improve the well-being of the mother and her fetus.

Keywords: maternal welfare; physical activity; pregnancy

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INTRODUCTION

Pregnancy is a process of fetal development in the womb (Fatimah & Nuryaningsih, 2017), as a sign of a woman's perfection (Werdiningsih, 2013). During pregnancy, the health of the mother and fetus she is carrying needs to be considered, one of which is the physical activity of pregnant women, so that the health status of the mother and baby she is carrying is good. According to Attallah (2022), the health conditions of the mother and fetus during pregnancy need to be considered, one of which is through physical activity (Attallah et al., 2022). Physical activity is a body movement that expends energy to maintain a person's physical and mental health, as well as maintain a healthy and fit quality of life (Indarwati et al., 2019). Physical activity during pregnancy also affects the length of labor. Often, with the increasing weight of the pregnancy, it will be difficult for pregnant women to move and be active, which makes them reluctant to do daily activities, so that more pregnant women will relax and rest. This will cause problems during labor. Pregnant women who are reluctant to be active will have difficulty during labor (Rahmawati, 2018).

Low physical activity in pregnant women can cause excess weight during pregnancy, diabetes mellitus, and hypertension (Rinaldi et al., 2022). Unfortunately, many pregnant women are not aware of the negative impacts of not doing physical activity during their pregnancy. During pregnancy, most mothers avoid exercise or physical activity because they think that physical activity can interfere with pregnancy, such as feeling tired, having problems defecating/urinating, or having trouble sleeping (Hartinah et al., 2019). It is important for pregnant women to be given information and given training about physical activity during their pregnancy. According to Sattler, physical activity has a significant impact on improving and maintaining the physical and mental health of pregnant women (Sattler et al., 2018). Lack of physical activity greatly affects the well-being and health of the mother and fetus. Physical activity during pregnancy has a good effect on cervical ripening before delivery, and can help reduce medical interventions during delivery, such as: amniotomy, labor induction, and the risk of cesarean section (Szumilewicz et al., 2013). Physical activity for pregnant women such as exercise can be done for approximately 30-60 minutes to reduce fatigue in pregnant women (Aulia, 2014).

Knowledge about physical exercise for pregnant women is needed to improve the welfare of pregnant women. Previous studies have examined various types of physical exercises that can be done by pregnant women to improve their welfare during pregnancy, but there has been no literature study that summarizes the physical exercise intervention comprehensively. Based on this background, it is important to explore further the most effective physical exercise to improve the welfare or health of mothers during pregnancy. This study aims to identify effective physical exercises to improve the welfare of pregnant women.

METHOD

Literature review research design. The article eligibility process uses the PCC (Population, Concept, Context) approach, as showed in table 1.

Table 1.
PICO Formulation

Population (P)	Pregnant woman
Intervention (I)	Exercise
Comparison (C)	-
Outcome (O)	Wellbeing

Article search using Arksey and O'Malley framework guidelines to identify eligible research studies with the help of Pubmed, Science Direct, and Ebscohost databases using keywords from Mesh, namely "Pregnant women" OR "Pregnancy" OR "Pregnant" AND "Exercise" OR "Exercises" OR "Physical Activity" AND "Well-being" OR "Life satisfaction" OR "Life quality". The inclusion criteria for the study include: fulltext on physical exercise interventions in pregnant women published from 2014-2024, in English, primary research with Randomized Controlled Trial, Clinical Trial, quasi-experimental designs. While the exclusion criteria are studies in the form of reviews, theses, dissertations, and qualitative research designs. The initial results obtained were 3,363,298 articles. Then 2,581,858 were removed based on the inclusion and exclusion criteria. Then screened based on duplication and based on the title and abstract so that 10 eligible full-text articles were obtained that met the requirements for analysis (figure 1). All identified studies were then screened, extracted, and analyzed independently by two reviewers.

