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"How Does Prenatal Exercise Affect Labor and Delivery? A Review of the Influence of Prenatal Physical Activity on the Course of Vaginal Birth"

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ABSTRACT

Introduction and purpose: Regular physical activity during pregnancy is associated with many maternal health benefits, including a reduced risk of complications during pregnancy. This review explores its impact on vaginal birth outcomes, focusing on labor induction, duration, pain tolerance, instrumental delivery rates, and episiotomy or laceration occurrences.

Results: Studies suggest that prenatal exercise may lower the likelihood of labor induction and instrumental deliveries. Regular physical activity, including aerobic exercises, resistance training, and targeted prenatal workouts, has been associated with a higher rate of spontaneous labor onset, reducing the need for medical interventions such as oxytocin induction. Yoga and Pilates, in particular, have shown promising effects in enhancing pain tolerance during labor by improving flexibility, muscle strength, and relaxation techniques, which may help women

manage contractions more effectively. While some research indicates that yoga can potentially shorten labor duration, findings remain inconclusive. Additionally, despite the numerous benefits of prenatal exercise, studies consistently report no significant impact on the rate of episiotomies or perineal lacerations.

Conclusions: This review of literature shows that regular physical activity during pregnancy may reduce the need for labor induction, improve pain management, and lower the likelihood of instrumental deliveries. There is no doubt that prenatal physical activity may positively influence the course of spontaneous vaginal delivery by reducing the need for obstetric interventions.

Keywords: physical activity, pregnancy, vaginal labour

INTRODUCTION AND PURPOSE

Pregnancy is a unique stage of women's life often marking profound physical, emotional, and life changes. It is often referred to as a "teachable moment" because it is a time when women are highly motivated to modify their behavior, either for their health or the health of their developing fetus.[1] Regular physical activity during pregnancy is a very important factor that can have a positive impact on the course of the pregnancy. World Health Organization recommends that all pregnant and postpartum women without contraindication should undertake regular physical activity throughout pregnancy and postpartum, do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week for substantial health benefits, and incorporate a variety of aerobic and muscle-strengthening activities.[2]

These guidelines are similar to those provided by the American College of Obstetricians and Gynecologists, which recommends daily 20-30 min of engagement in safe exercises such as walking, aerobic activities and stretching exercises for pregnant women.[3] Many studies have proven that regular physical activity during pregnancy has beneficial effects for the mother. It can reduce the risk of pregnancy-related conditions such as excessive weight gain, gestational dyslipidemia, preeclampsia, gestational diabetes mellitus, gestational hypertension, delivery complications and postpartum depression.[2,4–6]

Contrary to these recommendations and potential benefits statistics show that the majority of pregnant women remains sedentary or insufficiently active. Moreover, many women limit their physical activity during pregnancy.[7]

It is well known that preparation for natural birth is worth treating as the main goal of the pregnancy for the future mothers, their families and the health care system.[7] Labour is a physically and emotionally demanding event that can be highly stressful for many women. The process involves intense physical exertion, often accompanied by significant pain and discomfort as the body works to deliver the baby. The uncertain nature of labour—its duration, intensity, and potential complications—is a common concern and fear among most women. The duration of labour varies in different women and is affected by factors such as age, parity, fetal size and maternal weight.[8] However there are conflicting results concerning the possible effect of physical activity on the course of vaginal labour. The mixed findings highlight the complexity of labour and the many factors that contribute to its course.

The purpose of this review is to summarize findings on the influence of regular physical activity during pregnancy on the course of vaginal birth. Only variables related to vaginal labour were analyzed, including the rate of labour induction, duration of labour, pain tolerance, rate of instrumental deliverie and rate of episiotomy or laceration.

MATERIALS AND METHODS

The aim of this review study is to determine the influence of prenatal physical activity on the course of vaginal labour. A systematic review of scientific papers with full text was carried out, based on the PubMed database. The keywords used were: ‘physical activity, ‘pregnancy’ and ‘vaginal labour’. Articles and research papers published between 2015 and 2024 were the focus of the analysis. The titles and abstracts were manually screened to assess the relevance of the abstract and the origin of the article. The gathered data were analyzed and summarized. Since this study was not designed as a meta-analysis, no statistical methods were utilized.

