

Review

Antenatal perineal massage - risk of perineal injuries, pain, urinary incontinence and dyspareunia - a systematic review

Weronika Milka^a, Weronika Paradowska^a, Daria Kołomańska-Bogucka^b,
Agnieszka I. Mazur-Bialy^{c,*}

^a Student of Physiotherapy, Jagiellonian University Medical College, Krakow, Poland

^b Department of Biomechanics and Kinesiology, Faculty of Health Science, Master of Physiotherapy, Jagiellonian University Medical College, Skawińska 8, Krakow 31-066, Poland

^c Prof. UJ, Department of Biomechanics and Kinesiology, Faculty of Health Science, Jagiellonian University Medical College, Skawińska 8, Krakow 31-066, Poland

ARTICLE INFO

Keywords:

Antenatal perineal massage
Pregnancy
Episiotomy
Perineal tears
Postpartum period

ABSTRACT

Background: Natural childbirth is associated with the risk of damage to the perineum - a tears or a episiotomy. Adequate preparation of the woman for childbirth is essential to minimize the occurrence of perinatal injuries. **Aim:** The aim of the review is to assess and analyze the impact of APM (antenatal perineal massage) on perinatal perineal injuries and the development of pelvic pain and other complications in postpartum women, such as dyspareunia, urinary (UI), gas (GI), and fecal incontinence (FI).

Methods: PubMed, Web of Science, Scopus and Embase were searched. Three authors independently searched databases and selected articles for inclusion and exclusion criteria. Next one author did Risk of Bias 2 and ROBINS 1 analyze.

Findings: Of 711 articles, 18 publications were left for the review. All 18 studies examined the risk of perineal injuries (tearing and episiotomy), 7 pain in postpartum period, 6 postpartum urinary, gas/fecal incontinence and 2 described dyspareunia. Most authors described APM from 34 weeks of pregnancy until delivery. There were different techniques and times for doing APM procedures.

Discussion: APM has many benefits for women during labor and the postpartum period (e.g. lower rate of perineal injuries and pain). However, it can be observed that individual publications differ from each other in the time of massage, the period and frequency of its performance, the form of obtaining instruction and control of patients. These components may affect the results obtained.

Conclusion: APM can protect the perineum from injuries during labor. It also reduces risk of fecal and gas incontinence in postpartum period.

Introduction

Intrapartum perineal tear, depending on the extent of the injury, has been divided into four degrees, with the 3rd and 4th including injury of anal sphincters complex and ano-rectal mucosa, respectively [1]. It is estimated that more than 85% of women have suffered perineal damage after vaginal childbirth, 3rd and 4th degree are 0.6–11% of them [2]. Risk factors for perineal injuries include: primogeniture [3], increasing maternal age [4], operative delivery - forceps, vacuum extraction [5], fetal macrosomia [6], prolonged duration of second stage of labor [7], position during labor [8].

Perinatal injuries can cause short- and long-term complications [9]

such as: bleeding, pain, infections [10]. It may also result in problems with incontinence [11], pelvic organs prolapse [12], self-esteem disorders [13] and fear of pregnancy/delivery [14].

In order to reduce spontaneous injuries, were proposed surgical incisions of perineum [15]. The purpose of episiotomy is to enlarge the vaginal opening [16], protect tonus of perineum, prevent unwanted vaginal tears, facilitate delivery [17]. Nevertheless, a Cochrane analysis indicates that performing routine episiotomy to prevent severe trauma is not warranted and no benefit to mother or baby can be identified [18]. What is more there is an option to reduce rate of episiotomies by perineal massage during labor also [19]. Unfortunately, available data indicate the incidence of episiotomy can range from 100% (China) [20],

* Corresponding author.

E-mail address: agnieszka.mazur@uj.edu.pl (A.I. Mazur-Bialy).

<https://doi.org/10.1016/j.jogoh.2023.102627>

Received 21 April 2023; Received in revised form 30 June 2023; Accepted 3 July 2023

Available online 4 July 2023

2468-7847/© 2023 The Authors. Published by Elsevier Masson SAS. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

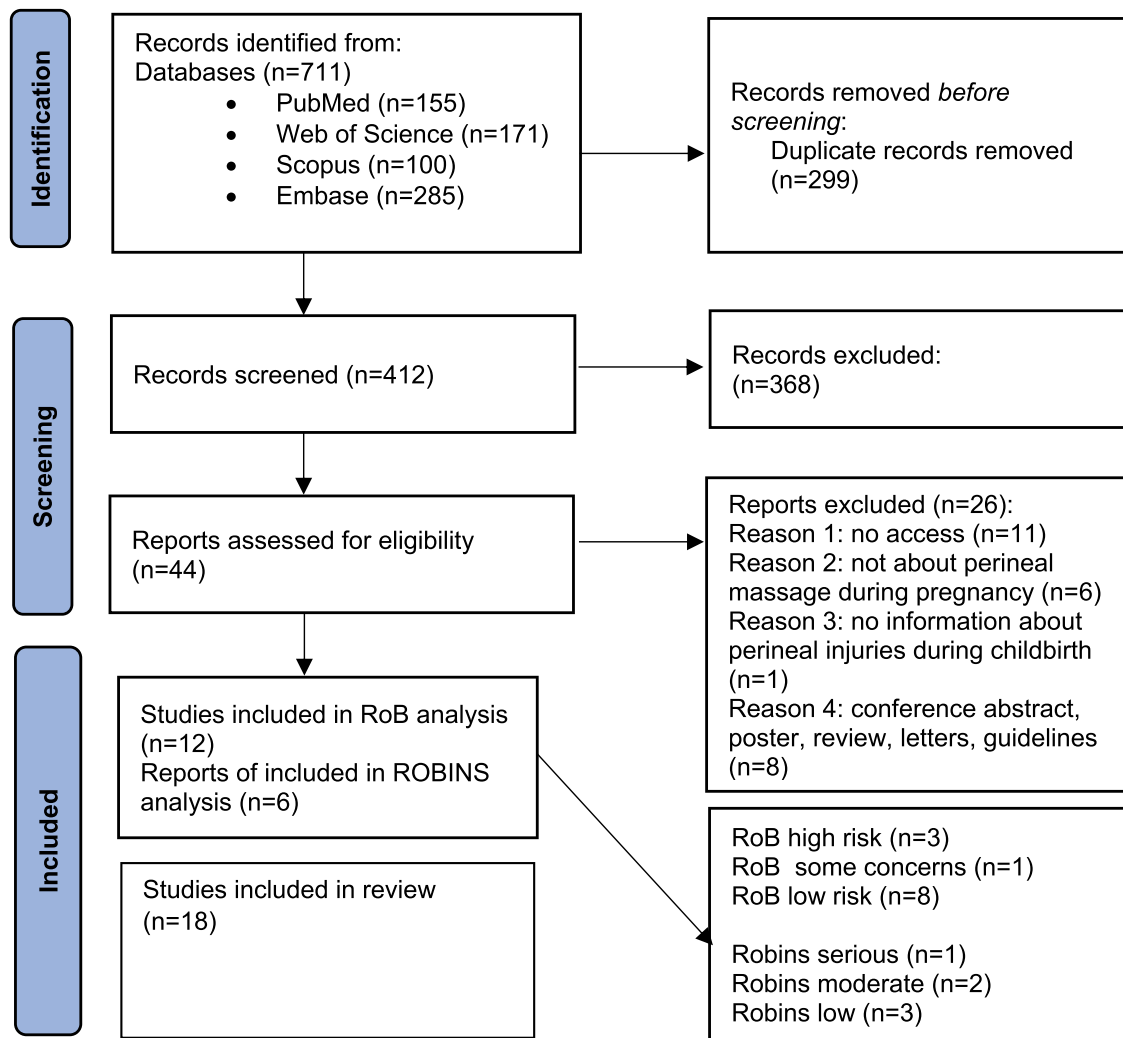


Fig. 1. PRISMA flow diagram of selection study.

94,5%–93,3 (Cambodia, Turkey) [21,22] to 4.9–8.4% (Denmark, Sweden, Iceland) [23].

The risk of injuries can be minimized by preparing pregnant woman for labor, e.g. learning to push, birthing positions, antepartum perineal massage (APM) [11,24]. APM relaxes the pelvic floor muscles (PFM) and improves blood flow. So as the APM can prepare tissues to labor, women who did it during pregnancy may have less perineal injuries, e.g. episiotomies [25]. It also reduces persistent perineal pain [25], leads to shortening second phase of labor, improve tissue regeneration and parameters of the newborn on APGAR scale [26]. If long-term consequences of delivery are considered, APM can minimize postpartum complications such as anal incontinence and can help in better wound healing also [26]. However, the prevention of perineal injuries can also include training of PFM during pregnancy [27] and instrumental techniques of stretching soft tissues, e.g. using the EPI-NO device [28]. In addition, research indicates that perineal flexibility can be increased during childbirth - the midwife performs an internal perineal massage or applies warm compresses [29]. Biana et al. [30] also recommend warm baths, electrostimulation, positions using balls, breathing techniques. They point out that appropriate actions preparing the body for childbirth should be implemented already during pregnancy, e.g. APM, pelvic floor muscle exercises (PFME), group classes for pregnant women [30].

In recent years, there has been a discussion on the necessity and consequences of perinatal episiotomy, which prompts reflection by many specialists, so we believe that it is necessary to update the state of

knowledge in this area. The CNGOF guidelines established that perineal massage during pregnancy can minimize the rate of episiotomy, and postpartum perineal pain. This publication also underlined the need of encouraging all women who want to do the perineal massage in pregnancy [31]. The aim of the review is to assess and analyze the impact of APM on perinatal perineal injuries and the development of pelvic pain and other complications in postpartum women, such as dyspareunia. We also want to establish the effect of APM on UI, GI and FI.

Materials and methods

The review was conducted in the following databases: PubMed, Web of Science, Scopus and Embase. Only publications in English concerning APM in pregnancy were considered. Articles had to be published by June 2023, there was no lower limit for the publication date. All results were exported to an Excel file, duplicates were removed after searching all databases. The following keywords were used: „antenatal perineal massage OR perineal massage OR digital perineal massage OR perineum massage OR antepartum massage AND (muscle OR pelvic floor OR pelvic OR episiotomy OR tearing OR injury OR pregnancy OR quality of life OR trauma OR risk OR compliance OR pain OR postpartum OR VAS OR questionnaire OR urinary incontinence OR gas incontinence OR fecal incontinence OR dyspareunia OR sexual dysfunction)”. The review was registered in PROSPERO database (protocol number CRD42023388949).