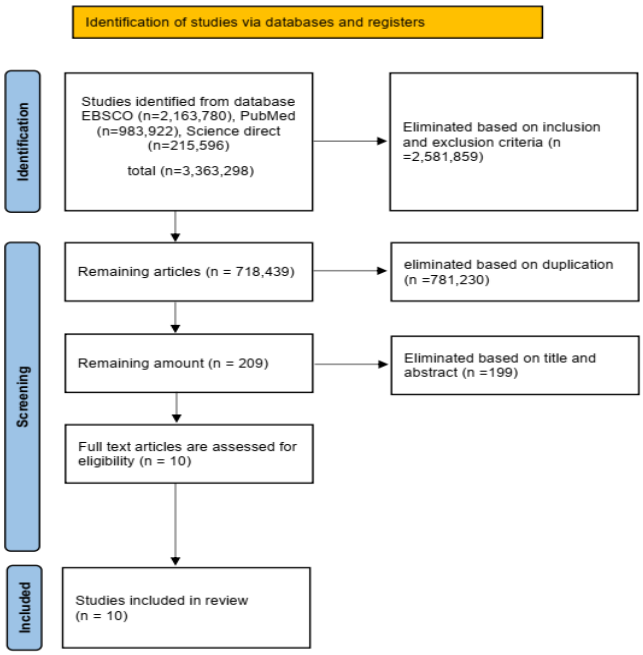

Figure 1. Prisma Flow

RESULT

This research was mostly conducted in Denmark (Alomairah et al., 2023; Broberg et al., 2020) and Iran (Ghandali et al., 2021; Ghodsi & Asltoghiri, 2014) with two studies each. All studies used a Randomized Controlled Trial (RCT) design. The duration of physical exercise intervention ranged from 15 minutes (Ghodsi & Asltoghiri, 2014) to 70 minutes (Broberg et al., 2020). The results of the study found six themes of the influence of physical activity during pregnancy on the well-being of pregnant women, namely: improving sleep quality and maternal-fetal attachment, reducing pain during pregnancy, affecting labor, improving fetal well-being and intrauterine safety, optimal weight gain, and preventing postpartum depression.

Table 2.
Article Analysis Results

No	Author/ Year	Research objectives	Sampel	Design	Instrument	Results
1.	Shen, W. C., & Chen, C. H. (2021)	To evaluate the effect of aerobic exercise intervention on sleep quality and maternal-fetal attachment.	140 pregnant women in a prenatal clinic in Southern Taiwan Control group = 70 experimental group = 70	RCT	- *The Pittsburgh Sleep Quality Index* (PSQI) - *Modified Maternal-Fetal Attachment Scale* (MMFAS)	Participants in the experimental group developed higher maternal-fetal attachment and better sleep quality compared to the control group. Aerobic exercise has also been shown to help improve physical relaxation by reducing pregnancy-related pain, sciatica, and neck stiffness.
2.	Carvalho et al. (2020)	To compare the effects of lumbar stabilization and stretching exercises in the treatment of gestational low back pain.	30 pregnant women with lower back pain LSE group =15 SE group =15	RCT	- *Skor Visual Analog Pain Scale* - (VAS), *McGill Pain Questionnaire* (MPQ), *Roland-Morris*	The results showed that LSE and SE were efficient in reducing the pain status from a clinical perspective in pregnant women with LBP, but did not affect the level of disability after 6 weeks of intervention. In addition, both exercise modalities were positive for improving postural balance (based on COP velocity sway measurements) and