STATE OF KNOWLEDGE

The impact of physical activity during pregnancy on the rate of labour induction

One of the analyzed variables was the rate of labour induction, which can be defined as the process of artificially stimulating the uterus to start labour. It is usually performed by

administering oxytocin or prostaglandins to the pregnant woman or by manually rupturing the amniotic membranes.[9] According to the Cochrane review routine induction of labour in pregnancies carried to the 41st week of gestation i a safe activity.[10] However, as with any treatment, the induction of labour should be approached with caution as induced labour is associated with a significantly increased risk of caesarean delivery, uterine rupture**,** a greater need for anesthesia, more frequent neonatal resuscitation, admission of the newborn to the neonatal intensive care unit, and the use of phototherapy, which consequently extends the duration of hospitalization.[11–13] Taking all of this into account, any methods should be considered which will reduce the need for labour induction, also the regular physical activity antepartum.

Ferreira et al. proved that women in the control group was associated with higher odds of an induced labour (34%) compared to intervention group (20.2%) that was in the training program between the 12th and 15th weeks of gestation, until the end of the pregnancy.[14] The training program consisted of three classes per week with duration of between 45 and 50 minutes and were planned according to the recommendations of the ACOG.1 The classes consisted of: warm up and a fundamental part formed by aerobic, strength, coordination and flexibility exercises. The physical program included pelvic musculature strengthening exercises. Furthermore, Haakstad et al. investigated the effect of antenatal exercise on the occurrence of spontaneous vaginal birth (without induction of labour). Although not reaching statistical significance, women randomised to the intervention group (the program consisted of two classes per week with 60 min exercise) had higher rates of spontaneous birth (85.7%) compared with controls (62.3%).[15]

Similarly, Bolanthakodi et al. found that the requirement for induction of labour was less in the study group practicing yoga (30-minute integrated yoga intervention practised at home) compared with control group.[16] Though the requirement of oxytocin augmentation in the study group was less, it was not statistically significant ($p < 0.070$).

Comparably, Ghandali et al. found that pregnancy modified Pilates program decreased the need for infusion of oxytocin in the intervention group than in the control group.[17]
Pereira et al. confirmed that for low-risk women at term walking for 30 min 3 times a week at 4 km/h from 38 week onwards is safe and enhances the spontaneous onset of labour.[18] However, despite the differences in the intervention group (women at term) compared to other citated studies, it was proven that for low-risk women at term who were not already regularly exercising in pregnancy, physical exercise of moderate intensity at term significantly reduced the need for labour induction.

As Kearney et al. in a systematic review about factors associated with spontaneous vaginal birth in nulliparous women summarized, antenatal preparation with low impact exercise may increase rate of spontaneous vaginal birth.[19]

In contrast to the above studies, a meta-analysis by Davenport et al. published in 2019 found no significant associations between prenatal exercise and the induction of labour.[20] However, this study summarizes the results of several recent papers, so further data analysis will be required.

The impact of physical activity during pregnancy on the duration of vaginal labour

Another variable analyzed was the duration of birth. Labour is a process that is subdivided into 3 stages. The first stage starts when labour begins and ends with full cervical dilation (10cm) and effacement. The second stage commences with complete cervical dilation and ends with the delivery of the fetus.[21] Birth would be expected to take place within 3 hours of the start of the active second stage in most women among nulliparous women and within 2 hours among parous women.[22] The third stage of labour begins after the fetus is delivered and ends with the delivery of the placenta. The available data regarding the impact of physical activity on the course of labour includes several meta-analyses, which will be discussed in the present review. The 2021 meta-analysis by Veisy et al., which included nine studies with a total of 2,048 participants, showed that exercise has no effect on the duration of the first stage of labour. Similarly, their meta-analysis of eight studies involving 2,074 participants found that exercise does not affect the duration of the second stage of labour.[23] The same conclusion was reached in a 2022 meta-analysis by Wang et al.[24] Likewise, Davenport et al., in their 2019 meta-analysis, demonstrated that there were no significant associations between prenatal exercise and the overall length of labour.[20]

However, a meta-analysis by Corrigan et al., which analyzed six studies involving 472 participants, revealed that yoga has a statistically significant beneficial effect on reducing the duration of labour by an average of almost two hours.[25] This raises an important question about why yoga, in particular, has such an effect. Nonetheless, there is a notable lack of research in this area, and further investigation is needed to understand the mechanisms by which yoga influences and modifies the duration of labour.