The inclusion criteria were: studies involving pregnant and/or postpartum women who performed APM and delivered vaginally, information about perineal tear/episiotomy, an assessment of pelvic pain/problems with incontinence/sexual dysfunctions. We qualified randomized, randomized, comparative and observational studies in English. The following elements were included in the exclusion criteria: not perform APM during pregnancy or despite APM, there was no information about perineal tears or episiotomy. Non-English articles, reviews, conference abstracts, letters to the editor, chapters in a book, dissertations were also rejected.

The inclusion criteria were based on the Participant-Intervention-Comparator-Outcomes-Study design (PICOS) format:

Participants: pregnant or postpartum women over 18 who gave birth vaginally. We excluded studies that did not involve pregnant or postpartum women, in which delivery was by cesarian section, or participants were under 18 years of age.

Intervention: APM performed independently/by a partner/specialist, APM combined with other procedures

Comparison: no intervention, comparison with another physiotherapeutic method, physical activity.

Outcomes: assessment of perinatal perineal injuries after APM - by medical personnel. Perineal pain - immediately after childbirth, during the postpartum period, VAS, VRS scale, verbal scale, e.g. no pain, medium, high, unbearable. Assessment of urinary/gas/fecal continence problems - proprietary questionnaire, standardized scales, e.g. KHQ, manometers, sonographic. Sexual dysfunctions - postpartum period, VAS scale, original questionnaires, ICIQ scales.

Study design: publications in English, no restrictions related to the type of study.

The review of the publication was conducted by three researchers. Searches were performed independently, then one researcher compared the results obtained and, if there were misunderstandings, consultations were carried out. After removing the duplicates, the first review of the articles was started. Publications were evaluated based on their titles and abstracts. Articles that met the inclusion criteria were left to be read in full. In the next step, using the Risk of Bias 2 tool available on the Cochrane platform, a Risk of Bias analysis was conducted. The answers obtained lead to the assessment of the publication: low risk of bias, some concerns, high risk of bias [32]. Non-randomized articles were evaluated using the ROBINS-I tool. The final results were classified as: low, moderate, serious, critical [33]. RoB-2 and ROBINS-I tool was performed by one researcher, however, doubts were consulted with other authors.

Results

The search identified 711 publications. After removing duplicates, 412 articles remained. 368 papers were rejected on the basis of titles and abstracts. After applying the inclusion and exclusion criteria, 18 publications were left for analysis. The reasons for rejection: lack of access to the full version ($n = 11$), publication did not concern APM during pregnancy ($n = 6$), lack of information on perineal injuries ($n = 1$), conference abstract, poster, review, recommendations ($n = 8$). 12 publications were finally qualified for the Risk of Bias analysis (Fig. A1), and 6 articles for the ROBINS-I analysis (Table A1). The exact characteristics of the analysis of publications in RoB-2 and ROBINS-I-tool can be found in Appendix A. We finally included all the analyzed papers in the review - PRISMA diagram (Fig. 1).

Antepartum perineal massage

APM is an element of physiotherapy that prepares a woman for natural childbirth [26]. In a study by Álvarez-González et al. [11] APM was performed from the 34th week of pregnancy until delivery. Pregnant women practiced it alone or with a physiotherapist. In the self-massage group, APM lasted about 10 min, at least twice a week. The group working with a physiotherapist received 6–10 sessions of 30 min

each. Self-massage was divided into external (semicircular movement on both sides of the vaginal vestibule, pressing the central part of the perineum) and internal work. In the internal massage, sliding movements were performed on both sides of the vagina, especially pressing strongly tense points. The massage was completed by stretching the tissues with one finger placed in the vagina and the other outside. In the group working with a physiotherapist, APM looked similar, however, the number of movements performed was precisely defined: external work - semicircular drainage along the vestibule of the vagina, pumping - 5 repetitions in 3 series. In the internal massage, rubbing of the levator ani was performed (5 repetitions, 3 series) and compression of the pelvic diaphragm trigger points, ending with stretching of the places exposed to episiotomy. The EPI-NO device was then used. The work with the pregnant woman was completed by loosening the external tissues of the perineum - 3 sets of 5 repetitions [11]. Identical techniques were used in the second paper by this author [34]. Also Cabral et al. [35] suggested performing massage from the 34th week of pregnancy. The physiotherapist started APM with circular movements on the vulva and the middle of the perineum. Then, semicircular movements were performed on the inner walls of the vagina (4 times on each side, 30 s) and compressions (entering the vagina, down to the center of the perineum - 2 min). The work was finished by massaging the lower half of the vagina - the finger was moved along the shape of the letter "U". The whole lasted 10 min, sessions were held twice a week, a total of 8 sessions [35]. In turn, in a study by de Freitas et al. [28] women from the 33rd week of pregnancy participated in APM sessions with a physiotherapist twice a week for 4 weeks. In the first stage of APM, external tissues were developed - semicircular movements - the vulva, around the vagina, the tendon center of the perineum. In the second stage, the physiotherapist introduced his fingers into the patient's vagina to a depth of about 4 cm - movements along the side walls of the vagina and towards the anus - rubbing, pressure - four times on each side, pressure about 30 s. Compression of the vaginal entrance - 2 min. At the end, a massage of the vaginal walls was performed, moving in the shape of the letter "U" [28].

In other studies, APM was limited only to internal techniques. In the publication by Bodner-Adler et al. [36] massage was started 6 weeks before delivery. Pregnant women applied pressure with their fingers along the internal entrance to the vagina. The massage lasted 5–10 min, 3–4 times a week [36]. However, in the study by de la Cueva-Reguera et al. [37] APM was performed by pregnant women once a week for 20 min. The massage consisted of downward and sideways movements along the inner walls of the vagina [37]. In a study by Labrecque et al. [38–40] pregnant women performed APM independently from the 34th/35th week of pregnancy, for 5–10 min. Also, only internal techniques were used, which consisted of maintaining pressure for 2 min on each side of the vaginal entrance [38–40]. Also Kiremitli et al. [41] recommended practicing APM for pregnant women from the 34th week of pregnancy, every day, for 10 min. It consisted of the internal stretching of tissues in the shape of the letter 'U' (from 3 to 9 o'clock) [41]. Similarly, in the study by Mei-dan et al. [42] APM was performed by pregnant women from the 34th week, every day, for about 10 min. Nevertheless, the massage consisted of inserting the thumbs into the vagina (2–3 cm deep) and gently pressing down and moving both sides. Stretching was to be performed until a burning or tingling sensation was felt, then patients were to hold pressure for 1 min [42]. Similar techniques were used in the article by Monguilhott et al. [43]. APM was also practiced by women in the 34th week of pregnancy. It was recommended to massage the inside of the vagina for 5–10 min a day until delivery. During the massage, 1–2 fingers were inserted into the vagina to a depth of 3–4 cm, and compressions were made in the lower and lateral directions for 2 min each [43]. Also in the study by Takeuchi et al. [44] pregnant women (from 34 weeks) were asked to perform APM for 5–10 min, 3–4 times a week. In turn, Ugwu et al. [45] recommended practicing APM from 34/36 weeks of pregnancy until delivery. The massage was done by inserting two fingers into the vagina to a depth of 3–5 cm, the fingers were moved down and to the sides, until the feeling

Table 1
Characteristics of publications qualified for the review.

Author	Type of study	Participants	Intervention	Inclusion criteria	Exclusion criteria
Álvarez-González et al. (2021) Spain [11]	A Non Randomised Controlled Trial	90 women, Exp1: 30 Exp2: 30 Con: 30	In both groups - therapies from 34 wg to delivery Exp1: 6–10 APM sessions performed by a physiotherapist, each 30 min (weekly), EPI-NO practice after massage, external manual techniques Exp2: self-APM (10 min, min. 2x a week) Con: standard care	Age 18–40, 34 wg, term delivery (37 weeks or later), singleton pregnancy, cephalic position, no pregnancy complications, no other interventions, birth planning in Nuestra Señora de Sonsoles (Spain)	Contraindications to VD and APM, urogynecological dysfunctions before pregnancy, previous CS and perineal injuries, no consent to participate in the study, no attendance at therapeutic and assessment sessions
Álvarez-González et al. (2022) Spain [34]	Controlled Clinical Trial	81 women Exp1: 27 Exp2: 27 Con: 27	In both groups - therapies from 34 wg to delivery Exp1: 6–10 APM sessions with a physiotherapist (30 min, once a week), EPI-NO stretching, external manual techniques Exp2: self-APM (10 min, min. 2x a week) Con: standard care	Age 18–40, 34 wg, term delivery (37 weeks or later), singleton pregnancy, no pregnancy or delivery complications, no other interventions, consent to participate in the study, birth planning in Nuestra Señora de Sonsoles (Spain)	Contraindications to APM, pelvic and perineal dysfunctions before pregnancy, previous CS, UI before delivery (ICIQ-SF diagnosis)
Bodner-Adler et al. (2002) Austria [36]	Controlled Clinical Trial	531 women Exp: 121 Con: 410	Exp: APM - 6 weeks before the due date of delivery, 5–10 min, 3–4 times a week. Con: no intervention	Nulliparous women, VD planning, singleton pregnancy, cephalic fetal position	No information
Cabral et al. (2022) Brazil [35]	A Randomized Controlled Study	96 women Exp1: 24 Exp2: 24 Exp3: 24 Exp4: 24	Therapies performed twice a week from 34 wg, all techniques were performed by a physiotherapist Exp1: APM (10 mins) Exp2: Instrumental perineum stretch (15 min) Exp3: APM (10 min), Instrumental perineum stretch (15 min) Exp4: APM (10 min), instrumental stretching of the perineum (4 × 30 s each - 2 min total)	Women at 33 wg, 18 to 40 years of age, primiparas or women with previous pregnancies ending before 21 wg, ability to voluntarily contract PFM, force > 1 on the Oxford scale	No attendance at 2 consecutive therapies, intimate infection, termination of pregnancy before the last stage of the study
de Freitas et al. (2019) Brazil [28]	A Randomized Controlled Study	20 women Exp1: 10 Exp2: 10	In both groups, therapy: 2x a week, for 4 weeks (8 sessions), from 34 wg Exp1: APM performed by a physiotherapist, approx. 10 min Exp2: instrumental stretching of the perineum - EPI-NO, 15 min	Age 18–40, at 33 wg, nulliparous or termination of previous pregnancies before 21 wg, ability to activate MDM (MDM strength > 1 on the Oxford scale)	Absence from 2 consecutive sessions, urinary tract infections during pregnancy, termination of pregnancy before the last stage of the study
de la Cueva-Reguera et al. (2020) Spain [37]	A Randomized Controlled Study	49 women Exp1: 30 Exp2: 19	Exp1: APM (once a week, 20 min) Exp2: manual lymphatic drainage of the vagina (20 min), labia majora, suprapubic and inguinal areas (5 min), 1x a week Exp1 + Exp2: conventional therapy (from 25 wg to delivery, 5x a week, PFMT - 8–12x, 2 sets, tension 6–8 s; compression stockings 6 h a day)	Multiparous, from 18 years old, diagnosis of gestational edema in the 2nd trimester of pregnancy	Planned CS, pre-pregnancy genital prolapse, infection or disease, previous preterm or premature birth, neuromuscular disorder, epidural, instrumental delivery
Dieb et al. (2020) Egypt [46]	A Randomized Controlled Study	400 women Exp: 200 Con.: 200	Exp: educational program + APM (4 min, 3–4x a week or 10 min, 1x a week - from 34 weeks + PFMT (8–12x, 3 sets, tension max. 8 s, relaxation 8 s, holding the stream of urine during micturition) Con: Educational program (micturition, stimulants, diet, perineal control)	Pregnant women > 35 years of age, nulliparous or multiparous women	Problems with chronic constipation and cough, past or present UI/GI, pre-pregnancy prolapse, neuromuscular or connective tissue disorders, diseases, history of premature or premature birth, PROM, intimate infections, multiple pregnancy, previous CS, epidural anesthesia, instrumental delivery
Eogan et al. (2006) Ireland [48]	A Randomized Controlled Study	179 women Exp: 100 Con: 79	Exp: APM, from 34 weeks, 5 min, daily, massage performed alone or by a partner Con: no intervention	Nulliparous, 34 wg	No information
Kiremitli et al. (2022) Turkey [41]	A Randomized Controlled Study	173 women Exp1: 55 Exp2: 59 Con: 59	Exp1: APM, 10 min per day from 34 wg to birth Exp2: massage, when the cervical dilation was min. 4 cm - 4x, last time the cervix was fully dilated, approx. 10 min Con: no intervention	Nulliparas, age 20–35, delivery at 37–42 wg	No information