No	Author/ Year	Research objectives	Sampel	Design	Instrument	Results
					Disability Questionnaire (RMDQ)	increasing muscle activity of one of the important abdominal muscles after intervention (EAO muscle).
3.	Ghandali et al.(2021)	To determine the effectiveness of the Pilates exercise program during pregnancy on labor.	110 primiparous women were randomly divided into two groups intervention (n=55) and control (n= 55)	RCT	*Borg Rating of Perceived Exertion* (RPE), *Visual Analog Scale* (VAS) dan *Mackey Childbirth Satisfaction Rating Scale*	The results showed that Pilates exercise during pregnancy significantly reduced the intensity of labor pain, the duration of active and second stage labor and increased maternal satisfaction with the labor process ($p<0.05$). Based on Kaplan Meyer analysis, the average duration of labor was shorter in the Pilates exercise group than in the control group ($P = 0.004$).
4.	Alomaira h et al. (2023)	To identify the effects of supervised structured exercise (EXE) and motivational counseling on physical activity (MOT) compared with standard prenatal care (CON) on sleep quantity and quality and sedentary time during pregnancy.	219 pregnant women at Copenhagen University Hospital, Denmark	RCT	- *Pittsburgh Sleep Quality Index* (PSQI) *questionna ire* - *The Pregnancy Physical Activity Questionn aire* (PPAQ) - *Garmin Vivosport activity tracker*	Physical activity interventions can improve sleep quality and reduce sedentary time in pregnant women. Specifically, a structured exercise training intervention was more effective in improving sleep quality than standard prenatal care, while both exercise training and motivational counseling resulted in lower sedentary time.
5.	Beata Makaruk et al (2021)	To determine the impact of a regular comprehensive physical exercise program during pregnancy on fetal well-being and intrauterine safety.	80 women with uncomplicate d pregnancies 66 healthy pregnant women (aged 24-35 years), with no contraindicati ons to exercise and no clinical signs of IUGR or genetic defects, assessed at 11-14 weeks of gestation	RCT	- *VOLUSON 730 EXPERT color Doppler ultrasound system*	The specially designed '9 months Aware' regular exercise program (taking into account certain types, intensity and duration parameters) does not pose a risk to fetal well-being and is safe for the fetus. In addition, the program illustrates a positive impact on maternal HR in the exercise group, indicating the potential for improving maternal physical fitness and cardiac efficiency, which can significantly affect normal delivery.
6.	Ghodsi & Asltoghir i (2014)	To determine the impact of home ergometry training during pregnancy on	80 nulliparous or primiparous pregnant	RCT	Prosedur dari *American College of Sports Medicine*	There were no statistically significant differences between the two groups in terms of gestational weight gain, duration of pregnancy, mode of

No	Author/ Year	Research objectives	Sampel	Design	Instrument	Results
		mothers and newborns.	women with gestational age of 20-26 weeks			delivery, first and second stages of labor, perineal tears, and Apgar scores at 1 and 5 minutes. The mean neonatal weight was significantly lower in the intervention group than in the control group (p<0.001)
7.	Raquel Rodrígue z-Blanque et al (2020)	To analyze the quality of life of pregnancy in women who completed a moderate physical activity program in water, a method was designed to enable women to safely perform physical exercise during pregnancy called the SWEP method (study on water exercise during pregnancy).	Sample: 122 pregnant women	RCT	- *Health-related quality of life* (HRQoL) - *SF36v2 health questionna ire*	HRQoL scores decreased significantly between weeks 12 and 35 of gestation, except for the mental health component, which decreased by ÿ3.28 points in CG and slightly increased in EG (p > 0.05). Among CG, the score for the mental health component at week 35 was ÿ42, indicating a positive risk of depression screening (39.20 ± 4.16).
8.	Coll et al (2019)	To assess the efficacy of regular exercise during pregnancy in preventing postpartum depression.	639 pregnant women	RCT	*Physical Activity for Mothers Enrolled in Longitudinal Analysis (PAMELA) Study*	Respondents who do not participate in regular sports activities tend to experience postpartum depression.
9.	Lotte Broberg et al. (2020)	To assess the effects of supervised group exercise on psychological well-being and depressive symptoms in pregnant women with or at high risk of depression.	Population: 300 pregnant women 282 participants divided into two groups, namely 143 intervention groups and 139 control groups	RCT	*Edinburgh Postnatal Depression Scale* (EPDS)	Plan-to-treat analysis showed no significant effect of psychological well-being on the primary outcome. The mean WHO-5 score in the intervention group was 2.0 (95% CI −1.3 to 5.2, P = .2) higher than in the control group. Per-protocol analysis of women who attended ≥75% of exercise sessions showed a significantly higher mean WHO-5 score than the control group at gestational weeks 29–34. Eight weeks postpartum the intervention group reported higher psychological well-being than the control group, a mean difference in WHO-5 score of 5.5 (95% CI 1.0–10.1, P = .04).
10.	Masayo Matsuzak i et al (2017)	To verify the effects of yoga practice and nutritional guidance program during pregnancy as a key to pregnancy and birth well-being among Japanese women.	400 pregnant women age of 18-23 weeks	RCT	*Health-related quality of life* (HRQoL)	The primary outcome was the number of pregnant women with adequate gestational weight gain. Secondary outcomes included physiological and psychological status assessed by biomarkers and health-related scales, dietary nutrient intake, and birth outcomes.

