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REVIEW ARTICLE

Antenatal perineal massage benefits in reducing perineal trauma and postpartum morbidities: a systematic review and meta-analysis of randomized controlled trials

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Abstract

Introduction and hypothesis Most vaginal births are associated with trauma to the perineum. The morbidity associated with perineal trauma can be significant, especially when it leads to third- and fourth-degree perineal tears. We hypothesized that antenatal perineal massage could decrease the incidence of perineal trauma, particularly severe perineal tears and other postpartum complications.

Methods We searched four different databases from inception until August 2019 for the available trials. We included randomized controlled trials (RCTs) which assessed the effect of antenatal perineal massage (intervention group) versus control group (no antenatal perineal massage) in perineal trauma patients. Data were extracted from eligible studies and meta-analyzed using RevMan software. Primary outcomes were the risk of episiotomies and perineal tears. Secondary outcomes were perineal pain, second stage of labor duration, wound healing, anal incontinence, and Apgar scores at 1 and 5 min.

Results Eleven RCTs with 3467 patients were analyzed. Women who received antenatal perineal massage had significantly lower incidence of episiotomies (RR = 0.79, 95% CI [0.72, 0.87], $p < 0.001$) and perineal tears (RR = 0.79, 95% CI [0.67, 0.94], $p = 0.007$), particularly the risk of third- and fourth-degree perineal tears ($p = 0.03$). Better wound healing and less perineal pain were evident in the antenatal perineal massage group. Antenatal perineal massage reduced the second stage of labor duration ($p = 0.005$) and anal incontinence ($p = 0.003$) with significant improvement in Apgar scores at 1 and 5 min ($p = 0.01$ and $p = 0.02$).

Conclusions Antenatal perineal massage is associated with a lower risk of severe perineal trauma and postpartum complications.

Keywords Antenatal perineal massage · Perineal trauma · Episiotomy · Prenatal perineal massage

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s00192-020-04302-8) contains supplementary material, which is available to authorized users.

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Introduction

Vaginal labor complications are prevalent, especially for those having their first newborn [1]. From 30 to 85% of women undergoing vaginal delivery are suffering from different degrees of perineal trauma while the internationally reported incidence of severe perineal trauma, which involves third- and fourth-degree perineal tears, is 0.5 to 10% [1, 2]. Episiotomy is one of the implicated risk factors for perineal tears, especially third- and fourth-degree perineal tears, which occur more frequently with median episiotomy [3, 4]. Routine use of episiotomy is no longer recommended because of the insufficient objective evidence-based data demonstrating any benefit for its use [5]. Other risk factors for perineal trauma include malposition, operative delivery, precipitous labor, fetal macrosomia, maternal obesity, and nulliparity [6, 7].

Among different degrees of perineal tears, third- and fourth-degree perineal tears are linked to the greatest morbidity where they increase the incidence of wound disruption, stress or urge urinary incontinence, flatal and/or fecal incontinence, infection, delayed wound healing, postpartum dyspareunia, pelvic organ prolapse, and rectovaginal fistulas [8–10]. In addition, for women who experience severe perineal trauma during childbirth, their physical and psychological outcomes can be complex, with some women suffering from social isolation and marginalization due to their ongoing symptomatology. Severe perineal trauma seems to affect not only the physiological and psychological well-being but also alters the women's understanding of their identity as sexual beings [11].

Restricted use of episiotomy rather than routine use and antenatal perineal massage are effective measures to decrease the risk of severe obstetric lacerations [5, 12, 13].

Massage is a historical therapeutic technique that increases the relaxation of the muscles and vasodilation of blood vessels [14]. Antenatal perineal massage is a technique that can be performed by pregnant women or their partners within 4 to 6 weeks before delivery [14]. It is postulated that it increases the blood flow to the perineum, enhancing the circulation and stretching the tissues for widening the vaginal opening for baby passage. In addition, it mimics the effect of the child's head during delivery; thus, it makes the labor easier [15, 16].