(continued on next page)

Table 1 (continued)

Author	Type of study	Participants	Intervention	Inclusion criteria	Exclusion criteria
Labrecque et al. (1999) Canada [38]	A Randomized Controlled Study	1034 pregnant women who have not given birth through VD before Exp1: 519 Con1: 515 493 women with previous VD Exp2: 246 Con2: 247	Exp1 + Exp2.: APM (daily, time 10 min, from 34/35 weeks to birth) Exp1 + Exp2 + Con1 + Con2: written and oral information on the prevention of perinatal perineal injuries	Pregnant women, patients of one of the five university hospitals in Canada, pregnant women who have previously given birth or not via VD, performed an USG or blood test in the 3rd trimester of pregnancy	High risk of CS, previous CS due to cephalopelvic disproportion, multiple pregnancy, placenta praevia, severe fetal growth restriction, non cephalic position, preeclampsia, non-participating physicians, genital herpes, other reasons including lack of French language skills or English, not understanding the instructions, already performing APM
Labrecque et al. (2000) Canada [39]	A Randomized Controlled Study	572 pregnant women who had not previously given birth via VD Exp1: 283 Con1: 289 377 women with previous VD delivery Exp2: 187 Con2: 190	Exp1 + Exp2: APM, 5–10 mins per day, from 34/35 by birth Exp1 + Exp2 + Con1 + Con2: written and oral information on the prevention of perinatal perineal injuries	A detailed description in the study by Labrecque et al. (1999) [43]	A detailed description in the study by Labrecque et al. (1999) [43]
Labrecque et al. (2001) Canada [40]	Observational Study	684 women rated the perineal massage during pregnancy (responders), 79 did not give such an assessment (non-responders)	APM from 34/35 wg until childbirth, 5–10 min a day	A detailed description in the study by Labrecque et al. (1999) [43]	A detailed description in the study by Labrecque et al. (1999) [43]
Leon-Larios et al. (2017) Spain [27]	A Randomized Controlled Study	466 women Exp: 254 Con: 212	Exp: leaflet with APM/PFE + instruction from a specialist. APM - by yourself/by your partner, from 32 pm until birth, 8 min, daily. PFE - 2x a day, from 32 g, 10–15 voluntary PFM contractions (5 s each) + relaxation, PFE with lift visualization, 10–15 min, 2x a day Con: no intervention	Single pregnancy, cephalic fetal position, planned delivery (without complications) in a public hospital, speaking and writing Spanish, consent to participate in the study	Probability of CS
Mei-dan et al. (2008) Israel [42]	Prospective Controlled Study	234 women Exp: 128 Con: 106	Exp: APM, 10 min, daily, from 34 weeks Con: no intervention Midwives, if necessary, could perform perineal massage during labor in both groups.	Primiparous women, 30–34 wg, planning VD in the indicated hospital	Previous perineal surgery, multiple pregnancies, use of other perineal massage oils, communication problems, CS delivery
Monguilhott et al. (2022) Brazil [43]	A Randomized Controlled Study	88 women Exp.: 44 Con.: 44	Exp.: APM (from 34 wg to the day of delivery, 5–10 min, daily) Con.: standard care	Single pregnancy with a physiological course, no age restrictions, pregnancy from ≤ 35 wg, decision VD, willingness to perform APM every day, speaking and writing Portuguese, understanding the instructions for APM	Fetal death, fetus weighing ≥ 4000 g or suspected cephalopelvic disproportion, CS planning, almond oil allergy, current APM
Shipman et al. (1997) United Kingdom [47]	A Randomized Controlled Study	681 women Exp.: 332 Con.: 349	Exp: APM (3–4 times a week, duration 4 min, from the 6th week before the planned birth) Exp + Con: PFE (4 exercises as instructed on the leaflet performed within an hour of waking up)	Nulliparous women, visit to the of midwife between 29 and 32 wg	Multiple pregnancy, planned CS, previously performed perineal massage, premature birth, medical conditions requiring hospitalization, allergy to nuts and products containing them, lack of knowledge of English in speech and writing
Takeuchi et al. (2016) Japan [44]	A Randomized Controlled Study	96 women Exp1: 47 Exp2: 49	In both groups: APM from 34 weeks, 5–10 min a day, 3–4 times a week Exp1: information about the massage technique, reminding about its performance, advantages, communication possibilities, were available on the smartphone website Exp2: information leaflet with instructions for perineal massage	30–33 wg, physiological pregnancy, primiparas, speaking and writing Japanese language, possession of a smartphone	No information
Ugwu et al. (2018) Nigeria [45]	A Randomized Controlled Study	108 primiparas Exp.: 53 Con.: 55	Exp.: APM (10 min, daily, from 34/36 weeks to delivery) Con.: no intervention	Primiparas at 34–36 wg, no pregnancy complications, fetal cephalic position, no uterine contractions	Uncertainty of the due date, contraindications to VD, diseases during pregnancy, genital herpes, thrush, PROM

APM, antepartum perineal massage; Con, control group; CS, cesarean section; Exp, experimental group; FI, fecal incontinence; GI, gas incontinence; h, hour; ICIQ-SF, International Consultation on Incontinence Questionnaire-Short Form; min, minutes; PFE, pelvic floor exercises; PFM, pelvic floor muscles; PFTM, pelvic floor muscle training; PROM, premature rupture of membranes; UI, urinary incontinence; USG, ultrasound examination; VD, vaginal delivery; wg, weeks gestation.

of burning, tingling, stinging. Then, at a given point, the pregnant woman applied pressure until the tissues became numb. It was performed daily for 10 min [45]. Dieb et al. [46] suggested starting APM 4 weeks before delivery. The massage focused only on internal techniques - movements up, down and sideways. A single session lasted 5 min, and pregnant women were encouraged to have 3 sessions a week [46].

In turn, Shipman et al. [47] combined APM with daily PFME. 6 weeks before delivery, pregnant women were to start practicing APM - 3-4 times a week for 4 min [47]. APM and PFME were also combined in a study by Leon-Larios et al. [27]. Women from the 32nd week of pregnancy were recommended to perform APM - fingers were inserted into the vagina to a depth of 3-4 cm, then pressure was applied to the vaginal tissues - pressure down and to the side. PFME were performed twice a day, with a combination of tensing and relaxing phases [27]. In Eogan et al. [48] massage was performed similarly to the articles [38, 47], its duration was 5 min daily, from the 34th week of pregnancy. The massage could also be performed by the woman's partner [48]. A brief description of the selected publications is shown in Table 1.

Perineal injuries

Labrecque et al. [38] compared primiparas and multiparous women. Significant differences in the intact perineum were observed only in primiparous women with APM compared to no APM (24.3% vs. 15.1%, $p = 0.01$). The lack of injuries correlated with the number of massages performed. The protective character of APM was also observed in multiparous women, but the obtained results were not significant (34.9% vs. 32.4%, $p = 0.92$) [38]. However, similar results were not obtained among primiparous women in the study by Mei-dan et al. [42]. Also, the study by Shipman et al. [47] showed no significant effect on the reduction of the percentage of perineal tears among primiparous women. Nevertheless, women who were over the age of 30 years and practicing APM were more likely to have an intact perineum during labor than those with no massage (30.7% vs. 18.6%, $p = 0.019$) [47].

