Fisioter Bras. 2023;24(6):896-907
doi: 10.33233/fb.v24i6.5534

ORIGINAL ARTICLE

The influence of muscle variables on delivery route after perineal preparation in primiparous women

Influência das variáveis musculares na via de nascimento após preparação perineal em primíparas

Leticia Rodrigues Silva, Natasha Morena Bazílio Silva, Alana Leandro Cabral, Sissi Sisconeto de Freitas, Rogério de Melo Costa Pinto, Vanessa Santos Pereira-Baldon

Universidade Federal de Uberlândia, MG, Brazil

Received: August 21, 2023; Accepted: November 28, 2023.
Correspondence: Leticia Rodrigues Silva, leticiars22@hotmail.com

Como citar
Silva LR, Silva NMB, Cabral AL, Freitas SS, Pinto RMC, Pereira-Baldon VS. The influence of muscle variables on delivery route after perineal preparation in primiparous women. Fisioter Bras. 2023;24(6):896-907. doi: 10.33233/fb.v24i6.5534

Abstract

Introduction: Many pregnant women seek vaginal delivery, as a healthier and more respectful mode of delivery, and perineal massage and instrument-assisted perineal stretching techniques aim to bring better postpartum outcomes. Despite this, some deliveries may not occur as expected and conclude with interventions or surgical delivery. *Objective*: To analyze the influence of muscle variables on the mode of delivery of women undergoing perineal preparation. *Methods*: This is a secondary analysis of a clinical trial in which primiparous women with a gestational age of 33 weeks were included. Evaluations were performed before and after eight intervention sessions using perineal massage and stretching assisted by the Epi-No Delphine Plus® instrument. Perineal distensibility muscle variables were evaluated using the Epi-No Delphine Plus® equipment and the peak and mean strength of pelvic floor muscles (PFM) using the PeritronTM vaginal manometer. After delivery, the method of delivery performed was determined by telephone contact. For statistical analysis, univariate logistic regression was performed with a significance level of 0.05. *Results*: Sixty-one primiparous women

were included in the study (mean age: 30 years; SD: 4.8). None of the muscle variables examined were predictors for vaginal delivery (p > 0.05). *Conclusion*: Muscle variables did not influence the final delivery route of women undergoing perineal preparation.
Keywords: cesarean section; natural childbirth; pelvic floor; perineum; physical therapy specialty.

Resumo

Introdução: Muitas gestantes buscam o parto vaginal, como uma via mais saudável e respeitosa, e as técnicas de massagem perineal e alongamento perineal assistido por instrumento tem como objetivo trazer melhores desfechos no pós-parto. Apesar disso, alguns partos podem não ocorrer como o esperado e finalizarem com intervenções ou parto cirúrgico. *Objetivo*: Analisar a influência das variáveis musculares no tipo de parto de mulheres submetidas a preparação perineal. *Métodos*: Trata-se de uma análise secundária de um ensaio clínico em que foram incluídas primíparas com idade gestacional de 33 semanas. Foram realizadas avaliações antes e após oito sessões de intervenção por meio de massagem perineal e alongamento assistido pelo instrumento Epi-No Delphine Plus®. Foram avaliadas as variáveis musculares distensibilidade perineal com uso do equipamento Epi-No Delphine Plus® e a força pico e média dos músculos do assoalho pélvico (MAP) por meio do manômetro vaginal Peritron. Após o parto foi questionado por contato telefônico o tipo de parto realizado. Para a análise estatística foi realizada a regressão logística univariada com nível de significância de 0,05. *Resultados*: Sessenta e uma primíparas foram incluídas no estudo (média de idade: 30 anos; DP: 4,8). Nenhuma das variáveis musculares examinadas foram preditores para o parto vaginal (p > 0,05). *Conclusão*: As variáveis musculares não influenciaram na via de parto final de mulheres submetidas a preparação perineal.
Palavras-chave: assoalho pélvico; Fisioterapia; parto normal; períneo; cesárea.