A Cochrane review showed that antenatal perineal massage reduced the probability of perineal trauma (mainly episiotomies) and ongoing perineal pain; however, this review was based on four trials only making the available evidence insufficient [14]. Two RCTs [12, 17] demonstrated that antenatal perineal massage was linked to a significant reduction in the need for episiotomy and risk of higher order perineal lacerations, and Ugwu et al. [17] noted a decrease in flatal incontinence and a higher rate of no laceration after vaginal delivery among antenatal perineal massage group. Mei-dan et al. [18] found that perineal massage during pregnancy slightly reduced the rates of first-degree perineal tears with a slight increase in the rates of second-degree perineal tears. In addition, they did not find any cases reported in third/fourth-degree perineal tears in antenatal perineal massage.

Thus, we conducted this systematic review and meta-analysis to update the current evidence about whether antenatal perineal massage reduces the risk of perineal trauma and postpartum complications.

Materials and methods

We performed this systematic review and meta-analysis in strict accordance with the Cochrane Handbook for Systematic Reviews of Interventions [19]. The meta-analysis was reported following the Preferred Reporting Item for Systematic Reviews and Meta-analyses (PRISMA) statement [20].

Literature search

We comprehensively searched four electronic databases (PubMed, Cochrane Library, Scopus, and ISI Web of Science) from inception until August 2019 using the following search strategy: (antenatal OR prenatal OR antepartum) AND (perineal massage OR birth canal widening OR massage). Two investigators (A.A & K.H) independently performed the search strategy with no restrictions regarding language or year of publication.

Eligibility criteria

We included RCTs that met the following inclusion criteria: (1) population: nulliparous or multiparous women during their antenatal care; (2) intervention: antenatal perineal massage performed in the last 4 to 6 weeks before delivery; (3) comparator: no antenatal perineal massage; (4) study design: randomized controlled trials (RCTs); (5) outcome parameters: our primary outcomes were the risk of all degrees of perineal tears and the incidence of episiotomies. The secondary outcomes were the duration of the second stage of labor in hours, perineal pain as evaluated by visual analog scale (VAS), wound healing as evaluated by REEDA scale (redness, edema, ecchymosis, discharge, and approximation), urinary incontinence and anal incontinence (fecal and flatus incontinence) reported within 3 months postpartum, and Apgar scores at 1 and 5 min.

We included all degrees of perineal tears in our outcomes as the protective effect of antenatal perineal massage may be more evident in one degree of perineal tear over the other and also to understand the relationship between the significant effects. For example, if we found more second-degree perineal tears but fewer obstetric anal sphincter injuries (OASIs), then this could be taken to be a beneficial effect, and if we found more second-degree tears and fewer intact perinea, this might be a cause for concern.

We excluded studies for the following reasons: (1) in vitro and animal studies, (2) non-randomized trials, (3) abstracts only studies, and (4) irrelevant studies. Two reviewers independently performed the title/abstract screening and full-text screening of the eligible studies. Differences were discussed, and a consensus was reached after the discussion.

Data extraction

Two authors (A.A & K.H) collected the data from eligible studies on a standardized data extraction sheet. We extracted the data, such as the following: list of authors, year of publication, sample size, and baseline characteristics of enrolled patients. Likewise, we extracted our intended primary and secondary outcomes.

Risk of bias assessment

We evaluated the methodological quality of included studies using the Cochrane risk of bias assessment tool, clearly described in Chapter 8.5 of the Cochrane Handbook for Systematic Reviews of Interventions 5.1.0 [21] to assess the risk of bias within included RCTs. This assessment tool involves the following domains: random sequence generation, allocation concealment, performance bias (blinding of participant and personnel), detection bias (blinding of outcome assessment), attrition bias, reporting bias, and other potential sources of bias. The authors' judgment is categorized as "low risk," "high risk," and "unclear risk" of bias.

Data synthesis

We pooled dichotomous data as risk ratios (RR) and 95% confidence intervals (CI) while continuous data were pooled as mean difference (MD) with the corresponding 95% CI employing the Mental-Haenszel method. All statistical analyses were performed using Review Manager software v. 5.3 (The Nordic Cochrane Centre, Cochrane Collaboration, 2014, Copenhagen, Denmark).

We assessed the statistical heterogeneity across studies using I-squared (I^2) statistics, and values ≥ 50% were indicative of high heterogeneity. We used the fixed-effects model for meta-analysis; however, in case of significant heterogeneity, the random effects model was utilized. Additionally, we performed a sensitivity analysis where we excluded one study at a time, "one-out sensitivity analysis," and evaluated the impact of removing each of the studies on the summary results and between-study heterogeneity. The data analysis was completed independently by four authors, then the results were compared, and any difference was resolved by discussion.