Álvarez-González et al. [11] noted that APM reduces the risk of perinatal injuries, however, it is more effective to combine with EPI-NO stretching and manual techniques. This combination allowed to reduce the risk of mild tear by 4 times, moderate and medium by 2.94 times. Similar techniques were also used in the study by Cabral et al. [35]. They showed that APM combined with short stretching resulted in the highest percentage of non-perineal injuries (PMA: 9.09%, IStrLS: 22.22%, PM+IStrLS: 20%, PM+IStrSR 33.33%) [35]. In turn, in the study by de Freitas et al. [28] women subjected to APM more often experienced perineal injuries, mainly first degree tear (71.4% vs. 40.0%), however, no significance was obtained [28]. De la Cueva-Reguera et al. [37] showed that APM is more effective in reducing perineal injuries than manual lymphatic drainage, but the results were not statistically significant (51.8% vs. 58.1%). Both procedures combined with PFME [39]. In a study by Dieb et al. [46] reported that the combination of APM with PFME significantly reduces the incidence of perineal injuries compared to no such procedures during pregnancy (13.5% vs. 21.5%, $p = 0.034$). Nevertheless, it should be noted that the PFME proposal was to stop the urinary stream during voiding [46], which is an incorrect exercise regimen [49]. Also in the study by Leon-Larios et al. [27] reported that APM and PFME resulted in a lower rate of perineal injuries compared to women in the control group (17.61% vs. 6.85%, $p < 0.003$). In the intervention group, significantly fewer third and fourth degree tears were observed (5.18% vs. 13.12%, $p < 0.001$ and 0.52% vs. 2.5%, $p < 0.001$) [27]. By contrast, Kiremitli et al. [41] observed that APM, compared to massage during labor or no intervention, is the most effective in protecting the perineum from tearing (14.4%; 5.1%, 3.4%, respectively).

In turn, in the study by Bodner-Adler et al. [36] it was observed that APM resulted in a lower risk of perineal tears, however, these differences were not statistically significant. The lack of a significant effect of APM compared to no intervention for perineal tears was also noted in the

Table 2

Perineal massage during pregnancy and the risk of perineal injuries: tearing and episiotomy.

Refs.	No. of perineal tears [n/%]	No. of episiotomy [n/%]
Álvarez-González et al. (2021) Spain [11]	Mild: Exp1.: 7 (23.3); Exp2: 7 (23.3); Con: 8 (26.7) Moderate/severe: Exp1: 1 (3.3); Exp2: 2 (6.7); Con: 4 (13.3)	Exp1: 3 (10.0); Exp2: 14 (46.7); Con: 20 (66.7)
Álvarez-González et al. (2022) Spain [34]	Mild: Exp1.: 4 (14.8); Exp2: 5 (18.5); Con: 8 (29.6) Moderate/severe: Exp1: 1 (3.7); Exp2: 2 (7.4); Con: 4 (14.8)	Exp1: 2 (7.4); Exp2: 14 (51.9); Con: 19 (70.4)
Bodner-Adler et al. (2002) Austria [36]	1st degree: Exp: 17 (14.1); Con: 64 (15.6) 2nd degree: Exp: 21 (17.4); Con: 70 (17.1) 3rd degree: Exp: 3 (2.5); Con: 22 (5.4)	Midline episiotomy: Exp: 20 (16.5); Con: 66 (16.1) Mediolateral episiotomy: Exp: 17 (14.1); Con: 45 (10.9)
Cabral et al. (2022) Brazil [35]	1st degree: Exp1: 7 (63.63); Exp2: 4 (44.44); Exp3: 1 (10.0); Exp4: 3 (12.0) 2nd degree: Exp1: 3 (27.27); Exp2: 3 (33.3); Exp3: 7 (70.0); Exp4: 5 (41.66)	No information
de Freitas et al. (2019) Brazil [28]	1st degree: Exp1: 6 (71.4); Exp2: 2 (40.0) 2nd degree: Exp1: 1 (28.6); Exp2: 1 (20.0)	No information
de la Cueva-Reguera et al. (2020) Spain [37]	Exp1: 14 (51.8); Exp2: 11 (58.1)	Exp1: 0 (0.0); Exp2: 3 (17.6)
Dieb et al. (2020) Egypt [46]	1st degree: Exp: 8 (4.0); Con: 4 (2.0) 2nd degree: Exp: 12 (6.0); Con: 19 (9.5) 3rd degree: Exp: 7 (3.5); Con: 15 (7.5) 4th degree: Exp: 0 (0.0); Con: 5 (1.3)	Exp: 59 (29.5); Con: 77 (38.5)
Eogan et al. (2006) Ireland [48]	1st degree: Exp: 12 (12.0); Con: 8 (10.1) 2nd degree: Exp: 13 (13.0); Con: 12 (15.2)	Exp: 38 (38.0); Con: 28 (35.4) Episiotomy + 3rd degree of perineal tear: Exp: 4 (4.0); Con: 1 (1.3)
Kiremitli et al. (2022) Turkey [41]	1st degree: Exp1: 5 (9.1); Exp2: 3 (5.1); Con: 1 (1.7) 2nd degree: Exp1: 1 (1.8); Exp2: 5 (8.5); Con: 3 (5.1) 3rd degree: Exp1: 1 (1.8); Exp2: 3 (5.1); Con: 7 (11.9)	Exp1: 41 (74.5); Exp2: 48 (81.4); Con: 54 (91.5)
Labrecque et al. (1999) Canada [38]	1st degree: Exp1: 60 (14.6); Con1: 77 (18.5); Exp2: 54 (23.0); Con2: 54 (22.4) 2nd degree: Exp1: 97 (23.6); Con1: 96 (23.0); Exp2: 63 (26.8); Con2: 66 (27.4) 3rd/4th degree: Exp1: 10 (2.4); Con1: 12 (2.9); Exp2: 1 (0.4); Con2: 1 (0.8)	Exp1: 111 (27.0); Con1: 129 (30.9); Exp2: 35 (14.9); Con2: 41 (17.0) 3rd/4th degree + episiotomy: Exp1: 33 (8.0); Con1: 40 (9.6); Exp2: 0 (0.0); Con2: 1 (0.8)
Labrecque et al. (2000) Canada [39]	1st degree: Exp1: 14.0; Con1: 18.4; Exp2: 23.8; Con2: 22.6 2nd degree: Exp1: 27.5; Con1: 25.9; Exp2: 26.5; Con2: 28.5 3rd/4th degree: Exp1: 8.7; Con1: 12.6; Exp2: 0.0; Con2: 0.5	Exp1: 25.3; Con1: 28.0; Exp2: 14.9; Con2: 16.7
Labrecque et al. (2001) Canada [40]	1st degree: R: 105 (17.9); NR: 9 (15.0) 2nd degree: R: 144 (24.6); NR: 16 (26.7) 3/4th degree: R: 41 (7.0); NR: 3 (5.0)	R: 135 (23.0); NR: 11 (18.3)

(continued on next page)

Table 2 (continued)

Refs.	No. of perineal tears [n/%]	No. of episiotomy [n/%]
Leon-Larios et al. (2017) Spain [27]	Severe perineal trauma: Exp: 11 (5.7); Con: 25 (15.62)	Exp: 97 (50.25); Con: 131 (81.8)
Mei-dan et al. (2008) Israel [42]	1st degree: Exp: 44 (73.3); Con: 45 (78.9) 2nd degree: Exp: 16 (26.7); Con: 11 (19.3) 3rd/4th degree: Exp: 0 (0.0); Con: 1 (1.8)	Exp: 23 (20.0); Con: 20 (18.9)
Monguilhott et al. (2022) Brazil [43]	1st degree without suture: Exp: 6 (14.0); Con: 6 (13.6) 1st degree with suture: Exp: 9 (20.9); Con: 10 (22.7) 2nd degree: Exp: 12 (27.9); Con: 20 (45.5)	Exp: 1 (2.3); Con: 1 (2.3)
Shipman et al. (1997) United Kingdom [47]	Intact perineum, 1st degree of perineal tears, nonperineal lacerations: Exp: 87 (24.9); Con: 103 (31.0) 2nd/3rd degree of perineal tears + episiotomy: Exp: 263 (75.1); Con: 229 (69.0)	
Takeuchi et al. (2016) Japan [44]	1st degree: Exp1: 3 (7.3); Exp2: 9 (20.9) 2nd degree: Exp1: 10 (24.4); Exp2: 9 (20.9) 3rd degree: Exp1: 0 (0.0); Exp2: 0 (0.0)	Exp1: 24 (58.5); Exp2: 23 (53.5)
Ugwu et al. (2018) Nigeria [45]	1st degree: Exp: 6 (11.3); Con: 5 (9.1) 2nd degree: Exp: 0 (0.0); Con: 2 (3.6)	Exp: 20 (37.7); Con: 32 (58.2)

Con, control group; Exp, experimental group.

study by Eogan et al. [48]. Similarly, Monguilhott et al. [43] reported that APM resulted in perineal integrity during labor compared to controls (34.9% vs. 15.9%), but the differences were not significant. Results are presented in Table 2.

Pain in the postpartum period

In a study by Labrecque et al. [39] no pain was reported more often by multiparous than by primiparous women (93.6% vs. 83.2%), despite the fact that the same APM protocol was used in both groups. In turn, Eogan et al. [48] observed that no intervention resulted in significant increase severe pain (4.0% vs. 15.2%), while women who received APM reported mostly mild pain (50.0% vs. 34.2%). Monguilhott et al. [43] shown that APM differentiates level of pain immediately after childbirth (3.0 ± 2.9 vs. 4.1 ± 2.9) and on the 45th day of the postpartum period (1.4 ± 2.1 vs. 1.7 ± 2.5). In the 3rd month there were no differences in the level of symptoms. However, no significant differences were noted [43]. In turn, De la Cueva-Reguera et al. [37] showed that women who underwent perineal drainage procedures experienced less pain than the APM group (week 30 *p* = 0.037; week 36 *p* = 0.000; postpartum *p* = 0.014). APM and drainage was combined with PFME [37]. On the other hand, in the study by Dieb et al. [46], APM in combination with PFME and education, compared to education alone, results in significantly less pain in the perineum immediately after childbirth and almost 2 weeks later (*p* = 0.001 and *p* = 0.013, respectively). The effect of massage and PFME on pain reduction was also confirmed in a study by Leon-Larios et al. [27]. In APM group, pain was reported by 24.35% of patients, in the control group by 36.25% (*p* < 0.001) [27]. Also, Álvarez-González et al. [11] reported that self-massage and a combination of APM with mechanical stretching and manual therapy reduce pain in the puerperium. Detailed characteristics are presented in Table 3.