Introduction

In recent years, many women have sought the vaginal route, with the minimum of interventions, as a more respectful, healthy, and faster recovery mode of birth [1,2]. For the baby to pass through the vaginal route, the pelvic floor musculature (PFM) must stretch approximately 2.5 times its original size, which can result in perineal trauma [3]. Thus, to improve the delivery experience, perineal preparation techniques have been developed, such as perineal massage and instrument-assisted perineal stretching, aiming for better childbirth and postpartum outcomes [4,5]. These techniques aim to reduce muscle endurance and improve extensibility, allowing perineal tissue to expand more easily during the baby's passage [5,6].

However, even with the preparation of the perineum and the desire of the pregnant women for the vaginal route, some deliveries may not occur as expected. Many pregnant women may undergo vaginal delivery interventions or are referred for cesarean delivery [2,7]. In view of these unexpected outcomes, some studies have identified predictive factors for delivery routes. Advanced maternal age [8], high body mass index (BMI) [9], advanced gestational age (over 40 weeks) [10] and newborn weight (over 4,500 g) [11] have been indicated as risk factors for cesarean section.

It is known that the pelvic floor (PF) muscles play a fundamental role during labor, allowing the passage of the fetus during the expulsive period [3,12]. However, little is known about the participation of variables related to the PF muscles in the final method of delivery. The extensibility of the perineal muscles seems to be extremely important during delivery, as this region needs to be able to stretch sufficiently to allow the passage of the fetus through the vaginal canal and ensure the integrity of the perineum in the postpartum period [3,12,13]. According to Zanetti *et al.* [13], a circumference larger than 20.8 cm achieved by a balloon introduced into the vaginal introitus was a predictor of perineal integrity in parturients. However, in a systematic review, the authors found no effects of the instrument-assisted perineal stretching technique on perineal outcomes at delivery [14].

PFM strength also seems to be important for labor and birth. Although some studies have reported that a strong musculature could be associated with failures in labor [15], new studies and systematic reviews reports positive effects of muscle strength [16,17]. Sobhgol *et al.* [16] found in their systematic review that antenatal PFM training may be effective in shortening labor and did not affect the instrumental delivery rate and cesarean section rate. In addition, another study showed that the strength of the pelvic floor has no negative effects on vaginal delivery [17].

Despite the influence of muscle tissue in the passage of the fetus through the birth canal, no studies have analyzed the possible contribution of muscle variables as predictors of method of delivery birth. Variables such as PFM extensibility and strength are widely discussed in the literature, but their relationship with the final outcome of the delivery route has not yet been studied. Thus, considering the importance of PFM in the vaginal delivery process and the absence of studies that analyzed the relationship between the PFM strength and extensibility with the final birth path, the objective of this study was to analyze the influence of muscle variables on the type of delivery route of women undergoing perineal preparation.

Methods

Study design

This study is a secondary analysis of an unpublished clinical trial, approved by the Ethics and Research Committee at the Federal University of Uberlândia (no. 3.402.205) and registered in the Brazilian Registry of Clinical Trials (ReBEC - no. RBR-387ntq). All study participants were informed about the procedures and signed the informed consent form.

The research was carried out at the Faculty of Physiotherapy at the Federal University of Uberlândia. Recruitment took place through dissemination on social media, totaling 65 eligible volunteers recruited for evaluation.

Inclusion and exclusion criteria

The study included women over 18 years old, gestational age of 33 weeks, primiparous, who had medical authorization to perform the intervention, and who wanted vaginal delivery.

The non-inclusion criteria were: multiple pregnancy, presence of bone deformities, important muscle and nervous disorders, presence of high gestational risk, unusual fetal position or risks that preclude vaginal delivery (placenta previa), risk of ascending infection like vaginal infection, presence of unhealed lesions in the vaginal region, presence of vaginal bleeding, presence of cervical cancer, inability to contract the pelvic floor muscles, intolerance to vaginal palpation, presence of neurological and/or cognitive disabilities that make it impossible to understand the proposed procedures, use of prenatal methods of preparing the pelvic floor before taking part in the study, and being visibly under the influence of illegal drugs or alcohol.