The impact of physical activity during pregnancy on the pain tolerance during labour

Labour is commonly recognized as a physically painful experience for women. Today, there are numerous methods available, both natural and pharmacological, to help women manage labour pain.[26] One commonly used approach is epidural anesthesia, which is highly effective in minimizing pain during labour. However, this method of pain relief is not without its side effects. The meta-analysis by Anim-Somuah et al., based on the Cochrane Pregnancy and Childbirth Group's Trials Register, summarized that women who receive epidurals are more likely to experience hypotension, motor blockade, fever, and urinary retention. Additionally, they tend to have longer first and second stages of labour and are more likely to require oxytocin augmentation.[27] This raises an important question: how might regular physical activity help reduce the reliance on anesthesia?

In the randomized, control trial Bolanthakodi et al. the study group received the intervention in the form of integrated yoga consisting of a series of 30-min practice sessions at the 30th, 32nd, 34th, 36th, 37th, 38th, and 39th weeks of gestational age. Subsequently, they were asked to practice at home at least thrice a week. The matched control group did not perform yoga. The study demonstrated that the pregnancy yoga group showed a notable decrease in the need for intravenous analgesia ($p < 0.045$). Pain tolerance, assessed using the Numerical Pain Intensity Scale (NPIS) ($p < 0.001$) and the Pain Behavioral Observation Scale (PBOS), was significantly higher in the pregnancy yoga group ($p < 0.001$).[16]

In a retrospective study by Wadhwa et al., pregnant women were divided into two groups: control and exercise. The exercise group participated in supervised antenatal exercises, including resistance, aerobic, yoga, pelvic floor, stretching, and relaxation exercises, with or without walking, for at least 3 months. Sessions were held weekly for a minimum of 30 minutes. Labour pain, measured using the Visual Analog Scale (VAS), was significantly lower in the exercise group (7.5 points) compared to the control group (9 points) ($p < 0.05$).[28]

The study by Ghandali et al. explored whether Pilates exercises during pregnancy reduce labour pain intensity. While no statistically significant difference was observed in mean pain intensity at 3-cm dilation (latent phase) ($p = 0.46$), a significant reduction in pain intensity was noted at 6-cm dilation, 8-cm dilation, and full dilation as measured by the Visual Analog Scale (VAS). In conclusion, the study found that Pilates exercises effectively reduce labour pain intensity during the late phase of the first stage of labour ($p < 0.05$).[17]

In contrast to these studies, a randomized controlled trial by Haakstad et al. reported no differences between the exercise and control groups regarding the use of analgesia. The exercise group participated in regular aerobic sessions (60 minutes, twice per week).[15]

The impact of physical activity during pregnancy on rate of instrumental deliveries

While most women experience spontaneous vaginal births, some require assistance during the second stage of labour through the use of obstetric forceps or vacuum extraction. Assisted vaginal delivery is a crucial component of obstetric care. In industrialized countries, the rates of instrumental vaginal deliveries range from 5% to 20% of all births. [29]

It is evident that this procedure is often lifesaving for the fetus. However, it is important to be aware of the potential complications associated with this type of delivery. The most common complications include perineal and vaginal tears, pelvic floor damage that can result in long-term urinary and fecal dysfunction as well as genital prolapse, psychological and psychosexual issues, and various neonatal complications such as scalp lacerations, facial nerve palsy, hematomas, skull fractures, and more.[30] Given these considerations, it is worth asking: does prenatal exercise have an impact on the rate of instrumental deliveries?