Table 3

Antenatal perineal massage for postpartum pain in women.

Reference	Assessment	Time of assessment	Result
Álvarez-González et al. (2021) Spain [11]	VAS	5/6 weeks postpartum	Exp1: 1.0 ± 1.5 Exp2: 2.3 ± 2.5 Con: 2.8 ± 3.0 *
de la Cueva-Reguera et al. (2020) Spain [37]	VAS (0-no pain, 10-unbearable pain)	At the beginning of the study, 30th, 36th week of pregnancy and at the end of the postpartum period	Baseline: Exp1: 4.0 ± 2.42; Exp2: 5.0 ± 2.53 At 30 week: Exp1: 4.36 ± 2.37; Exp2: 2.84 ± 1.53* At 36 week: Exp1: 4.96 ± 2.00, Exp2: 2.58 ± 2.19* End of puerperium: Exp1: 2.00 ± 1.63; Exp2: 0.72 ± 1.01* 24 h after delivery*: Mild: Exp: 179 (89.5); Con: 153 (76.5) Moderate: Exp: 10 (5.0); Con: 15 (7.5) Severe: Exp: 11 (5.5); Con: 32 (16.0) 15th days of puerperium*: Mild: Exp: 15 (7.5); Con: 18 (9.0) Moderate: Exp: 0 (0.0); Con: 5 (2.5) Severe: Exp: 0 (0.0); Con: 5 (2.5)
Dieb et al. (2020) Egypt [46]	Verbal rating score: no pain, mild, medium, severe	Assessment of pain in the first 24 h after delivery and on the 15th day of the postpartum period	No pain: Exp: 28 (28.0); Con: 24 (30.4) Mild: Exp: 50 (50.0); Con: 27 (34.2) Significant: Exp: 18 (18.0); Con: 16 (20.3) Severe: Exp: 4 (4.0); Con: (12 (15.2)) *
Eogan et al. (2006) Ireland [48]	Scale: no pain, mild, severe, unbearable	3rd day of postpartum	No pain: Exp: 28 (28.0); Con: 24 (30.4) Mild: Exp: 50 (50.0); Con: 27 (34.2) Significant: Exp: 18 (18.0); Con: 16 (20.3) Severe: Exp: 4 (4.0); Con: (12 (15.2)) *
Labrecque et al. (2000) Canada [39]	Scale: none, mild, moderate/severe	3rd trimester, 3rd month postpartum	No pain: Exp1: 83.2; Con1: 78.3; Exp2: 93.6; Con2: 85.8 Mild: Exp1: 15.0; Con1: 19.6; Exp2: 5.9; Con2: 12.6 Moderate/severe: Exp1: 1.8; Con1: 2.1; Exp2: 0.5; Con2: 1.6 *only for women with a previous vaginal delivery (Exp2, Con2)
Leon-Larios et al. (2017) Spain [27]	Original questionnaire	48 h after delivery	Pain was felt by 47 women (24.35%) from the Exp group and 58 (36.25%) from the Con group* PP after delivery: Exp: 3.0 ± 2.9; Con: 4.1 ± 2.9 PP after 45 days: Exp: 1.4 ± 2.1; Con: 1.7 ± 2.5 PP after 90 days: Exp: 0.3 ± 1.0; Con: 0.3 ± 0.9
Monguilhott et al. (2022) Brazil [43]	VAS (0-no pain, 10-unbearable pain)	Evaluation of perineal pain after childbirth, on the 45th and 90th day of the postpartum period	PP after delivery: Exp: 3.0 ± 2.9; Con: 4.1 ± 2.9 PP after 45 days: Exp: 1.4 ± 2.1; Con: 1.7 ± 2.5 PP after 90 days: Exp: 0.3 ± 1.0; Con: 0.3 ± 0.9

* statistical significant <0.05; Con, control group; Exp, experimental group; h, hours; PP, perineal pain; VAS, Visual Analogue Scale.

Table 4
Antepartum perineal massage and urinary, gas or fecal incontinence in postpartum women.

Refs.	Questionnaire/ device	Problem	Evaluation	Parameters of UI, GI or FI	Outcome
Álvarez-González et al. (2022) Spain [34]	KHQ, ICIQ-SF	UI	5/6 weeks postpartum	UI severity [n/%]: Lack: Exp1: 23/85.2; Exp2: 15/55.6; Con: 18/66.7 Low: Exp1: 4/14.8; Exp2: 12/44.8; Con: 8/29.6 Medium: Exp1: 0; Exp2: 0; Con: 1/3.7	No form of perineal massage had a significant effect on the frequency of UI. The severity of UI depended on the BMI of the woman and the weight of the child.
de la Cueva-Reguera et al. (2020) Spain [37]	KHQ	UI	1st and 5th meeting with therapists	KHQ UI impact: Exp1: 11.11 ± 18.96; Exp2: 10.71 ± 21.29	In both groups, a slight effect of UI on quality of life was demonstrated.
Eogan et al. (2006) Ireland [48]	Manometry, sonographic	FI, the activity of the sphincter mechanism	3rd month of postpartum	Median continence score: Exp: 0; Con: 0 Sonographic defect in external anal sphincter [n/%]: Exp: 25/37.3; Con: 18/38.3	No problems with stool continence were noted in the patients. External anal sphincter injury was diagnosed among 25 (37.3%) women performing perineal massage and 18 (38.3%) from the control group.
Labrecque et al. (2000) Canada [39]	Original questionnaire	UI, FI, GI	3rd trimester, 3rd month postpartum	Lack of UI [%]: ExpP: 73.5; ConP: 71.3; ExpW: 66.3; ConW: 61.1 Lack of GI [%]: ExpP: 73.4; ConP: 76.5; ExpW: 73.3; ConW: 74.2 Lack of FI [%]: ExpP: 96.8; ConP: 96.9; ExpW: 98.4; ConW: 95.8	There was no effect of perineal massage on UI, FI or GI dysfunctions in any of the postpartum groups.
Monguilhott et al. (2022) Brazil [43]	Original questionnaire	UI, FI, GI	Before the study, the 45th and 90th day of the puerperium	45 days postpartum [n/%]: UI: Exp: 13/30.2; Con: 17/40.5 GI: Exp: 9/20.9; Con: 20/47.6* FI: Exp: 4/9.3; Con: 3/7.1 90 days postpartum [n/%]: UI: Exp: 10/23.8; Con: 8/19.0 GI: Exp: 9/21.4; Con: 15/37.5 FI: Exp: 0; Con: 2/4.8	Perineal massage significantly reduced the percentage of women suffering from GI at 45 postpartum days. Similar relationships were not demonstrated in the later period of the study and for UI.
Ugwu et al. (2018) Nigeria [45]	ICIQ-UI-SF	UI, FI, GI	6th week, 3rd month postpartum	3rd month postpartum [n/%]: UI: Exp: 3/6.8; Con: 4/8.0 GI: Exp: 4/8.3; Con: 13/26.0* FI: Exp: 2/4.2; Con: 8/16.0	Women who performed perineal massage during pregnancy reported significantly less problems with FI and GI compared to no intervention. Similar differences were not shown in the UI.

* statistical significant <0.05; ICIQ-SF - International Consultation on Incontinence Questionnaire-Short Form.

Problems with continence during postpartum period

In a study by Álvarez-González et al. [34] patients received 3 types of therapy: standard care, self-APM and APM performed by a physiotherapist combined with EPI-NO stretching. The analysis conducted in the 5th/6th week of the postpartum period showed that UI was most common among women practicing APM at home (Exp1: 14.8%; Exp2: 44.4%; Con: 33.33%). In contrast, Labrecque et al. [39] reported that APM from the 34th week of pregnancy resulted in a slightly lower incidence of UI problems compared to no intervention. Furthermore, multiparous women were more likely to experience UI than primiparous women (Exp2: 30.0%, Con2: 35.9% vs. Exp1: 24.0%, Con1: 26.3%). On the other hand, regardless of the number of births, the lack of GI was more frequently among participants from the control groups (Exp1: 73.4%, Con1: 76.5% vs. Exp2: 73.3%, Con2: 74.2%). Problems with FI occurred only in primiparous women [39]. A similar study was also conducted by Monguilhott et al. [43]. A 5–10 min APM, from 34 weeks of gestation, resulted in a lower percentage of women reporting UI (Exp: 30.2% vs. Con: 40.5%). Massage significantly reduced only the risk of GI - Exp: 20.9% vs. Con: 47.6% at 45th day of postpartum. By the 90th day of the postpartum, no woman practicing APM suffered from FI, in the controls this problem was present in 2 patients (4.8%) [43]. The impact of APM on the development of GI after childbirth was also confirmed in

the studies of Ugwu et al. [45]. A 10 min APM from 34 to 36 weeks of gestation significantly reduced the proportion of women with GI compared to no intervention (Exp: 8.3% vs. Con: 26.0%). APM also had a positive effect on the incidence of UI (Exp: 6.3% vs. Con: 8.0%) and FI (Exp: 4.2% vs. Con: 16.0%) in women in the 3rd month of childbirth. In turn, in the observational study Eogan et al. [48] after 3 months postpartum, no problems with FI were reported. However, the ultrasound examination showed that 37.3% patients who performing APM had an external anal sphincter injury, in the control group this percentage was slightly higher (38.3%) [48]. Detailed characteristics are presented in Table 4.

Sexual dysfunctions in the postpartum period

The percentage of women suffering from dyspareunia may remain at a higher level than before pregnancy even a year after labor. Compared to women with no trauma/1st degree tear, 2nd/3rd/4th degree tears had a higher risk of developing dyspareunia [50]. Perineal injuries also negatively affects the level of arousal, pain and satisfaction during intercourse in women in the 6th month of the puerperium [51]. Unfortunately, despite this, most of the papers qualified for this review did not provide any data between APM and sexual dysfunctions.

In a study by Monguilhott et al. [43] it has been shown that a daily,

Table 5
Effect of antenatal perineal massage on dyspareunia.

