

Impact Of Pelvic Floor Muscle Exercise During Pregnancy On Maternal Outcome: A Systematic Review

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Abstract

Introduction: Pregnancy and childbirth entail significant physiological changes, often accompanied by challenges such as perineal trauma and pelvic floor dysfunction. Pelvic floor muscle exercises, including Kegel exercises and perineal massage, have emerged as potential interventions to mitigate these issues and promote maternal well-being.

Objective: This systematic review aims to evaluate the impact of pelvic floor muscle exercise during pregnancy on maternal outcomes.

Methods: A comprehensive search of databases yielded ten relevant studies conducted between 2011 and June 2022. These studies, encompassing various interventions and methodologies, were analyzed to identify trends in outcomes such as duration of labor, mode of delivery, perineal trauma, episiotomy rates, and postpartum pain. Ten studies, utilizing randomized controlled trials and quasi-experimental designs, were systematically reviewed.

Results: The findings suggest that pelvic floor interventions contribute to more efficient labor progression, reduced rates of perineal trauma, and enhanced pelvic floor muscle strength. Findings from various studies indicated significant differences favoring the intervention group, such as reduced labor duration, favorable mode of delivery, decreased perineal trauma, and alleviated perineal pain. However, there were some contradictory results, with one study showing no significant impact on delivery mode or perineal outcomes.

Conclusion: Kegel exercises, particularly during the third trimester, showcased a notable reduction in labor duration and perineal trauma. The pelvic floor training exhibited significant reductions in episiotomy rates, severe perineal trauma, postpartum perineal pain, and analgesia requirements.

Keywords: Kegel exercises, Labor outcomes, Labor duration, Mode of delivery, Perineal trauma.

1. Introduction

Pregnancy and childbirth are natural processes marked by significant physiological changes in women's bodies. While these processes generally proceed smoothly, complications can arise, affecting both maternal and fetal health. Therefore, promoting maternal well-being during pregnancy and childbirth is a priority for public health agencies worldwide.¹

During the third trimester, the uterus However, obstetric interventions, such as instrumental births and perineal trauma, can detrimentally impact on strength of pelvic floor muscle (PFMS) and contribute to pelvic floor impairment.² Perineal trauma, including tears and episiotomies, is particularly common in primigravida women undergoing vaginal delivery.³ "Research has indicated that a substantial percentage of women experience urinary and fecal incontinence following childbirth, while pelvic organ prolapse affects up to 30% of women who have had children, with prevalence rates varying across regions.⁴

In response to these challenges, pelvic floor exercises, commonly known as Kegel exercises or pelvic floor muscle training, have emerged as a conservative intervention to strengthen the pelvic floor muscles. These exercises aim to mitigate the effects of pregnancy and childbirth on pelvic floor function, potentially reducing the risk of complications such as instrumental delivery, perineal tears, cesarean section, and lumbopelvic pain.⁵

The benefits of pelvic floor muscle training during pregnancy are well-documented. Research indicates that such interventions can enhance the likelihood of vaginal delivery, decrease the incidence of episiotomies and prolonged labor, and lower the risk of perineal tears. Moreover, improving pelvic floor strength and function can lead to better maternal outcomes, including reduced rates of urinary incontinence, pelvic organ prolapse, and sexual dysfunction postpartum.^{6,7} Given the importance of maternal well-being during pregnancy and childbirth, there is growing interest in interventions aimed at optimizing pelvic floor health.

This systematic review seeks to synthesize the existing literature on the impact of pelvic floor interventions on maternal outcomes, providing a comprehensive overview of the efficacy of pelvic floor exercises in promoting maternal health and reducing the risk of complications associated with childbirth.

The primary objective of this systematic review is to evaluate the impact of pelvic floor interventions, including Kegel exercises, perineal massage, and pelvic floor muscle training, on maternal outcomes during pregnancy and labor. Specifically, the review aims to assess the effects of these interventions on variables such as the duration of labor, mode of delivery, perineal trauma, episiotomy rates, and postpartum pain.