The volunteers who missed two consecutive interventions or who had a medical request to interrupt the sessions were excluded.

Assessments

The study participants were evaluated before and after the intervention regarding the variables perineal distensibility and PFM strength, by two trained and experienced evaluators. After delivery, telephone contact was made and the method of delivery and the type of delivery assistance performed were determined.

During the initial evaluation, the eligible pregnant women, with 33 gestational weeks, were submitted to a standard interview with questions about their urogynecological and obstetric history and their life habits. Next, in the dorsal decubitus position, with hips and knees semi-flexed and feet supported on the examination table, vaginal palpation was performed to verify if the volunteer could perform satisfactory voluntary muscle activation. Satisfactory activation was defined as a muscle contraction equal or bigger than 2 by the Modified Oxford scale.

For the measurement of PFM strength, vaginal manometry was performed, with the aid of the PeritronTM electronic manometer. The vaginal probe was initially coated with a non-lubricated condom and lubricated with a water-based gel. Then it was introduced until its center reached approximately 3.5 cm in the volunteer's vaginal introitus. The device was calibrated to zero before starting the measurements and the researcher instructed the performance of three maximal contractions, with duration of 5 seconds each, with a 30-second interval in between. The arithmetic mean of the mean values and arithmetic mean of the peak values of the three contractions were used for the statistical analysis of the manometry data.

The perineal distensibility was evaluated using Epi-No Delphine Plus® equipment (Starnerg Medical, Tecsana, Munich, Germany). The equipment was coated with a non-lubricated condom and lubricated with water-based gel, and then introduced into the volunteer's vaginal introitus so that 2 cm of the equipment base was visible. The pregnant woman was informed that she should keep the PFM relaxed throughout the procedure. The equipment was inflated to the pregnant woman's tolerance, for a 1-minute interval. After the interval, this procedure was repeated two more times and finally, the volunteer was instructed to expel the equipment, still inflated, during exhalation. With the equipment still inflated, the condom was removed, and the examiner measured the balloon at its largest circumference, using a metric tape measure [18].

Intervention

Eight interventions were performed, from the 34th to the 38th gestational week, with a frequency of twice a week. Perineal massage and instrument-assisted perineal stretching techniques were performed by two researchers experienced in the use of these techniques during pregnancy.

Initially, the perineal massage was performed for about 10 minutes. With the pregnant woman in the dorsal decubitus position, with hips and knees semi-flexed and feet supported on the examination table, the researcher introduced two fingers, lubricated with almond oil, about 3 to 5 cm into the vaginal introitus. The technique consisted of performing an internal massage in lateral semicircles, towards the anus, for 20 to 30 seconds (repeating the procedure four times). Soon after, the physiotherapist put pressure on each lateral wall of the vagina, for 2 minutes, and then down. At the end, the vagina was massaged in motion simulating the letter U [19].

Instrument-assisted perineal stretching was performed using the Epi-No Delphine Plus® device (Tecsana GmbH, Munich, Germany). For this, the equipment was coated with a non-lubricated condom and lubricated with water-based gel. With the pregnant woman still in the same position as the perineal massage, the equipment was inserted into the vaginal introitus and inflated to maximum tolerance for 15 minutes, with the device being able to be inflated again within this period. At the end, the researcher instructed the volunteer to expel the equipment during exhalation [13].

Data analysis

For the sample calculation, the Bioestat 5.0 software was used. Considering the sample size so that it can be identified, with 95% confidence (error $\alpha = 0.05$) and a test power of 80% (error $\beta = 0.20$), a significant model in logistic regression with a pseudo $R2$ significant above 23%, the minimum sample size would be 50 patients [20].

Statistical analyses were performed using the SISVAR software. The normality of the data was tested by the Shapiro-Wilk test. Univariate logistic regression was used to determine odds ratios (OR) and significant associations between muscle variables predictors and vaginal birth. The t-test was applied to compare variables between participants with vaginal and cesarean delivery. The level of significance adopted was 0.05.