Refs.	Questionnaire	Evaluation	SD	Outcome
Labrecque et al. (2000) Canada [39]	Original questionnaire	3rd trimester, 3rd month postpartum	3rd month of postpartum: Mild SD [%]: ExpP: 32.9; ConP: 34.8; ExpW: 23.5; ConW: 27.3 Moderate to severe SD [%]: ExpP: 29.2; ConP: 29.3; ExpW: 9.0; ConW: 8.1	Among primiparas, dyspareunia was not reported by 37.9% and 36.0% of women (Exp1 and Con). In turn, among multiparous women these percentages were higher (Exp2: 67.5, Con2: 64.5). However, there was no effect of massage on the level of sexual complaints. Women who performed perineal massage returned to sexual activity earlier (34.9 vs. 36.1 days) and experienced less pain, but the differences were not significant
Monguilhott et al. (2022) Brazil [43]	Original questionnaire, VAS	45th and 90th day of the postpartum period	After 45 days of confinement: Exp: 2.3 ± 2.2; Con: 3.1 ± 2.8 After 90 days of confinement: Exp: 1.3 ± 1.8; Con: 2.0 ± 2.5	Women who performed perineal massage returned to sexual activity earlier (34.9 vs. 36.1 days) and experienced less pain, but the differences were not significant

*statistical significant <0.05; SD, sexual dysfunction; VAS, Visual Analogue Scale.

5–10 min APM from the 34th week can eliminate problems of sexual life in the postpartum period. Women who received APM returned to sexual activity more quickly than patients receiving standard medical care (34.9 vs. 36.1 days). In addition, APM also reduced pain during intercourse, however, the results were not statistically significant: 45th day 2.3 ± 2.2 vs. 3.1 ± 2.8, 90th day 1.3 ± 1.8 vs. 2.0 ± 2.5 [43]. In turn, in the study by Labrecque et al. [39] the problem of sexual activity was analyzed in women in the 3rd month of the postpartum period. Sexual activity was then resumed by 88.0% of primiparous women and 90.9% of multiparous women who performed APM. Compared to the previous publication [43] massage was practiced for 10 min a day from 34/35 weeks of pregnancy. Unfortunately, about 1/3 of primiparas practicing APM had mild or moderate/severe dyspareunia. In the group of multiparous women, the percentage was lower (23.5% and 9.0%, respectively). The analyzed works [39,43] indicate that 5–10 min of daily APM may have a positive effect on the sexual life of postpartum women, however, results were not statistically significant (Table 5).

Discussion

The aim of the review is to assess and analyze the impact of APM on perinatal perineal injuries and the development of pelvic pain and other complications in postpartum women, such as dyspareunia and problems with incontinence (urinary, gas or fecal). Nearly 85% of women may experience perineal injuries during childbirth [2].

In our review, most authors recommended massage from 34 weeks of

pregnancy until delivery [11,26,34,35,41–44,46,48]. Pregnant women also practiced APM from 6 weeks before delivery [36,47], 34/35 [38–40] and 34–36 weeks of pregnancy [45]. However, Leon-Larios et al. [27] showed that APM from the 32nd week of pregnancy is also effective and safe in protecting the perineum. Nevertheless, the studies differed in the technique of performing APM. In publications [11,28,34,35], APM was started with the preparation of the external tissues of the perineum, and then the internal walls of the vagina. In turn, in studies [27,36,37,46,41,38,47,45] pregnant women performed/received only internal vaginal massage.

Álvarez-González et al. [11] reported that patients in whom APM was performed by a specialist, combined with stretching using EPI-NO, had perinatal perineal injuries less often than women practicing APM alone or not performing it at all. However, it should be noted that the group was not randomized - patients were assigned to interventions according to their own preferences. In addition, women who massaged the perineum during pregnancy (by a specialist or independently) were less likely to deliver in the lithotomy position and more often in the sit/squat position (lithotomy: control: 90.1%, selfmassage: 80.0%, massage: 60%; sit/squat: 3.3%, 6.7%, 33.3% respectively). Moreover, APM during pregnancy resulted in significantly less perineal pain in the postpartum period, especially in women participating in APM with a physiotherapist [11]. In the continuation of this study [34], no differences in the severity of UI in young mothers were observed, regardless of the type of intervention during pregnancy. In a study by Cabral et al. [35] pregnant women were randomly assigned to one of four groups: APM, EPI-NO perineal stretching, APM combined with short (2 min) or long (15 min) EPI-NO stretching. There were no significant differences between the examined women in the frequency of perineal injuries during childbirth, however, it should be noted that in each group min. 50% of the deliveries were by cesarian section. The patients also gave birth in different hospitals, which could have influenced the monitoring and course of delivery [35]. De Freitas et al. [28] also assigned patients randomly in the morning to one of two groups: APM with a physiotherapist or stretching (15 min) with EPI-NO. In the APM group, every woman had a perineal tear, while in the EPI-NO group, 40.0% of the patients had an intact perineum. Nevertheless, in the massage group, 30% of women delivered by cesarian section, in the second group - 50.0% [28]. Also in the study by Bodner-Adler et al. [36], there were no significant differences in the occurrence of perineal injuries between women practicing APM or not. Women in the APM group more often used epidural analgesia (32.2% vs. 30.2%) and oxytocin stimulation (38.8% vs. 36.3%). However, when assessing the results, the number of people in the group should be taken into account: APM: 121, no intervention: 410, and no randomization [36]. No significant effect of APM on the risk of perineal injuries during childbirth was also reported in the study by De la Cueva-Reguera et al. [37]. Nevertheless, pregnant women were to practice APM only once a week, for 20 min. The second group performed perineal manual lymphatic drainage (51.8% vs. 58.1%). However, regardless of the measurement point, a significant decrease in pain sensation was noted in the drainage group compared to APM. In the drainage group, the time of delivery was also shorter 30.29 ± 20.02 vs. 36.42 ± 27.29 min, but the difference was not significant. The patients were assigned to the groups on a radome basis [37]. In turn, Labrecque et al. [38] divided the patients into primiparas and multiparous women, who were then randomly assigned to APM or control (no intervention). An intact perineum was significantly more common in primiparas receiving APM than in controls (24.3% vs. 15.1%, $p = 0.01$), no similar differences were found in multiparous women (34.9% vs. 32.4%, respectively). Among primiparas, the second stage of labor was slightly longer than in controls (89.0 ± 63.4 vs. 85.9 ± 60.7 min), similarly in multiparous women (31.8 ± 38.2 vs. 26.2 ± 27.3 min). Regardless of the type of intervention, nearly 80% of primiparous women used epidural anesthesia, in the group of multiparous women, slightly more than 50%. It was noted that in total, women who performed APM of min. 2/3 of recommendations, significantly more often did not have perineal

injuries than women meeting less than 2/3 [38]. In another paper by Labrecque et al. [39], it was observed that regardless of the practice of APM or not, among primiparous women there were no significant differences in perineal pain, dyspareunia, sexual satisfaction and UI, GI, FI after 3 months of the postpartum period. Among multiparous women, the results were similar, with the exception of perineal pain - massage turned out to be a practice that significantly reduced pain compared to the control (93.6% vs. 85.8%; $p = 0.01$) [39]. In turn, Kiremitli et al. [41] showed that APM is significantly better at protecting the perineum from laceration than perineal massage during labor or no intervention. However, regardless of the type of massage performed, significantly shorter time in the second stage of labor was observed in both intervention groups (APM: 30.1 ± 14.8 ; massage during labor: 28.9 ± 15 ; control 36.8 ± 14.4 min) [41]. Meidan et al. [42] showed no significant effect of APM on perineal protection during labor compared to controls (intact perineum: 29.8% vs. 40.0%, respectively). However, women were assigned to groups based on their preferences. Participants were forbidden to inform the staff about their group assignment during labor, but midwives were allowed to perform perineal massage during the second stage of labor. Only 48.1% of women in the massage group performed APM more than two-thirds of the recommended time [42]. In a study by Monguilhott et al. [43] pregnant women were randomly assigned to the group of APM or control. Women in the intervention group were more likely to retain an intact perineum during labor, but the difference was not significant (34.9% vs. 15.9%). Nevertheless, after 10 days of puerperium, women from the control were diagnosed with edema significantly more often than women from the massage group (61.9% vs. 39.5%, $p = 0.032$). APM also significantly reduced the risk of developing GI (assessment after 45 days: 20.9% vs. 47.6%, $p = 0.009$). However, similar relationships were not found in the case of UI, FI, pain and dyspareunia [43]. In turn, Ugwu et al. [45] showed that women who practiced APM had significantly more intact perineum after delivery than controls (50.9% vs. 29.1%, $p = 0.02$). Moreover, similarly to the study [43], a significant effect of APM on reducing the risk of developing GI was observed (assessment 3 months after delivery: 8.3% vs. 26.0%, $p = 0.03$). Women were assigned to groups randomly [45]. In a study by Dieb et al. [46] examined only pregnant women over 35 years of age who were assigned to APM group combined with PFME and education or only education. It was noted that the combination of various techniques

to prepare a woman for childbirth resulted in a significantly lower percentage of perineal injuries (13.5% vs. 21.5%, $p = 0.034$), and less pain on the 1st and 15th postpartum day ($p = 0.001$ and $p = 0.013$, respectively). Moreover, patients in the intervention group needed postpartum analgesia less frequently (10.5% vs. 24.5%, $p < 0.001$). No differences in the duration of the second stage of labor were observed [46]. Shipman et al. [47] also randomly divided the patients into a group performing APM and PFME or exercises alone. 24.9% of women practicing massage had an intact perineum, compared to 31.0% of the control group, but this difference is not significant. It was shown, that with the increase in age by one year, there was an increase in the risk of perineal injuries and instrumental delivery (in both cases $p = 0.0002$). Nevertheless, only 32.9% of pregnant women declared that they fully performed all APM sessions [47]. Also Leon-Larios et al. [27] combined APM with pelvic PFME. Participants were randomly assigned to an intervention or control group. APM combined with PFME resulted in a significantly higher percentage of intact perineum in young mothers (17.61% vs. 6.85%, $p < 0.003$). In addition, they had less postpartum pain (24.57% vs. 36.30%, $p < 0.001$) and required less epidural analgesia (83.46% vs. 94.81%, $p < 0.001$). Patients from the control more often gave birth in the lithotomy position, and less often in the semi-seated or lateral position ($p < 0.001$) [27]. In turn, in the study by Eogan et al. [48], there were no significant differences in the occurrence of perineal injuries between the massage group and the control group, but it was observed that the massage effectively reduced pain on the 3rd postpartum day ($p = 0.029$). However, none of the women in the intervention group completed all of their APM sessions. Moreover, the patients refused to be randomized into study groups [48]. Monguilhott et al. [43] reported the good acceptance of practicing APM by women and the willingness to do it again.