By synthesizing data from diverse studies, this review seeks to provide insights into the efficacy of pelvic floor exercises in promoting maternal well-being during the perinatal period.

2. Material and methods

Search strategy, selection criteria, and data selection process

Multiple databases were queried, including CINHALL (EBSCOhost), Health Collection, PubMed (NCBI, US National Library of Medicine), Embase Ovid, Wiley Online Library (John Wiley & Sons), Medline (OvidSP, Wolters Kluwer), Cochrane, Health Source, Scopus, Wiley, Health & Medical Complete (ProQuest), Joanna Briggs Institute. Full-text articles published between 2011 and June 2022 were included. The following keywords were used in combination: “pregnancy”, “maternal outcome”, “labor”, “delivery”, “kegel exercise” and “pelvic floor muscle exercises”. The reference lists from selected studies were also checked to identify other studies that the electronic keyword search could have overlooked.

Study Selection

The procedure for selecting studies is depicted in Figure 1. The search was carried out by a single reviewer, Farha Usmani. The determination of article inclusion was reached through consensus among all authors. The criteria for study eligibility are detailed in Table 1.

The inclusion criteria encompassed randomized controlled trials focusing on pregnant primiparous or second gravida multiparous women undergoing pelvic floor muscle exercise interventions. Studies were required to evaluate at least one labor and birth outcome, including mode of delivery, duration of labor, episiotomy rate, perineal outcomes, pelvic floor muscle strength, and postpartum pain.

Exclusion criteria involved studies utilizing interventions other than pelvic floor muscle exercises, observational studies, and studies with only abstracts available. Moreover, studies involving high-risk pregnant mothers or non-pregnant women were excluded.

Data Extraction:

Data extraction was conducted independently by two skilled investigators (F.U and M.C) utilizing a standardized form. Any discrepancies were resolved through discussion or consultation with a third and fourth reviewer. Data extracted from each study included author(s), title, country, variables examined, instruments used, sample size and sampling technique, study design, main findings, and conclusions presented in Table 2.

Quality Assessment: The quality of included studies was assessed using Cochrane risk-of-bias (RoB) criteria for evaluating randomized controlled trials. This assessment involved examining aspects such as randomization, blinding, sample size calculation, allocation concealment, and intention-to-treat analysis. Studies were rated based on their methodological rigor and risk of bias.

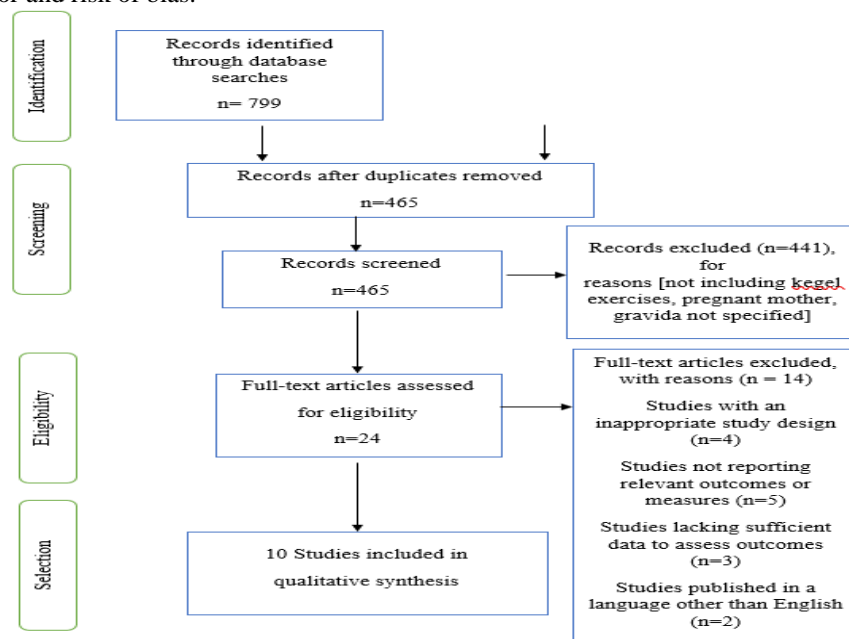


Figure 1- Flow diagram of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)