DISCUSSION

Pregnancy is a transition period between life before having a child in the womb and life after the child is born (Ratnawati, 2021), is the meeting of the egg and sperm inside or outside the uterus and ends with the release of the baby and placenta (Yulaikhah, 2019). Pregnant women

need the ability to adapt to the changes that occur during their pregnancy (Fatimah & Nuryaningsih, 2017), so that it is hoped that the mother will remain healthy and prosperous during her pregnancy. For this reason, efforts are needed to improve the health and well-being of pregnant women, one of which is through physical exercise. In this study, several influences of activities during pregnancy were found on the health and well-being of pregnant women.

Fetal Well-being and Intrauterine Safety

Activity during pregnancy has an effect on improving fetal well-being and intrauterine safety. This is proven by research by Makaruk et al., (2021) by conducting a training program that began at 13 weeks of gestation, and continued until 40-41 weeks of gestation. All participants received routine prenatal care during pregnancy and were instructed not to participate in other exercise programs. The exercise program included three 50–60-minute exercise sessions per week (Monday, Wednesday, Friday). A total of 81 sessions were conducted. The intensity of the program was moderate, with a consistent heart rate (HR) between 100-145 beats per minute (recommended individually). Women's HR was monitored during the training sessions, using a Polar M400 HR monitor, with a range of 15-240 bpm. All training sessions included warm-up, core exercises, and cool-down. Overall, all sessions included breathing and relaxation techniques, antithrombotic exercises, strengthening exercises, stretching, pilates elements, and pelvic floor exercises. To ensure maximum safety for the mother and her fetus, all training sessions include only 4-6 participants, are supervised by qualified prenatal physical activity specialists, and support from prenatal specialists, such as obstetricians, midwives and physiotherapists, is always available to women.

The results of the study by Makaruk et al. (2021) showed that the "Conscious 9 Months" exercise can improve fetal well-being and intrauterine safety because this exercise program is specifically designed to pose no risk to fetal well-being and is safe for the fetus. This study showed that there were no negative impacts on fetal well-being and the exercise program was safe for the fetus. This was proven by the 27-week trial that was conducted, no fetal hypoxia, growth retardation, placental exchange, or amniotic fluid volume abnormalities were observed in any fetus. The results of this trial are in accordance with the results of other studies which state that a regular moderate physical activity program during pregnancy does not pose a health risk to either the mother or the fetus (Barakat et al., 2014; Perales et al., 2015). This exercise program also had a positive impact on the mother's heart rate which was significantly lower at week 37. This indicates an increase in the mother's fitness/physical condition and cardiac efficiency, which can ultimately affect normal delivery. This exercise program provides a holistic and comprehensive approach to improving the physical condition of pregnant women and ensuring fetal safety during pregnancy.