Publication Bias

According to Egger and colleagues, assessment of publication bias using the funnel plot method and Egger's test is unreliable for fewer than ten included studies. Therefore, in the present study, we assessed publication bias in our primary outcomes (perineal tears and episiotomies), which were reported in 11 studies [22, 23]. *P* value < 0.05 was considered statistically significant.

Results

Results of the literature search and characteristics of included studies

Our search strategy resulted in 388 studies. After title and abstract screening, 16 articles were subjected to full-text screening in which five studies were excluded; three were irrelevant, and two studies did not meet inclusion criteria. Finally, 11 RCTs [12, 13, 17, 24–31] with 3467 patients (1711 women in the intervention group and 1756 women in the control group) were included in the final analysis. The PRISMA flow diagram for study selection is shown in Fig. 1.

The included studies compared perineal massage versus no perineal massage during antenatal care. All included studies performed antenatal digital perineal massage in the last 4 to 6 weeks before delivery by either the pregnant women or their partners. The following were the locations of the included studies: four studies were conducted in Egypt [12, 13, 30, 31], one study in Nigeria [17], one study in Turkey [28], one study in Iran [29], one study in Japan [27], two studies in Canada [24, 26], and one study in the UK [25]. The baseline characteristics are shown in supplementary file no.1.

Risk of bias assessment

The quality of included RCTs ranged from moderate to high quality based on the Cochrane risk of bias assessment tool. The summary of risk of bias assessment for the included RCTs is shown in supplementary file no.2.

Outcomes

Perineal tears

Antenatal perineal massage significantly reduced the risk of perineal tears compared with the control group (RR = 0.79, 95% CI [0.67, 0.94], $p = 0.007$), as shown in Fig. 2. The pooled studies were heterogeneous ($p = 0.002$, $I^2 = 65\%$). The significant heterogeneity was resolved by sensitivity analysis by excluding two studies [12, 28] ($p = 0.26$, $I^2 = 20\%$). After sensitivity analysis, antenatal perineal massage was still significantly effective in reducing perineal tears (RR = 0.90, 95% CI [0.81, 0.99], $p = 0.03$). According to Egger's regression test, there was evidence of publication bias among the studies (Egger bias = 1.861, 95% CI [−2.18, −2.34), $p = 0.004$).

We performed a subgroup analysis to evaluate the efficacy of antenatal perineal massage in reducing different degrees of perineal tears. Antenatal perineal massage was linked to a significant reduction in the incidence of third- and fourth-degree perineal tears compared with the control group (RR = 0.36, 95% CI [0.14, 0.89], $p = 0.03$) as shown in Fig. 3. However, no significant differences were found in the first- and second-degree perineal tears between the intervention and control groups as shown in Fig. 3.

Episiotomy

Antenatal perineal massage decreased the incidence of episiotomy compared with the control group (RR = 0.79, 95% CI