Table 1-Eligibility Criteria

Criteria	Description
Design	Randomized controlled trials
Participants	Pregnant primiparous or second gravida multiparous women
Intervention	Pelvic floor muscle exercise (Kegel exercises)
Control	No treatment
Main outcomes	Effect of PFME on at least one labor and birth outcome including mode of delivery (Spontaneous vaginal birth, instrumental birth, and cesarean section), duration of labour (first and second stages of labour), episiotomy rate, perineal outcomes, pelvic floor muscle strength, postpartum pain
Exclusion criteria	The study used other interventions such as general exercise, Observational studies, and only abstracts available. Studies include high-risk pregnant mothers, twin pregnancy, non-pregnant women

3. Result

A total of 799 records were initially identified through database searches published between 2011 and June 2022. After removing duplicates, 465 records remained, which were screened for eligibility. Among these, 441 records were excluded mentioned in figure 1. Full-text assessment was conducted on 24 articles, resulting in 10 papers being included in this study with a total of 1303 pregnant mothers included in this systematic review. The summary of studies is depicted in Table 2

Main Effects of Pelvic Floor Interventions on Maternal Outcomes

a) Reduction in Labor Stages:

El-Sayed et al., Elsebeiy FI., and Goda AA et al.^(8,9,10) demonstrated significant improvements in the duration of labor stages among women who practiced Kegel exercises during the third trimester compared to the control group. This suggests that pelvic floor interventions may contribute to more efficient labor progression.

b) Lower Rates of Episiotomy and Perineal Trauma:

Elsebeiy FF.⁹ study revealed a significantly lower rate of perineal tears among women who underwent prenatal perineal massage or Kegel exercises compared to the control group. Similarly, studies by Ali HAF, El-Sayed MHS et al., Dönmez S, and Kavlak O.^(11,8,12) reported decreased rates of episiotomy and laceration among women who practiced Kegel exercises. Additionally, Leon-Larios et al.¹³ found that pelvic floor training led to significantly lower rates of episiotomy, perineal trauma. These findings suggest that pelvic floor interventions can help mitigate the risk of perineal trauma during childbirth.

c) Enhanced Pelvic Floor Muscle Strength:

El-Shamy and Abd El Fatah.¹⁴ reported a significant increase in pelvic floor muscle strength at 36 weeks gestation among women who engaged in antenatal pelvic floor muscle exercises. Similarly, Wang X et al.¹⁵ found that pelvic floor muscle training enhanced pelvic floor myodynamia (muscle strength) in the intervention group at both 6 weeks and 3 months post-delivery. This suggests that these exercises may strengthen the pelvic floor muscles, potentially reducing the risk of pelvic floor dysfunction.

d) Improved Mode of Delivery:

El-Shamy, F.F., and Abd El Fatah E.E.¹⁴ found a significant correlation between PFM strength at 36 weeks gestation and the mode of delivery (vaginal delivery: $r = 0.58$, $p < 0.05$; cesarean delivery: $r = -0.49$, $p < 0.05$). While Wang et al. did not find a significant difference in the mode of delivery between groups, they noted enhanced pelvic floor muscle strength in the intervention group post-delivery. This implies that pelvic floor interventions may contribute to overall pelvic floor health, which could impact future deliveries and pelvic health.

e) Reduced Postpartum Pain:

Yetişkin and Kaya.¹⁶ observed a significant decrease in genito-pelvic pain levels during pregnancy and the postpartum period among women who performed pelvic floor muscle exercises. This suggests that these exercises may alleviate postpartum pain and discomfort, contributing to better overall postnatal recovery. Additionally, El-Sayed et al., Ali HAF, Leon-Larios et al. Wang et al. Dönmez S and Kavlak O.^(8,11,13,15,12) found lower levels of postpartum perineal pain in their studies.