Results

Sixty-five primiparous volunteers were assessed, aged between 21 and 43 years and gestational age of 33 weeks. Four pregnant women were excluded, three because they were unavailable for the visits and one for presenting a medical request for interruption (Figure 1). The 61 included volunteers were in the data analysis. Table 1 shows the sample characterization.

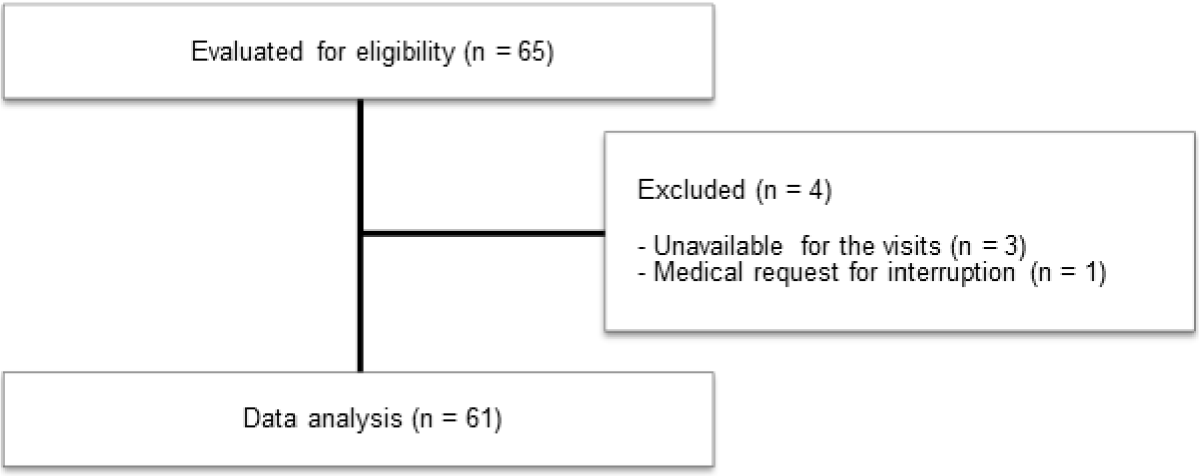

Figure 1 - *Study participants*

Table I - *Sample characterization*

Variables		Overall average
Body mass index (kg/m²)		23.6 ± 4.3
Stable union n (%)	Yes	50 (82)
	No	11 (18)
Physical activity n (%)	Yes	34 (56)
	No	27 (44)
Medical assistance n (%)	Public	23 (38)
	Private	38 (62)
Gestational age at childbirth (weeks)		39.7 ± 0.87

Regarding the mode of delivery, 31 (50.8%) of the deliveries were vaginal and 30 (49.2%) were cesarean sections. When the participants were divided by the mode of delivery, no statistically significant differences were observed between them in the initial or final muscle variables (Table II).

Table II - *Variables when the sample was divided by the type of vaginal delivery (n = 31) and cesarean section (n = 30)*

Variables	Mode of Delivery	Average	*P* value t-test
Initial peak contraction pressure	Vaginal Cesarean	35.96 ± 15.37 39.03 ± 17.28	0.466
Initial mean contraction pressure	Vaginal Cesarean	25.28 ± 10.94 26.33 ± 12.97	0.732
Initial distensibility	Vaginal Cesarean	19.01 ± 2.42 19.00 ± 2.43	0.980
Final peak contraction pressure	Vaginal Cesarean	40.98 ± 18.79 44.94 ± 24.51	0.480
Final mean contraction pressure	Vaginal Cesarean	29.48 ± 15.44 31.18 ± 19.42	0.706
Final distensibility	Vaginal Cesarean	21.54 ± 2.89 22.16 ± 2.35	0.368

Logistic regression was performed involving the predictor variables (initial and final mean contraction pressure, initial and final peak contraction pressure and initial and final distensibility) and considering vaginal delivery as the reference variable. The results showed that none of the variables analyzed demonstrated statistical significance as a predictor for the vaginal route in the initial or final muscle variables (Table III).