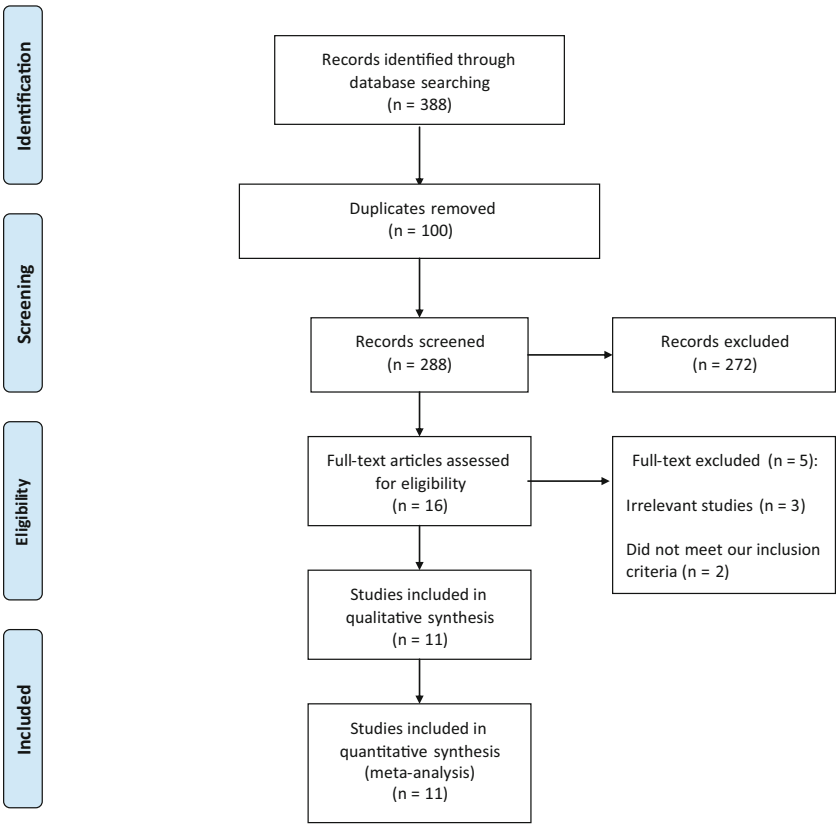


Fig. 1 PRISMA flow diagram

[0.72, 0.87], $p < 0.001$) as shown in Fig. 4. The pooled studies were homogeneous ($p = 0.23$, $I^2 = 23\%$). There was evidence of publication bias as assessed by Egger's test (Egger bias = 1.581, 95% CI [−2.13, −1.64), $p = 0.002$).

Duration of the second stage of labor

We found no significant difference between both groups regarding the duration of the second stage of labor (MD = −0.09, 95% CI [−0.20, 0.02], $p = 0.09$), as shown in Fig. 5A. The pooled studies were heterogeneous ($p < 0.001$, $I^2 = 96\%$). After solving the reported heterogeneity by excluding two studies [12, 24] ($p = 0.18$, $I^2 = 34\%$), we found that antenatal perineal massage was beneficial in reducing the duration of the second stage of labor (MD = −0.06, 95% CI [−0.10, −0.02], $p = 0.005$) as shown in Fig. 5B.

VAS perineal pain

The perineal pain, as evaluated by VAS, was significantly lower among the antenatal perineal massage group (MD = −1.72, 95% CI [−3.09, −0.36], $p = 0.01$) as shown in Fig. 6.