TABLE 2- Summary of studies of pelvic floor muscle exercise impact on maternal outcomes

S.No and Author	Objectives	Country	Variables	Instrument	Sample sampling technique	Design	Findings	Conclusion
1. El-Sayed MHS et al. ⁸ (2019)	Effect of Kegel's exercises during the third trimester of pregnancy on maternal outcome	Egypt	Duration of labor stages (1st, 2nd, 3rd), mode of delivery, degree of tears, perineal pain	Structured interview schedule, maternal outcome assessment sheet, numerical analogue pain-rating scale	A purposive sample of 110 pregnant women	Quasi-Experimental research design	The intervention group showed significant improvements compared to the control group in the duration of labor stages, mode of delivery, degree of tears, and perineal pain before discharge (P=0.000*).	Kegel's exercises during the third trimester positively affect maternal outcomes.
2. Elsebeiy FI (2018)	Comparing Effects of Prenatal Perineal Massage vs. Kegel Exercise on Labor Outcome	Egypt	Duration of the second stage of labor, perineal trauma	Socio-demographic characteristics sheet, labor stage sheets, neonatal outcome sheet, postnatal sheet and REEDA scale	118 pregnant women	Randomized controlled trial	Significant reduction in the second stage of labor duration and lower rates of perineal tears in massage and exercise groups compared to the control group. Perineal tears of the first-degree type were experienced by 27.0% and 23.7% of women in the perineal massage and kegel exercise groups, respectively, while 14.0% in the control group had second-degree tears. Mean REEDA scale scores 15 days postpartum were 1.7 ± 1.3 and 2.7 ± 1.6 for the perineal massage and kegel exercise groups, respectively, compared to 4.3 ± 0.8 for the control group (P = 0.000*).	Prenatal perineal massage and Kegel exercises are safe methods that reduce the duration of the second stage of labor and the likelihood of perineal tears
3. El-Shamy, F.F. and Abd El	, "Effect of Antenatal Pelvic Floor Muscle Exercise on	Egypt	PFM strength at 20- and 36-weeks' gestation,	Vaginal squeeze pressure measurement	Random allocation of 20 healthy pregnant women	Randomized controlled trial	A significant change in mean PFM strength at 36 weeks	Pelvic floor muscle exercise is recommended for increasing

Fatah E.E. ¹⁴ (2018)	Mode of Delivery"		mode of delivery				gestation ($p < 0.05$) was observed between the two groups. Additionally, a significant correlation was found between PFM strength at 36 weeks gestation and the mode of delivery (vaginal delivery: $r = 0.58$, $p < 0.05$; cesarean delivery: $r = -0.49$, $p < 0.05$).	the rate of vaginal delivery.
4. Ali H.A.F. ¹¹ (2015)	"Effects of Prenatal Perineal Massage and Kegel Exercise on Episiotomy Rate"	Egypt	Episiotomy rate, laceration, perineal pain	REEDA Scale, Kegel Exercise Training Hand Out, Perineal Massage Learning Guide, Assessment Sheet	Random selection of 180 pregnant mothers	Randomized controlled trial	Statistically significant differences favouring massage and exercise groups in terms of episiotomy, laceration, and perineal pain. Episiotomy rates were lower in the Kegel exercise (36.7%) group compared to control (42.8%) group, with a statistically significant difference ($p = 0.031$). Laceration rates were also lower in the Kegel exercise (53.3%) compared to control (70%) groups, with a significant difference ($p < 0.001$).	Prenatal perineal massage and Kegel exercises significantly reduce episiotomy rates and perineal pain.
5. Leon-Larios F et al. ¹³ (2017)	"Effects of Pelvic Floor Training on Perineal Trauma"	Spain	Episiotomy rate, perineal trauma, perineal pain	Assessment Sheet	Single-blind quasi-randomized controlled trial with 466 women	Quasi-randomized controlled trial	The intervention group had significantly 31.63% lower rates of episiotomy (50.56% versus 82.19%, $p < 0.001$), and a higher probability of maintaining intact perineum (17.61% versus 6.85%, $p < 0.003$).	A pelvic floor training program reduces perineal trauma and postpartum perineal pain.