Sleep Quality and Maternal-Fetal Attachment

Physical activities such as aerobics during pregnancy can improve sleep quality and maternal attachment to the fetus. Aerobic exercises that can be done during pregnancy include walking, jogging, or practicing yoga. Shen & Chen's (2021) study provided aerobic exercise interventions in the form of yoga for pregnant women for 20 minutes using video media that displayed a modified yoga exercise program. The exercise began with warm-up movements followed by the neck, shoulders, arms, chest, waist, and legs and ended with regular breathing. Furthermore, for 14.5 minutes the exercise was done in a sitting position, followed by 3.5 minutes in a standing position, and the last 2 minutes in a sitting position. During the 2-minute warm-up stage and the 2-minute final breathing stage, pregnant women were instructed to touch the center of their chest with their right hand and their stomach with their left hand to feel the connection with the fetus. The results of the study showed that aerobic

exercise during pregnancy had an effect on higher maternal-fetal attachment and better sleep quality compared to the control group.

Yoga exercises can be given to pregnant women according to the physical condition of the pregnant woman. Yoga exercises can stimulate a relaxation response both physically and psychologically which will stimulate the activity of the parasympathetic autonomic nervous system which will result in a decrease in body metabolism, heart rate, pulse, blood pressure and respiratory rate and an increase in serotonin so that the body becomes more relaxed and can improve sleep quality (Azward et al., 2021). Yoga exercises also provide benefits in increasing muscle strength, building positive affirmations and mental strength during childbirth and calming the mind through relaxation and meditation also provide quiet time to create an inner bond between mother and fetus. Yoga exercises that are done include touching the stomach to feel the fetus, communicating with the fetus, and also paying attention to fetal movements. These actions can make pregnant women feel more comfortable with their role as a mother and encourage bonding with the fetus, so it can be concluded that yoga also facilitates a woman's transition to motherhood (Astuti et al., 2021).

Pregnancy is often associated with sleep deprivation. Alomairah et al (20023) investigated the effects of a physical activity (PA) intervention on sleep in pregnant women. A secondary analysis of a randomized controlled trial (n = 219) explored the effects of structured supervised exercise training (EXE) compared with standard prenatal care on sleep during pregnancy. Respondents were provided with a wrist-worn activity tracker that continuously measured sleep. The results showed that the EXE intervention during pregnancy improved sleep quality.

Optimal Weight Gain

Aerobic exercise using an ergometer bicycle during pregnancy is safe for the mother and her baby (Ghodsi & Asltoghiri, 2014). The results of the study showed that with aerobics using an ergometer bicycle, the birth weight of the baby was significantly lower in the intervention group. The intervention given was by following an ergometer bicycle for 15 minutes 3 times per week with a maximum intensity of 50-60% of the heart rate.

Hatha Yoga and Nutrition Guidance also affect the weight of pregnant women. In the study of Matsuzaki et al. (2018) the intervention involved standard care. The standard of care includes determining optimal pregnancy weight gain according to the guidelines of the Japan Society for the Study of Hypertension in Pregnancy (JSSHP) at the first health check and recommendations on a balanced diet in general by a midwife or nurse. The recommended weight gain (kg) for BMI (kg/m2) is 10-12 for underweight women (<18.5), 7-10 for normal weight women (18-24), and 5-7 for obese women (>24). Hatha Yoga exercises are performed for at least 60 minutes/day 3 times a week, either in a group at the hospital or individually at home. This exercise consists of yoga classes held at the hospital three or five times a month, lasting 60 minutes, and home exercises using digital video discs (DVDs), lasting 30 or 60 minutes per session. Participants were able to attend yoga classes at the hospital at any time. The frequency of yoga was determined to reduce the incidence of low birth weight, following the recommendations of the American College of Sports Medicine (ACSM). Participants received a DVD containing a yoga program for home practice after allocation. One session consisted of warm-up, poses, meditation, and breathing. During the warm-up, participants stretched their entire body in a sitting position. Then, they practiced seven to eight yoga poses, rested for 5 minutes, and practiced seven to eight more poses coordinated with

breathing. During meditation, participants closed their eyes in a supine position and meditated guided by images provided by the instructor.