Table III - *Univariate logistic regression using vaginal delivery as a reference*

Variable	Odds Ratio	95% CI	P-value
Initial peak contraction pressure	0.988	0.958-1.020	0.460
Initial mean contraction pressure	0.992	0.951-1.036	0.727
Initial distensibility	1.003	0.813-1.237	0.979
Final peak contraction pressure	0.991	0.968-1.015	0.475
Final mean contraction pressure	0.994	0.966-1.024	0.701
Final distensibility	0.912	0.748-1.112	0.364

Discussion

The results of the present study demonstrate that PF muscle variables are not predictors of the vaginal route, either before or after the intervention. The importance of PFM during delivery and expulsion of the fetus is known. During delivery, the PFM act in concert with the uterine contractions and the contraction of the abdominal muscles and mold themselves around the fetal head during descent through the vaginal canal. For this action to happen, the perineal musculature is subjected to extreme stretching [3,12,21].

The flexibility of the perineal tissue is improved throughout pregnancy, thanks to hormonal changes and changes in the concentration of collagen in the PFM. There is also an increase in the length of muscle fibers, in response to the overload exerted on this musculature during the gestational period, enabling greater muscle distension during fetal passage [22,23]. Thus, the elastic capacity of the musculature to achieve the necessary stretching, in addition to assisting in the passage of the fetal head, allows vaginal delivery to happen with lower rates of perineal trauma [12,21].

It is possible that there are differences between the measurement of perineal extensibility at the end of pregnancy and that performed during labor, due to the hormonal action during the process. Zanetti *et al.* [13] evaluated the maximal distensibility of the PFM of nulliparous and multiparous parturients and concluded that a greater capacity of perineal distensibility is associated with lower rates of trauma, with the cut-off point for perineal integrity of 20.8 cm circumference of the Epi-No® equipment, same equipment used for measurement in the present study. Thus, despite not being a predictor of the route of birth, perineal extensibility seems to be important for perineal integrity after vaginal delivery. However, in this study, the relationship between distensibility and cesarean delivery was not analyzed.

The PFM strength also did not show statistical significance as a predictor for vaginal delivery. This finding is in agreement with the study carried out by Bø *et al.* [17] who showed that PFM strength and endurance did not affect cesarean rates, second stage of delivery, instrumental vaginal delivery, and third- and fourth-degree perineal trauma. Thus, the authors concluded that the ability of nulliparous women to contract or maintain maximum PFM contraction does not have negative effects on childbirth.

In addition to no harm, studies have demonstrated that strong and well-controlled muscles seem to facilitated labor and reduce the need for instrumental delivery [24,25]. The effects of antenatal PFM interventions results in improved muscle control and strong, flexible muscle, which may contribute to the descent, flexion, and rotational movements of the fetal head [16,25].

In the present study, an increase in strength and extensibility was observed in both delivery routes, after the intervention using perineal massage and instrument-assisted perineal stretching. Although not the objective of this study, the finding that the techniques can promote muscle benefits opens the way for further research on possible neural gains with the performance of perineal preparation techniques for childbirth.

This study is limited by the impossibility of having all volunteers monitored by the same medical team in the same hospital. It is known that, in Brazil, the obstetric care model still presents a scenario quite marked by medical interventions during childbirth and by high rates of operative deliveries [26], which may have influenced the route of birth. As well as the lack of standardization and consensus between the medical procedures performed during childbirth, they may also have influenced the final outcome.

Another limitation of this study is the difficulty in evaluating PFM distensibility. Pelvic floor stretching is not related to joint movement, as in other muscle groups, which makes its assessment more complex. Therefore, the Epi-No Delphine Plus® has been used by several authors, as an evaluation and measurement method of pelvic floor stretching [13,18,27].

To the authors’ knowledge, this study is the first to examine the relationship between the strength and extensibility of the AP with the final delivery route. The strengths of this study are the previous sample size calculation, few withdrawals, high adherence to the training protocol, blinded and experienced assessors, and physiotherapists trained in the use of the applied techniques.

Conclusion

Based on this study, it can be concluded that the muscle variables PFM strength and distensibility did not influence the final delivery route of women undergoing perineal preparation.