It can be seen that the benefits of APM are not only during childbirth, but also during the postpartum period. Abdelhakim et al. [26] point to the potential impact of APM on shortening the duration of the second stage of labor. Their findings also as ours did not find evidence for positive aspects APM on UI. The difference about that and our review is that our data analysis was extended to June 2023 and we did not include any data about second stage of labor duration, wound healing, and Apgar score in our criteria [26]. In addition, Beckmann et al. [25], emphasizing the proven and potential benefits of performing APM,

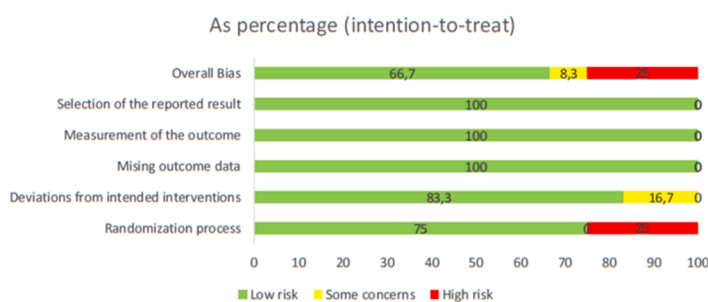
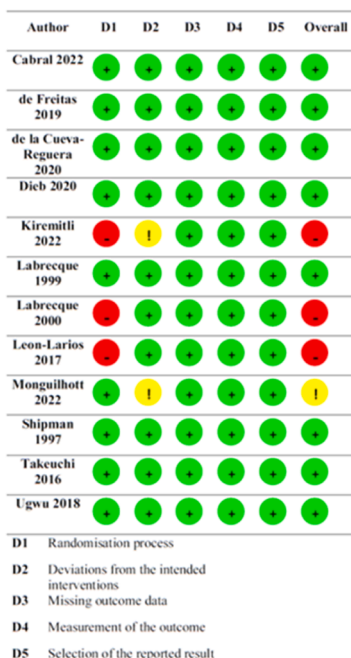


Fig. A1. RoB-2 analysis.

Table A1
Robins analysis.

Author	Type of study	Bias Due to Confounding	Bias in Selection of Participants into the Study	Bias in Classification of Interventions	Bias due to deviations from intended interventions	Bias due to missing data	Bias in measurement of outcomes	Bias in selection of the reported result	Overall
Álvarez-González, 2021	Non-RCT	Moderate	Low	Low	Moderate	Low	Low	Low	Low
Álvarez-González, 2022	CCT	Moderate	Low	Low	Moderate	Low	Low	Low	Low
Bodner-Adler, 2002	CCT	Moderate	Low	Moderate	Moderate	Low	Moderate	Low	Moderate
Eogan, 2006	POS	Serious	Low	Low	Moderate	Moderate	Low	Low	Moderate
Mei-dan, 2008	PCT	Moderate	Moderate	Low	Serious	Low	Serious	Moderate	Serious
Labrecque, 2001	OS	Low	Low	Low	Moderate	Low	Low	Low	Low

A Non-RCT, A Non-Randomised Controlled Trial; CCT, Controlled Clinical Trial; OS, Observational study; PCT, A Prospective Controlled Trial; POS, Prospective Observational Study.

postulate that pregnant women should be informed about the benefits of this procedure and appropriate way of performing it.

Limitations and strengths

The main strength of our work is the lack of limitations related to the years of publication, which allows us to present studies performed in different periods. Unfortunately, no study has undertaken a comprehensive assessment of the psychophysical state in the postpartum period. The articles also differ in the follow-up period, so it was impossible to precisely compare results.

It should be noted that compared to the meta-analysis by Abdelhakim et al. [26] and Beckmann et al. [25], we not limit our review to RCT studies. The inclusion of all types of studies enabled a more accurate presentation of the relationship between APM and perineal injuries. However, in most articles, the massage was done at home. The authors noted that pregnant women were obliged to keep massage diaries, however, this is not an objective measure. In order to obtain the best publications, we performed the RoB-2 and ROBINS-I-tool analysis. However, due to the small number of papers meeting the inclusion and exclusion criteria (18), we decided to include also articles that scored high in risk of bias analyses.

Conclusions

APM performed in the second half of the third trimester of pregnancy is conducive to protecting the perineum during labor. Perineal massage during pregnancy reduces the risk of GI and FI in the puerperium. Unfortunately, a similar effect has not been demonstrated for UI. There are also no unequivocal reports on the impact of APM on sexual dysfunction.

Techniques of APM should be constantly improved. Current information on performing APM are insufficient. There are no recommendations that say unequivocally about the best time to start a massage, its duration and frequency. Some researchers recommended only internal vaginal massage, some also external. All these factors affect the effectiveness of massage, which should be taken into account when designing further research on its impact on the state of a woman during labor and the postpartum period.

Author contributions

All authors have read and agreed to the published version of the manuscript.

Declaration of Competing Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Appendix A

12 publications were assessed in Rob-2 and 6 articles in ROBINS-I-Tool. Finally, all publications were included in the review.

References

- [1] Royal College of Obstetricians and Gynaecologists. The management of third- and fourth-degree perineal tears. Green-top Guideline No. 29, 2015, pp. 5–6.
- [2] Goh R, Goh D, Ellepola H. Perineal tears - A review. Aust J Gen Pract 2018;47(1–2): 35–8. <https://doi.org/10.31128/AFP-09-17-4333>.
- [3] Jansson MH, Franzén K, Hiyoshi A, Tegerstedt G, Dahlgren H, Nilsson K. Risk factors for perineal and vaginal tears in primiparous women - the prospective POPRACT-cohort study. BMC Pregnancy Childbirth 2020;20(1):749. <https://doi.org/10.1186/s12884-020-03447-0>.
- [4] D'Souza JC, Monga A, Tincello DG. Risk factors for perineal trauma in the primiparous population during non-operative vaginal delivery. Int Urogynecol J 2020;31(3):621–5. <https://doi.org/10.1007/s00192-019-03944-7>.
- [5] Abedzadeh-Kalahroudi M, Talebian A, Sadat Z, Mesdaghinia E. Perineal trauma: incidence and its risk factors. J Obstet Gynaecol 2019;39(2):206–11. <https://doi.org/10.1080/01443615.2018.1476473>.
- [6] Worede DT, Alemu S, Tsegaye TB. Risk factors for severe perineal laceration among vaginally delivered mothers in public hospitals in ethiopia: unmatched case control study. Primary Health Care 2020;10(4):350.
- [7] Sánchez-Ávila MT, Galván-Caudillo M, Cantú-Pompa JJ, Vázquez-Romero N, Martínez-López JP, Matías-Barrios VM, Avitia-Herrera AM, Morales-Garza LA, Hernández-Escobar CE, Soto-Fuenzalida G, González-Garza MT. Prevalence of high-grade perineal tear during labor in Mexican adolescents. Colomb Med 2018; 49(4):261–4. <https://doi.org/10.25100/cm.v49i4.3515> (Cali).
- [8] Leon-Larios F, Corrales-Gutierrez I, Casado-Mejía R, Suarez-Serrano C. Influence of a pelvic floor training programme to prevent perineal trauma: a quasi-randomised controlled trial. Midwifery 2017;50:72–7. <https://doi.org/10.1016/j.midw.2017.03.015>.
- [9] Domenighi LHH, Weinmann ARM, Haefner LSB, Feltrin ML. Perineal lacerations: a retrospective study in a habitual-risk public maternity. Rev Bras Ginecol Obstet 2021;43(8):588–94. <https://doi.org/10.1055/s-0041-1735227>.
- [10] Hartinah A, Usman AN, Sartini Jafar N, Arsyad MA, Yulianty R, Sirenden H, Nurung J. Care for perineal tears in vaginal delivery: an update for midwife. Gac Sanit 2021;35(S2):216–20. <https://doi.org/10.1016/j.gaceta.2021.10.024>.
- [11] Álvarez-González M, Leirós-Rodríguez R, Álvarez-Barrio L, López-Rodríguez AF. Prevalence of perineal tear peripartum after two antepartum perineal massage techniques: a non-randomised controlled trial. J Clin Med 2021;10:4934. <https://doi.org/10.3390/jcm10214934>.
- [12] Edqvist M, Hildingsson I, Mollberg M, Lundgren I, Lindgren H. Midwives' management during the second stage of labor in relation to second-degree tears-an experimental study. Birth 2017;44(1):86–94. <https://doi.org/10.1111/birt.12267>.
- [13] Priddis H, Dahlen H, Schmied V. Women's experiences following severe perineal trauma: a meta-ethnographic synthesis. J Adv Nurs 2013;69(4):748–59. <https://doi.org/10.1111/jan.12005>.