Meanwhile, nutritional guidance was conducted at 20, 28, and 36 weeks of gestation. Individual dietary intake was assessed for a month before recruitment, and at 28 and 36 weeks of gestation, and 1 month postpartum using the Brief-type Diet History Questionnaire (BDHQ), which has been validated for various nutrient intakes. The BDHQ is a 4-page structured questionnaire that collects the frequency of intake of 58 foods and beverages, as well as eating habits during the previous month. At subsequent examinations after dietary assessment at recruitment and at 28 and 36 weeks of gestation, participants were informed about their own dietary intake values and possible gaps with dietary reference intakes for pregnant women. After that, participants received a 32-page pamphlet containing recipes for dishes containing protein, vitamin D, folate, calcium, and iron, as well as the relationship between dietary intake and pregnancy complications. In addition, the pamphlet showed strategies to reduce salt intake and methods to improve vitamin D status, namely vitamin D production through sunlight exposure.

Matsuzaki et al.'s (2018) study found that yoga practice and nutritional guidance can promote adequate gestational weight gain because both methods are effective ways to ensure a healthy pregnancy process for the mother and fetus. The study conducted in Japan showed that physical exercise such as yoga and control of food intake during pregnancy can help pregnant women achieve optimal gestational weight gain and reduce the risk of complications such as preeclampsia and low birth weight (LBW) babies. In addition, yoga practice can also reduce psychological stress in pregnant women, such as salivary cortisol levels. Therefore, researchers recommend that health care providers and pregnant women combine physical exercise and a healthy diet during pregnancy to achieve optimal gestational weight gain, maintain a healthy pregnancy process, and reduce the risk of complications.

Reduce Pain

Physical activities such as lumbar stabilization exercises (LSE) and Water Exercise can reduce pain during pregnancy. Low back pain (LBP) is a common condition in pregnancy, the main physical therapy intervention used for this condition is LSE. The results of the study by Fontana et al. (2020) showed that LSE was effective in reducing pain status from a clinical perspective in pregnant women with LBP. LSE was positive for improving postural balance and increasing muscle activity of one of the important abdominal muscles after the intervention. Each pregnant woman received treatment given for six weeks, twice a week, and was re-evaluated in the seventh week. The time for each session, in both protocols, was 50 minutes. For each task, a trial of trunk stability efforts was carried out for 3x10 seconds with a 1-minute rest interval. The tasks were: 1) remain sitting on the ball in a static position, with both feet resting on the floor and hands resting on the sternum (Balance Sitting Two Legs Static, BS-TLS); 2) sitting on the ball, lift the lower right leg off the floor and hold the lift for 10 seconds, with the hands resting on the thigh (Balance Sitting Right Leg Elevate, BS-RLE); 3) sitting on the ball, lift the lower left leg off the floor and hold the lift for 10 seconds, with the hands resting on the thigh (Balance Sitting Left Leg Elevate, BS-LLE). The importance of physical exercise using an exercise ball can be useful for relaxing any stiff and painful joints due to increased load on pregnant women, reducing complaints arising from changes in body shape, strengthening and maintaining the elasticity of the abdominal wall muscles, so that it can prevent or overcome complaints of lower back pain (Lilis, 2019).

LSE with various movements can improve both static and dynamic balance. Balance is a complex interaction of the sensory system (vestibular, visual, and somatosensory including proprioceptive) and musculoskeletal (muscles, joints and other soft tissues) which are regulated in the brain (motor control, sensory, basal ganglia, cerebellum). Proprioception will provide information from body parts such as muscle strength, joint position and information from the environment such as floor surface conditions. This information can be in the form of pressure, joint position, tension, length, and muscle contraction. With the increase in proprioceptive function, it will cause an increase in sensory input which will be processed in the brain as central processing. Central Processing functions to determine the body's fulcrum and gravity alignment so that good postural control occurs and is able to create good stability when moving to maintain lower back health to prevent injury and minimize back pain in pregnant women (Rasyid & Igirisa, 2019).