Conflitos de interesse
Nenhum

Fontes de financiamento
Este estudo foi financiado em parte pela Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG - APQ-01085-15) e pela Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) – Código de financiamento 001.

Contribuição dos autores
Concepção e desenho da pesquisa: Silva LR, Pereira-Baldon VS; *Coleta de dados*: Silva LR, Silva NMB, Cabral AL, Freitas SS; *Análise e interpretação dos dados*: Silva LR, Pinto RMC, Pereira-Baldon VS; *Análise estatística*: Silva LR, Pinto RMC, Pereira-Baldon VS; *Redação do manuscrito*: Silva LR, Pereira-Baldon VS; *Revisão crítica do manuscrito quanto ao conteúdo intelectual importante*: Silva LR, Silva NMB, Cabral AL, de Freitas SS, Pinto RMC, Pereira-Baldon VS

References

1. World Health Organization. Who recommendations on intrapartum care for a positive childbirth experience. World Health Organization; 2018. [Internet]. [cited 2020 Sep 24]. Available from: https://www.who.int/reproductivehealth/publications/intrapartum-care-guidelines/en/
2. Arik RM, Parada CMGL, Tonete VLP, Sleutjes FCM. Perceptions and expectations of pregnant women about the type of birth. Rev Bras Enferm. 2019;72:41-9. doi: 10.1590/0034-7167-2017-0731
3. Hoyte L, Damaser MS, Warfield SK, Chukkapalli G, Majumdar A, Choi DJ. Quantity and distribution of levator ani stretch during simulated vaginal childbirth. Am J Obstet Gynecol. 2008;199:198.e1-198.e5. doi: 10.1016/j.ajog.2008.04.027
4. Beckmann MM, Stock OM. Antenatal perineal massage for reducing perineal trauma. Cochrane Database of Systematic Reviews. 2013. doi: 10.1002/14651858.CD005123.pub3
5. Kovacs GT, Heath P, Heather C. First Australian trial of the birth-training device Epi-No: A highly significantly increased chance of an intact perineum. Aust N Z J Obstet Gynaecol. 2004;44:347–8. doi: 10.1111/j.1479-828X.2004.00265.x
6. Abdelhakim AM, Eldesouky E, Elmagd IA, Mohammed A, Farag EA, Mohammed AE, et al. Antenatal perineal massage benefits in reducing perineal trauma and postpartum morbidities: a systematic review and meta-analysis of randomized controlled trials. Int Urogynecol J. 2020;31:1735–45. doi: 10.1007/s00192-020-04302-8