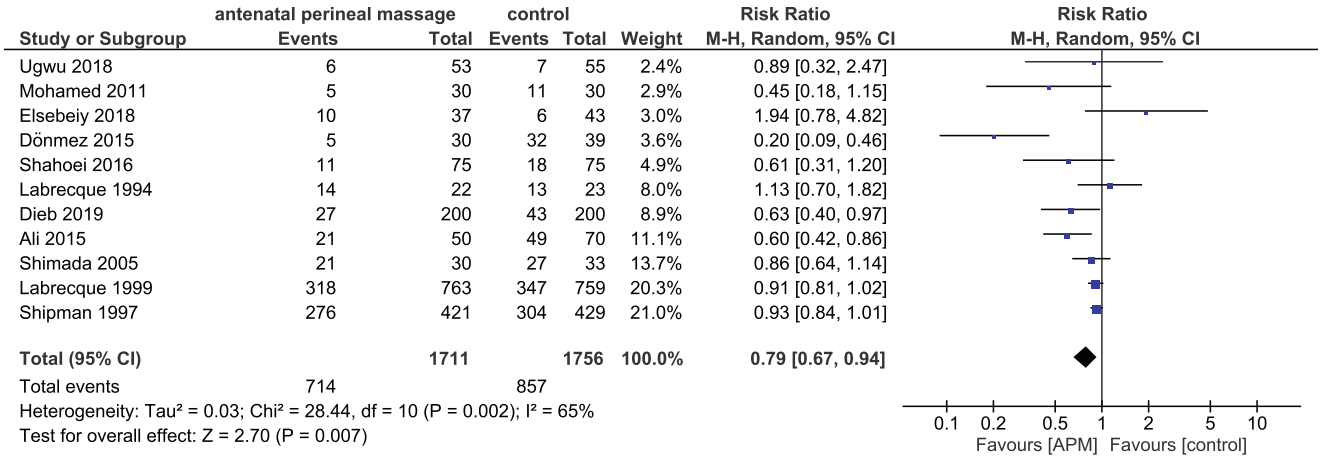
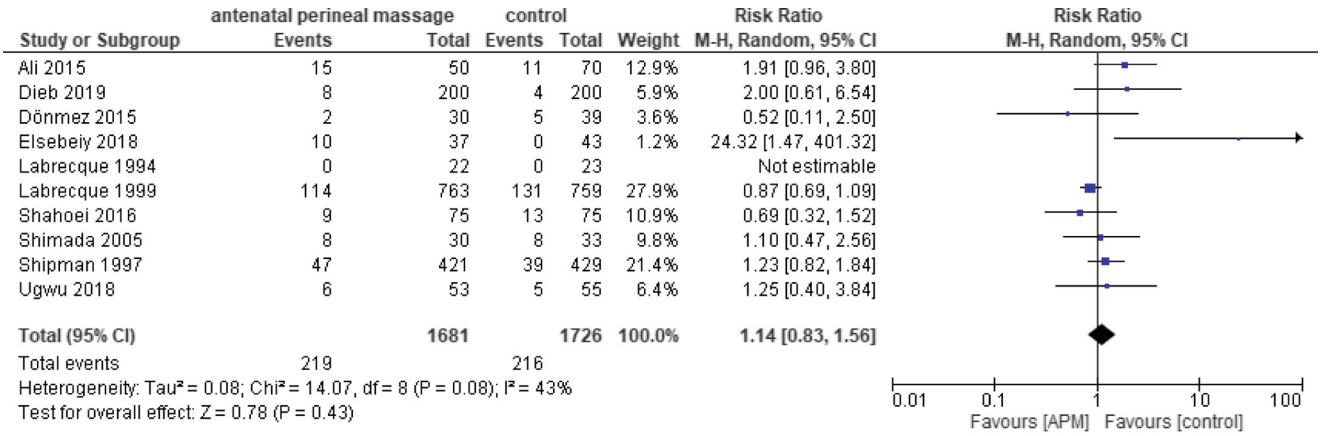
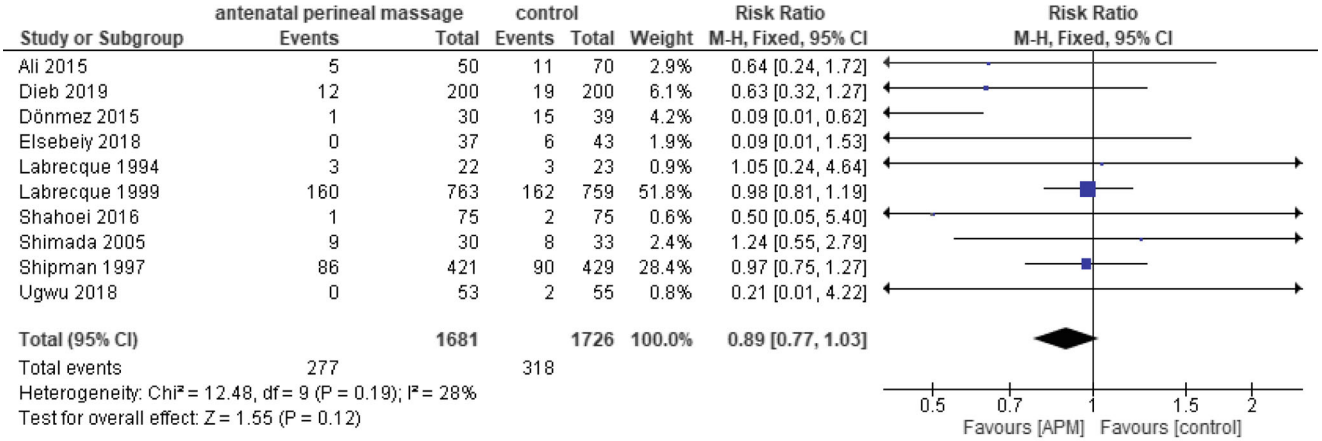