Another activity that can reduce pain during pregnancy is Water Exercise. According to Rodríguez-Blanque et al. (2020), physical exercise helps maintain a healthy lifestyle and its practice is recommended for mothers during pregnancy as a way to limit the negative effects on the body that may occur so that it will improve the quality of life of pregnant women. Aquatic exercise programs for pregnant women have been shown to improve their physical preparation and development and optimize well-being, mood and sleep patterns, as well as encourage daily physical activity, improve work ability and prevent pregnancy-related complications. In this study, water exercise or aquabic exercise was carried out during the 20th to 37th week of pregnancy. This program is carried out every three sessions per week which still last for 60 minutes each.

The water exercise procedure that can be done starts from the preparation stage consisting of consulting a doctor, preparing equipment, and warming up. Then continued with the water exercise stage, starting from walking in the water or in a pool with a water level that reaches the chest. Walking in the water has the benefit of helping to improve circulation and strengthen the leg muscles without putting excessive pressure on the joints. Then squat in the water by standing with your feet shoulder-width apart, bend your knees and lower your body like doing a regular squat. Squatting in the water will provide additional resistance while reducing pressure on the knees. The next step is kicking, holding the edge of the pool and doing kicking movements with your feet alternately. This helps strengthen the leg and lower back muscles. Next followed by the Arm Circles movement, which is standing with your feet shoulder-width apart, raising your arms to the side and doing a circular motion with your arms. This exercise can strengthen the muscles of the arms and shoulders. The last movement is Pelvic Tilts, standing with your back against the pool wall, bending your knees slightly and lifting your pelvis forward and backward. This exercise can strengthen the pelvic and lower back muscles. The last stage is the cool-down stage which aims to help lower the heart rate slowly and prevent muscle cramps. After doing water exercise, make sure to drink water to replace lost fluids.

The results of the study showed that a moderate physical activity program during the first, second, and third trimesters of pregnancy will improve the perception of maternal health status. In addition, water exercise for pregnant women has several benefits, including water can help reduce pressure on the lower back and joints, thereby reducing pain that is often experienced during pregnancy (Rodríguez-Blanque et al., 2020). Exercise in water helps improve blood circulation, which is important for the health of the mother and baby. Water pressure helps reduce swelling in the feet and ankles. Cardiovascular exercise in water can

help maintain the heart health of pregnant women. Exercise in water helps control excessive weight gain during pregnancy (Backhausen et al., 2017).

Effects on Childbirth

Pilates exercises can affect labor. Ghandali et al (2021) study on 110 primiparous women who were divided into an intervention group (n=55) who were given Pilates exercises from 26 to 28 weeks of gestation for 8 weeks, and a control group (n=55) who did not do any exercises. The results showed that Pilates exercises during pregnancy significantly reduced the intensity of labor pain, the duration of the active phase and the second stage of labor, and increased maternal satisfaction with the labor process ($p<0.05$). Pilates exercises during pregnancy can improve the labor process and increase maternal satisfaction with the labor process, without causing complications for the mother and baby.

Pilates exercise is a form of physical exercise that focuses on developing core strength, flexibility, posture and body awareness. Pilates exercise is considered a sport to improve physical, psychological and motor functions. During pregnancy, pilates exercise using breathing techniques will help mothers prepare for childbirth, improve muscle, body and pelvic floor abilities as well as flexibility and proper breathing. The results of the study are in line with Ghandali et al. (2021) which showed that Pilates gymnastics or exercise during pregnancy reduces the length of the active phase and second stage of labor, reduces labor pain and improves maternal well-being and satisfaction with the labor process. Yilmaz, Taş, Günaydin, & Kaya (2023) stated that Pilates is a low and moderate intensity sport and is a cheap, easy-to-implement, non-pharmacological method and does not cause side effects. So it is necessary to increase the use of Pilates exercise during pregnancy. In his study, the results of Pilates were also found to be effective in reducing labor pain. This is in line with research by Noviyanti, Nurdahliana, Munadya, & Gustiana (2020) which states that Pilates exercises, especially using a birth ball, in mothers giving birth can significantly reduce pain during labor.