7. Weidle WG, Medeiros CRG, Grave MTQ, Dal Bosco SM. Escolha da via de parto pela mulher: autonomia ou indução? Cad Saúde Colet. 2014;22:46–53. doi: 10.1590/1414-462X201400010008
8. Rydahl E, Declercq E, Juhl M, Maimburg RD. Cesarean section on a rise—Does advanced maternal age explain the increase? A population register-based study. PLoS ONE. 2019;14:e0210655. doi: 10.1371/journal.pone.0210655
9. Chu SY, Kim SY, Schmid CH, Dietz PM, Callaghan WM, Lau J, Curtis KM. Maternal obesity and risk of cesarean delivery: a meta-analysis. Obes Rev. 2007;8:385-94. doi: 10.1111/j.1467-789X.2007.00397.x
10. Heffner L. Impact of labor induction, gestational age, and maternal age on cesarean delivery rates. Obst Gynecol. 2003;102:287–93. doi: 10.1016/S0029-7844(03)00531-3
11. Macrosomia: ACOG Practice Bulletin, Number 216. Obstet Gynecol. 2020;135: e18–e35. doi: 10.1097/AOG.0000000000003606
12. Mendes NA, Mazzaia MC, Zanetti MRD. Análise crítica sobre a utilização do Epi-No na gestação e parto. ABCS Health Sci. 2018;43. http://dx.doi.org/10.7322/abcshs.v43i2.1091
13. Zanetti MRD, Petricelli CD, Alexandre SM, Paschoal A, Araujo Junior E, Nakamura MU, et al. Determination of a cutoff value for pelvic floor distensibility using the Epi-no balloon to predict perineal integrity in vaginal delivery: ROC curve analysis. Prospective observational single cohort study. Sao Paulo Med J. 2015;134:97–102. doi: 10.1590/1516-3180.2014.8581009
14. Schreiner L, Crivelatti I, Oliveira JM, Nygaard CC, Santos TG. Systematic review of pelvic floor interventions during pregnancy. Int J Gynecol Obstet. 2018;143:10–18. doi: 10.1002/ijgo.12513
15. Aran T, Aran T, Osmanagaoglu MA, Kart C, Guven S, Sahin M, Unsal MA, et al. Failed labor induction in nulliparous women at term: the role of pelvic floor muscle strength. Int Urogynecol J. 2012;23:1105–10. doi: 10.1007/s00192-012-1754-7
16. Sobhgol SS. The effect of antenatal pelvic floor muscle exercises on labour and birth outcomes: a systematic review and meta-analysis. Int Urogynecol J. 2020;15. doi: 10.1007/s00192-020-04298-1
17. Bø K, Hilde G, Jensen JS, Siafarikas F, Engh ME. Too tight to give birth? Assessment of pelvic floor muscle function in 277 nulliparous pregnant women. Int Urogynecol J. 2013;2065–70. doi: 10.1007/s00192-013-2133-8
18. Freitas SS, Cabral AL, Melo CPR, Resende APM, Pereira BVS. Effects of perineal preparation techniques on tissue extensibility and muscle strength: a pilot study. Int Urogynecol J. 2018;30:951–7. doi: 10.1007/s00192-018-3793-1
19. Labrecque M, Eason E, Marcoux S, Lemieux F, Pinault JJ, Feldman P, Laperrière L. Randomized controlled trial of prevention of perineal trauma by perineal massage during pregnancy. Am J Obstet Gynecol. 1999;180. doi: 10.1016/S0002-9378(99)70260-7

20. Hair Jr JF, Black WC, Babin BJ, Anderson RE, Tatham RL. Análise multivariada de dados. Bookman; 2009.
21. Silva MET, Oliveira DA, Roza TH, Brandão S, Parente MPL, Mascarenhas T. Study on the influence of the fetus head molding on the biomechanical behavior of the pelvic floor muscles, during vaginal delivery. J Biomech. 2015;48:1600–5. doi: 10.1016/j.jbiomech.2015.02.032
22. Moccellin AS, Rett MT, Driusso P. Existe alteração na função dos músculos do assoalho pélvico e abdominais de primigestas no segundo e terceiro trimestre gestacional? Fisioter Pesqui. 2016;23:136–141. doi: 10.1590/1809-2950/14156523022016
23. Alperin M, Lawley DM, Esparza MC, Lieber RL. Pregnancy-induced adaptations in the intrinsic structure of rat pelvic floor muscles. Am J Obstet Gynecol. 2015;213:191.e1-191.e7. doi: 10.1016/j.ajog.2015.05.012
24. Salvesen, KÅ, Mørkved S. Randomised controlled trial of pelvic floor muscle training during pregnancy. BMJ. 2004;329:378–80. doi: 10.1136/bmj.38163.724306.3a
25. Du Y, Xu L, Ding L, Wang Y, Wang Z. The effect of antenatal pelvic floor muscle training on labor and delivery outcomes: a systematic review with meta-analysis. Int Urogynecol J. 2015;26:1415–27. doi: 10.1007/s00192-015-2654-4
26. Zanardo GLP, Uribe MC, Nadal AHRD, Habigzang LF. Violência obstétrica no Brasil: uma revisão narrativa. Psicol Soc. 2017;29. doi: 10.1590/1807-0310/2017v29155043
27. Nakamura MU, Sass N, Elito Júnior J, Petricelli CD, Alexandre SM, Edward Araujo Júnior E, et al. Parturient perineal distensibility tolerance assessed by EPI-NO: an observational study. Einstein. (São Paulo) 2014;12:22–6. doi: 10.1590/S1679-45082014AO2944