The 2019 meta-analysis conducted by Davenport et al., which included 20 randomized controlled trials, reported that interventions focused solely on exercise significantly reduced the likelihood of requiring instrumental delivery during childbirth.[20]

There are several recent studies that support this finding. For instance, Duchette et al., in their overview, summarized that resistance training during pregnancy appears to be associated with a lower incidence of operative deliveries.[31]

Interestingly, Pereira et al. found that for low-risk women at term who had not been regularly exercising during pregnancy, walking for 30 min 3 times a week at 4 km/h starting at 38 weeks is both safe and effective in reducing rates of operative vaginal delivery.[18] This suggests that even initiating exercise late in pregnancy can be beneficial for both the mother and the fetus.

The impact of physical activity during pregnancy on rate of episiotomy or laceration

Tearing of the vaginal tissue during childbirth is a frequent occurrence and can happen naturally during delivery. In some cases, a midwife or obstetrician may perform an episiotomy—a surgical cut in the perineum—to widen the vaginal opening and assist in the

baby's delivery.[32] This damage may result in urinary and/or fecal incontinence. Avoiding episiotomy and lacerations during vaginal birth has several benefits, including reduced perineal pain and discomfort during intercourse, allowing for an earlier return to sexual activity.[33] Therefore, strategies to minimize the likelihood of episiotomies and perineal tears are essential. In a quasi-experimental study by Ferreira et al., it was concluded that there was no difference in the episiotomy rate between the control group and the intervention group.[14] The intervention group participated in a training program from the 12th to 15th week of pregnancy until delivery. This program consisted of three weekly sessions, each lasting between 45 and 50 minutes, and was designed in accordance with ACOG guidelines. Each session included a warm-up, followed by a core segment incorporating aerobic, strength, coordination, and flexibility exercises. Additionally, the program featured exercises specifically aimed at strengthening the pelvic muscles.

Similarly, a clinical trial by Ghandali et al. was conducted on primiparous women, who were randomly assigned to either an intervention or a control group.[17] The intervention group participated in Pilates exercises from 26 to 28 weeks of gestation for a duration of eight weeks, while the control group did not engage in any exercise. The study results indicated that Pilates exercises during pregnancy did not have a significant impact on the episiotomy rate between the two groups.

A prospective cohort study by Watkins et al. categorized pregnant women into two groups based on the Kaiser Physical Activity Survey: one with a lower level of physical activity and the other with a higher level. The rates of perineal lacerations were similar between the two groups.[34]

Comparably, in the meta-analysis by Masoud et al. it was proven that exercise also does not reduce perineal lacerations.[35] It appears that researchers consistently agree that physical activity during pregnancy does not impact the rate of episiotomy or perineal lacerations.

CONCLUSIONS

The impact of physical activity during pregnancy on various aspects of labour and delivery has been extensively studied, with mixed findings across different outcomes. Overall, the evidence suggests that prenatal exercise can have several beneficial effects, though its influence may vary depending on the specific type of physical activity.

Regarding labour induction, multiple studies indicate that regular physical activity during pregnancy may reduce the need for induction. Training programs that include aerobic,

strength, coordination, and flexibility exercises, as well as activities such as yoga and Pilates, have been associated with a lower likelihood of labour induction. Walking, even when initiated late in pregnancy, has also been shown to enhance the spontaneous onset of labour.

In terms of labour duration, the majority of meta-analyses suggest that physical activity does not significantly affect the length of the first and second stages of labour. However, yoga has been found to reduce the duration of labour by nearly two hours, though the mechanisms behind this effect remain unclear and warrant further investigation.

Additionally, several studies have demonstrated that prenatal exercise, particularly yoga and Pilates, can reduce the need for analgesia and improve pain management during labour. Also the rate of instrumental deliveries also appears to be influenced by physical activity during pregnancy. Meta-analyses and systematic reviews suggest that prenatal exercise, including resistance training and walking, can reduce the likelihood of requiring forceps or vacuum extraction during childbirth.

However, no strong evidence supports a link between physical activity and a lower risk of episiotomy or perineal lacerations.

Overall, staying active during pregnancy can support a smoother labour experience, but further research is needed to refine recommendations and understand the mechanisms behind these effects. This review emphasizes the potential positive impact of physical activity during pregnancy on the course of spontaneous vaginal delivery by minimizing obstetric interventions.

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