- [14] Wegnelius G, Hammarström M. Complete rupture of anal sphincter in primiparas: long-term effects and subsequent delivery. *Acta Obstet Gynecol Scand* 2011;90(3):258–63. <https://doi.org/10.1111/j.1600-0412.2010.01037.x>.
- [15] Barjon K, Mahdy H. Episiotomy. 2022 Sep 6. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. PMID: 31536281.
- [16] Fodstad K, Laine K, Staff AC. Different episiotomy techniques, postpartum perineal pain, and blood loss: an observational study. *Int Urogynecol J* 2013;24(5):865–72. <https://doi.org/10.1007/s00192-012-1960-3>.
- [17] Kartal B, Kızıllırmak A, Calpbıncı P, Demir G. Retrospective analysis of episiotomy prevalence. *J Turk Ger Gynecol Assoc* 2017;18(4):190–4. <https://doi.org/10.4274/jtgga.2016.0238>.
- [18] Jiang H, Qian X, Carroli G, Garner P. Selective versus routine use of episiotomy for vaginal birth. *Cochrane Database Syst Rev* 2017;2(2):CD000081. <https://doi.org/10.1002/14651858.CD000081.pub3>.
- [19] Demirel G, Golbasi Z. Effect of perineal massage on the rate of episiotomy and perineal tearing. *Int J Gynecol Obstet* 2015;131(2):183–6. <https://doi.org/10.1016/j.ijgo.2015.04.048>.
- [20] Sangkomkamhang U, Kongwattanakul K, Kietpeerakool C, Thinkhamrop J, Wannasiri P, Khunpradit S, Thepsuthamarat K, Jampathong N, Lumbiganon P. Restrictive versus routine episiotomy among Southeast Asian term pregnancies: a multicentre randomised controlled trial. *BJOG* 2020;127(3):397–403. <https://doi.org/10.1111/1471-0528.15982>.
- [21] Schantz C, Sim KL, Ly EK M, Barennes H, Sudaroth S, Goyet S. Reasons for routine episiotomy: a mixed-methods study in a large maternity hospital in Phnom Penh, Cambodia. *Reprod Health Matters* 2015;23(45):68–77. <https://doi.org/10.1016/j.rhm.2015.06.012>.
- [22] Kartal B, Kızıllırmak A, Calpbıncı P, Demir G. Retrospective analysis of episiotomy prevalence. *J Turk Ger Gynecol Assoc* 2017;18(4):190–4. <https://doi.org/10.4274/jtgga.2016.0238>.
- [23] Blondel B, Alexander S, Bjarnadóttir RI, Gissler M, Langhoff-Roos J, Novak-Antolić Z, Prunet C, Zhang WH, Hindori-Mohangoo AD, Zeitlin J. Euro-Peristat Scientific Committee. Variations in rates of severe perineal tears and episiotomies in 20 European countries: a study based on routine national data in Euro-Peristat Project. *Acta Obstet Gynecol Scand* 2016;95(7):746–54. <https://doi.org/10.1111/aogs.12894>.
- [24] Moraes JCM, de Assis LC. Role of physical therapy during pregnancy for childbirth preparation. *Pediatr Dimens* 2018;3(3). <https://doi.org/10.15761/PD.1000172>.
- [25] Beckmann MM, Stock OM. Antenatal perineal massage for reducing perineal trauma. *Cochrane Database Syst Rev* 2013;4:CD005123. <https://doi.org/10.1002/14651858.CD005123.pub3>.
- [26] Abdelhakim AM, Eldesouky E, Elmagd IA, Mohammed A, Farag EA, Mohammed AE, Hamam KM, Hussein AS, Ali AS, Keshta NHA, Hamza M, Samy A, Abdel-Latif AA. 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(9):1735–45. <https://doi.org/10.1007/s00192-020-04302-8>.
- [27] Leon-Larios F, Corrales-Gutierrez I, Casado-Mejía R, Suarez-Serrano C. Influence of a pelvic floor training programme to prevent perineal trauma: a quasi-randomised controlled trial. *Midwifery* 2017;50:72–80. <https://doi.org/10.1016/j.midw.2017.03.015>.
- [28] de Freitas SS, Cabral AL, de Melo Costa Pinto R, Resende APM, Pereira Baldon VS. Effects of perineal preparation techniques on tissue extensibility and muscle strength: a pilot study. *Int Urogynecol J* 2019;30(6):951–7. <https://doi.org/10.1007/s00192-018-3793-1>.
- [29] Aasheim V, Nilsen ABV, Reinar LM, Lukasse M. Perineal techniques during the second stage of labour for reducing perineal trauma. *Cochrane Database Syst Rev* 2017;6(6):CD006672. <https://doi.org/10.1002/14651858.CD006672.pub3>.
- [30] Biana CB, Cecagno D, Porto AR, Cecagno S, Marques VA, Soares MC. Non-pharmacological therapies applied in pregnancy and labor: an integrative review. *Rev Esc Enferm. USP* 2021;55:e03681. <https://doi.org/10.1590/S1980-220x2019019703681>.
- [31] Ducarme G, Pizzoferrato AC, de Tayrac R, Schantz C, Thubert T, Le Ray C, Riethmuller D, Verspyck E, Gachon B, Pierre F, Artzner F, Jacquetin B, Fritel X. Perineal prevention and protection in obstetrics: CNGOF clinical practice guidelines. *J Gynecol Obstet Hum Reprod* 2018;48(7):455–60. <https://doi.org/10.1016/j.jogoh.2018.12.002>.
- [32] Sterne JAC, Savović J, Page MJ, Elbers RG, Blencowe NS, Boutron I, Cates CJ, Cheng HY, Corbett MS, Eldridge SM, Emberson JR, Hernán MA, Hopewell S, Hróbjartsson A, Junqueira DR, Jüni P, Kirkham JJ, Lasserson T, Li T, McAleenan A, Reeves BC, Shepperd S, Shrier I, Stewart LA, Tilling K, White IR, Whiting PF, Higgins JPT. RoB 2: a revised tool for assessing risk of bias in randomised trials. *BMJ* 2019;366:14898. <https://doi.org/10.1136/bmj.14898>.
- [33] Risk of bias info. Access on-line: <https://www.riskofbias.info/welcome> [20.02.2023].
- [34] Álvarez-González M, Leirós-Rodríguez R, Álvarez-Barrio L, López-Rodríguez AF. Perineal massage during pregnancy for the prevention of postpartum urinary incontinence: controlled clinical trial. *Medicina* 2022;58(10):1485. <https://doi.org/10.3390/medicina58101485> (Kaunas).
- [35] Cabral AL, de Freitas SS, Pinto RMC, Resende APM, Pereira-Baldon VS. Are perineal massage and instrument-assisted perineal stretching with short protocol effective for increasing pelvic floor muscle extensibility? A randomized controlled trial. *Phys Ther* 2022;102(3):pzab305. <https://doi.org/10.1093/ptj/pzab305>.
- [36] Bodner-Adler B, Bodner K, Mayerhofer K. Perineal massage during pregnancy in primiparous women. *Int J Gynaecol Obstet* 2002;78(1):51–3. [https://doi.org/10.1016/s0020-7292\(02\)00065-6](https://doi.org/10.1016/s0020-7292(02)00065-6).
- [37] de la Cueva-Reguera M, Rodríguez-Sanz D, Calvo-Lobo C, Fernández-Martínez S, Martínez-Pascual B, Robledo-Do-Nascimento Y, Blanco-Morales M, Romero-Morales C. Effectiveness of manual lymphatic drainage vs. perineal massage in secundigravida women with gestational oedema: a randomised clinical trial. *Int Wound J* 2020;17(5):1453–61. <https://doi.org/10.1111/iwj.13427>.
- [38] 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(3 Pt 1):593–600. [https://doi.org/10.1016/s0002-9378\(99\)70260-7](https://doi.org/10.1016/s0002-9378(99)70260-7).
- [39] Labrecque M, Eason E, Marcoux S. Randomized trial of perineal massage during pregnancy: perineal symptoms three months after delivery. *Am J Obstet Gynecol* 2000;182(1 Pt 1):76–80. [https://doi.org/10.1016/s0002-9378\(00\)70493-5](https://doi.org/10.1016/s0002-9378(00)70493-5).
- [40] Labrecque M, Eason E, Marcoux S. Women's views on the practice of prenatal perineal massage. *BJOG* 2001;108(5):499–504. <https://doi.org/10.1111/j.1471-0528.2001.00111.x>.
- [41] Kiremitli S, Kiremitli T, Ulug P, Yilmaz N. Comparison of obstetric outcomes and morbidity in nulliparous pregnant women who received antenatal and intrapartum perineal massage. *Pelvipereineology* 2022;41(1):17–22. <https://doi.org/10.34057/Ppj.2022.41.01.2022-2-1>.
- [42] Mei-dan E, Walfisch A, Raz I, Levy A, Hallak M. Perineal massage during pregnancy: a prospective controlled trial. *Isr Med Assoc J* 2008;10(7):499–502. PMID: 18751626.
- [43] Monguilhott JJ, Bruggemann OM, Velho MB, Knobel R, Costa R. Antenatal perineal massage for trauma prevention: a pilot randomized clinical trial. *Acta Paul Enferm* 2022;35:eAPE0381345. <https://doi.org/10.37689/acta-ape/2022A003813459>.
- [44] Takeuchi S, Horiuchi S. Randomised controlled trial using smartphone website vs leaflet to support antenatal perineal massage practice for pregnant women. *Women Birth* 2016;29(5):430–5. <https://doi.org/10.1016/j.wombi.2016.01.010>.
- [45] Ugwu EO, Iferikigwe ES, Obi SN, Eleje GU, Ozumba BC. Effectiveness of antenatal perineal massage in reducing perineal trauma and post-partum morbidities: a randomized controlled trial. *J Obstet Gynaecol Res* 2018;44(7):1252–8. <https://doi.org/10.1111/jog.13640>.
- [46] Dieb AS, Shoab AY, Nabil H, Gabr A, Abdallah AA, Shaban MM, Attia AH. Perineal massage and training reduce perineal trauma in pregnant women older than 35 years: a randomized controlled trial. *Int Urogynecol J* 2020;31(3):613–9. <https://doi.org/10.1007/s00192-019-03937-6>.
- [47] Shipman MK, Boniface DR, Tefft ME, McCloghry F. Antenatal perineal massage and subsequent perineal outcomes: a randomised controlled trial. *Br J Obstet Gynaecol* 1997;104(7):787–91. <https://doi.org/10.1111/j.1471-0528.1997.tb12021.x>.
- [48] Eogan M, Daly L, O'Herlihy C. The effect of regular antenatal perineal massage on postnatal pain and anal sphincter injury: a prospective observational study. *J Matern Fetal Neonatal Med* 2006;19(4):225–9. <https://doi.org/10.1080/14767050600593155>.
- [49] Marques A, Stothers L, Macnab A. The status of pelvic floor muscle training for women. *Can Urol Assoc J* 2010;4(6):419–24. <https://doi.org/10.5489/cauj.10026>.
- [50] Leeman L, Rogers R, Borders N, Teaf D, Qualls C. The effect of perineal lacerations on pelvic floor function and anatomy at 6 months postpartum in a prospective cohort of nulliparous women. *Birth* 2016;43(4):293–302. <https://doi.org/10.1111/birt.12258>.
- [51] Gommenes D, Nøhr E, Qvist N, Rasch V. Obstetric perineal tears, sexual function and dyspareunia among primiparous women 12 months postpartum: a prospective cohort study. *BMJ Open* 2019;9(12):e032368. <https://doi.org/10.1136/bmjopen-2019-0323>.