							there were fewer occurrences of third-degree tears (5.18% versus 13.12%, $p < 0.001$) and fourth-degree tears (0.52% versus 2.5%, $p < 0.001$) in this group, lower levels of postpartum perineal pain (24.57% versus 36.30%, $p < 0.001$)	
6. Wang X et al. ¹⁵ (2014)	"Effect of Pelvic Floor Muscle Training on Delivery Outcomes"	China	Timing of labor stages, delivery mode, rates of episiotomy and perineal laceration	Clinical evaluation of pelvic floor myodynamia	Simple Random sampling of 106 primigravida mothers	Randomized controlled trial	The statistical analysis indicated that there was no significant difference observed in the mode of delivery (i.e., cesarean and vaginal) between the two groups ($\chi^2 = 3.446$, $p = 0.076$), as well as in perineal laceration rate or episiotomy rate ($p > 0.05$). However, the study findings demonstrated enhanced pelvic floor myodynamia in the intervention group at both 6 weeks and 3 months post-delivery ($p < 0.005$)	The intervention improved postpartum pelvic floor muscle strength. However, the delivery mode and rates of episiotomy and perineal laceration remains unknown.
7. Dias LA et al. ¹⁷ (2011)	"Effects of Antenatal Pelvic Floor Muscle Training on Labor and Newborn Outcomes"	Brazil	Gestational age at birth, type of labor, duration of the second stage of labor, total time of labor, prevalence of laceration, newborn weight, Apgar score	Vaginal squeeze pressure measurement by Peritron perinometer, medical records	Random allocation of 42 primigravida pregnant women	Randomized controlled trial	There were no significant differences between groups in gestational age, type or duration of labor, laceration prevalence, baby weight/size, or Apgar score. Additionally, pelvic floor muscle strength showed no correlation with the	Pelvic floor muscle training or strength did not affect labor and newborn outcomes.

							duration of labor stages.	
8. Goda AA et al. ¹⁰ (2015)	“Effect of pelvic floor muscle exercise training protocol for pregnant woman during 3rd trimester on labor duration”	Egypt	Cervical dilatation, effacement, station, duration of 1st, 2nd, and 3rd stages of labor.	Structured interviewing tool, pelvic floor muscles strength assessment, antenatal follow up checklist, partograph.	Convenience sample of 100 pregnant women.	Quasi-experimental non-equivalent control study.	Statistically significant differences were observed between the two groups regarding cervical dilatation rate ($p=0.004$), and labor progression in terms of effacement and station, with statistically significant differences noted ($p=0.001$, $p=0.035$). The study group exhibited shorter durations for the first, second, and third stages of labor compared to the control group, with a statistically significant difference between them ($p<0.05$).	Pelvic floor muscle training exercise during pregnancy improves labor progress.
9. Dönmez S and Kavlak O. ¹² (2015)	“Effects of perineal massage and the Kegel exercises practiced before childbirth on episiotomy rate”	Turkey	Episiotomy rates, laceration, and perineal pain at 24 hours and 15 days postpartum.	REEDA Scale	Random selection of 101 pregnant women.	Randomized controlled study.	Significant statistical difference was observed between the study and control groups concerning episiotomy rates, lacerations, postnatal perineal pain at both 24 hours and 15 days, as well as improvement ($p<0.05$).	Perineal massage and Kegel exercises significantly contribute to maintaining perineal integrity.
10. Yetişkin G and Kaya D H. ¹⁶ (2022)	“The effect of pelvic floor muscle exercises applied during pregnancy on Genito-pelvic pain level in postpartum period”	Turkey	Genito-pelvic pain levels	Descriptive Form, Verbal Category Scale, Pelvic Floor Distress Inventory-20, Labor and Postpartum Information Form	60 pregnant women	Randomized clinical trial	Genito-Pelvic Pain level during pregnancy and postpartum significantly decreased compared to those in the control group ($p<0.01$). Additionally, the Pelvic Floor Distress Inventory-20 total score and	Pelvic floor exercises prevent the development of pelvic floor disorders and reduce genito-pelvic pain.