Preventing Postpartum Depression

Physical activities such as “Supervised group exercise” and “16-week exercise” can prevent depression during pregnancy. Broberg et al. (2020) conducted a “Supervised group exercise” exercise intervention where the exercise was supervised by four physiotherapists and a rigshospitalet according to the Danish national recommendations for exercise during pregnancy. The session lasted for 70 minutes consisting of a 10-minute warm-up, 20 minutes of resistance training on a treadmill (exercise bike or cross trainer), 25 minutes of strength training (back, abdomen, thighs, arms and pelvic floor) and 15 minutes of stretching and relaxation. The results showed psychological well-being at 29-34 weeks of gestation. The results showed that at eight weeks postpartum, the intervention group reported significantly higher psychological levels (Broberg et al., 2020). The results of the study by Broberg et al. (2020) showed that supervised group exercise can improve psychological well-being outcomes for pregnant women at risk of depression due to the positive influence of peer support and the physical effects of the exercise program. The study showed that pregnant women who participated in a group exercise program had higher levels of psychological well-being compared to the control group, especially in the 8-week postpartum period. In addition, the results of the study also showed that psychosocial factors such as peer support and reduced loneliness may contribute to improved postpartum psychological well-being for women who participated in a group exercise program. Therefore, supervised group exercise may be a safe and beneficial complementary treatment approach for pregnant women at risk of depression.

Another exercise is "16-week Exercise". Coll et al. (2019) conducted a "16-week exercise" intervention consisting of aerobic activities, strength training and floor exercises specifically for pregnant women with a description of the routine exercise activities carried out according to the abilities and comfort of each participant which were carried out in 3 stages of exercise to reduce excess load until the end of the intervention. In stage 1 (1-4 weeks) includes 15 minutes of aerobic activity and 35 minutes of muscle strength and floor exercises. Stage 2 (weeks 5-10) carries out 20 minutes of aerobic activity and 30 minutes of muscle strength and floor exercises. Stage 3 (11-16 weeks) 25 minutes of aerobic activity and 25 minutes of strength and floor exercises. Before the session was carried out, it began with a 5-minute warm-up exercise and ended with a 5-minute colddown which included passive and active stretching exercises, this activity was trained in a maximum of 3 people per exercise instructor. After this activity was completed, it was concluded that there was a lack of significant intervention influence on postpartum reduction because there were many participants who were not compliant in this activity, such as not following the activity until the end of the schedule.

This activity is useful for assessing the effectiveness of regular exercise during pregnancy in reducing postpartum depression. According to Sofiyanti (2021), physical activity in the form of moderate-intensity exercise or aerobic exercise such as jogging, swimming, yoga which is done regularly since pregnancy can be a potential therapy in improving symptoms of postpartum depression by suppressing cortisol levels and increasing serotonin. Low physical activity is related to the incidence of postpartum depression. Therefore, moderate-intensity exercise is highly recommended for pregnant women and according to research conducted by Xu et al. (2023) said that aerobic exercise in preventing and treating postpartum depression is very significant.

CONCLUSION

Physical activity during pregnancy is very necessary to maintain the health of the mother and the fetus she is carrying. Some physical activities have been proven to affect the fitness of pregnant women and reduce problems experienced by the mother during her pregnancy, therefore it is recommended that pregnant women do physical activity during their pregnancy to improve the welfare of the mother and her fetus. For health services, it is recommended to hold a physical exercise program for pregnant women, either in hospitals, clinics, or health centers.

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