							sub-dimension scores of the experimental group were significantly lower than those of the control group ($p < 0.01$). Moreover, a statistically significant difference ($p < 0.01$) was observed in the postpartum 72-hour findings of the experimental group	
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4. Discussion

The systematic review presented in this paper consolidates findings from various studies investigating the impact of pelvic floor interventions, particularly pelvic floor muscle exercises, on maternal outcomes during pregnancy and labor. The review provides valuable insights into the efficacy of these interventions in promoting maternal well-being and reducing the risk of complications associated with childbirth.

One of the key findings of this systematic review is the positive effect of pelvic floor interventions on the duration of labor. Studies by El-Sayed et al. and Elsebeiy FI demonstrated significant improvements in the duration of labor stages among women who practiced Kegel exercises or underwent prenatal perineal massage. These findings suggest that pelvic floor interventions may contribute to more efficient labor progression, potentially reducing the overall duration of labor. Moreover, the review highlights the role of pelvic floor interventions in reducing the rates of episiotomy and perineal trauma during childbirth. Several studies, including those by Ali HAF, Leon-Larios et al., and Dönmez S, reported lower rates of episiotomy and perineal tears among women who engaged in pelvic floor exercises. These findings are particularly significant as perineal trauma can lead to long-term complications such as urinary and fecal incontinence, emphasizing the importance of preventive measures during childbirth.

Additionally, the review underscores the potential of pelvic floor interventions to enhance pelvic floor muscle strength. Studies by El-Shamy and Abd El Fatah, as well as Wang X et al., reported significant increases in pelvic floor muscle strength among women who participated in pelvic floor muscle training programs. Strengthening the pelvic floor muscles not only improves maternal outcomes during childbirth but also reduces the risk of pelvic floor dysfunction and associated complications postpartum.

Furthermore, the review discusses the impact of pelvic floor interventions on the mode of delivery. While some studies found a significant correlation between pelvic floor muscle strength and the likelihood of vaginal delivery, others did not observe a significant difference in the mode of delivery between intervention and control groups. However, the overall trend suggests that pelvic floor interventions may contribute to overall pelvic floor health, potentially influencing the mode of delivery and subsequent pregnancies.

Lastly, the review highlights the role of pelvic floor exercises in reducing postpartum pain and discomfort. Studies by Yetişkin and Kaya and El-Sayed et al. reported significant decreases in genito-pelvic pain levels among women who performed pelvic floor muscle exercises during pregnancy and the postpartum period. These findings emphasize the importance of incorporating pelvic floor exercises into prenatal care to promote better postnatal recovery and maternal well-being.

5. Conclusion

This systematic review provides compelling evidence supporting the efficacy of pelvic floor interventions, particularly pelvic floor muscle exercises, in improving maternal outcomes during pregnancy and labor. The findings underscore the importance of incorporating these interventions into routine prenatal care to promote maternal well-being and reduce the risk of complications associated with childbirth. Further research is warranted to explore the long-term effects of pelvic floor interventions on maternal health and to identify optimal strategies for implementation in clinical practice.

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