Fig. 2 Forest plot for perineal tears

1st degree perineal tears



2nd degree perineal tears



3rd / 4th degrees perineal tears

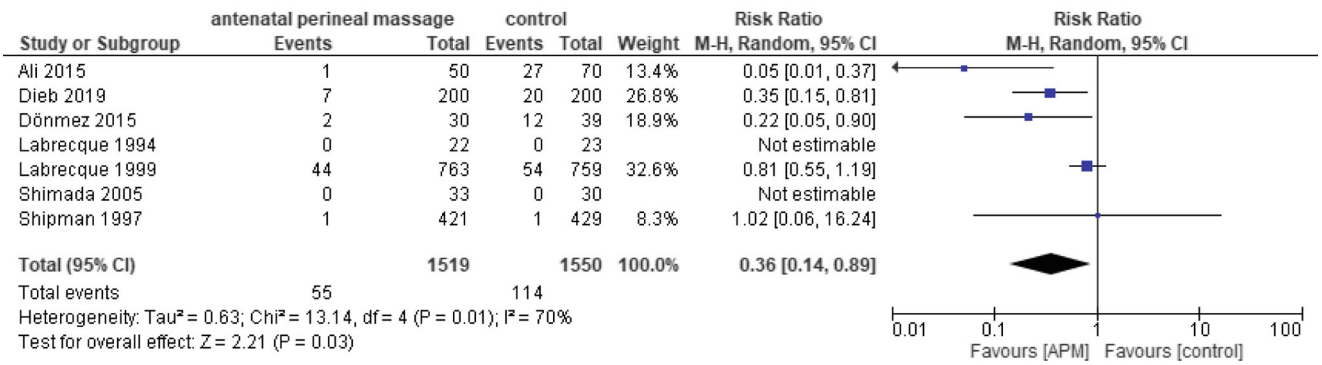


Fig. 3 Forest plot for subgroup analysis between perineal tears degrees

The pooled studies were heterogeneous ($p < 0.001$, $I^2 = 95\%$). We solved the heterogeneity by removing one study [30] ($p = 0.56$, $I^2 = 0\%$), and then the benefit of antenatal perineal massage was evident in decreasing perineal pain (MD = −2.29, 95% CI [−2.69, −1.88], $p < 0.001$).

Wound healing

Antenatal perineal massage was associated with better wound healing compared with the control group (MD = −1.86, 95% CI [−2.66, −1.07], $p < 0.001$), as shown in

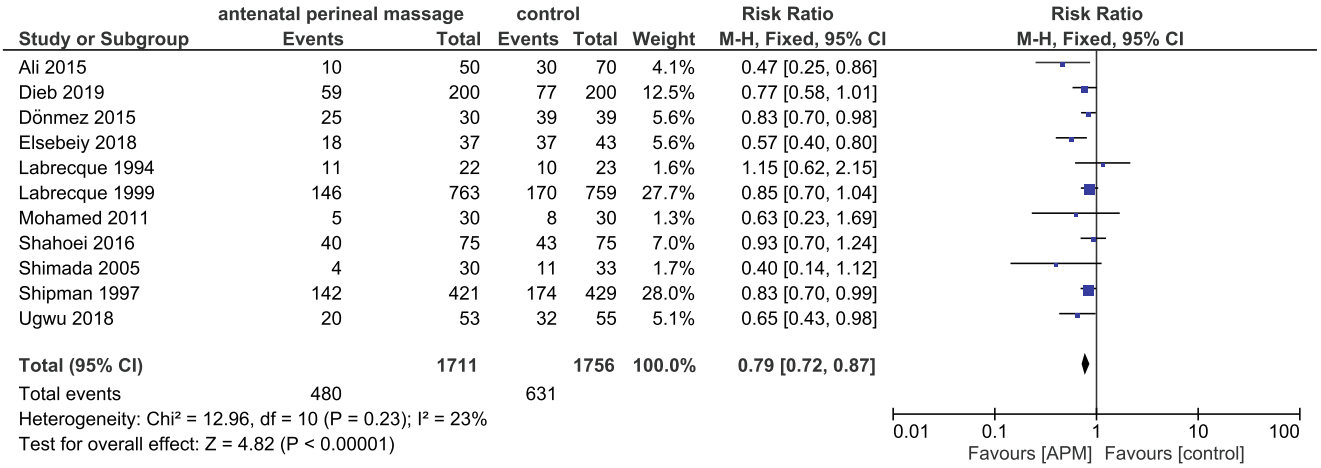


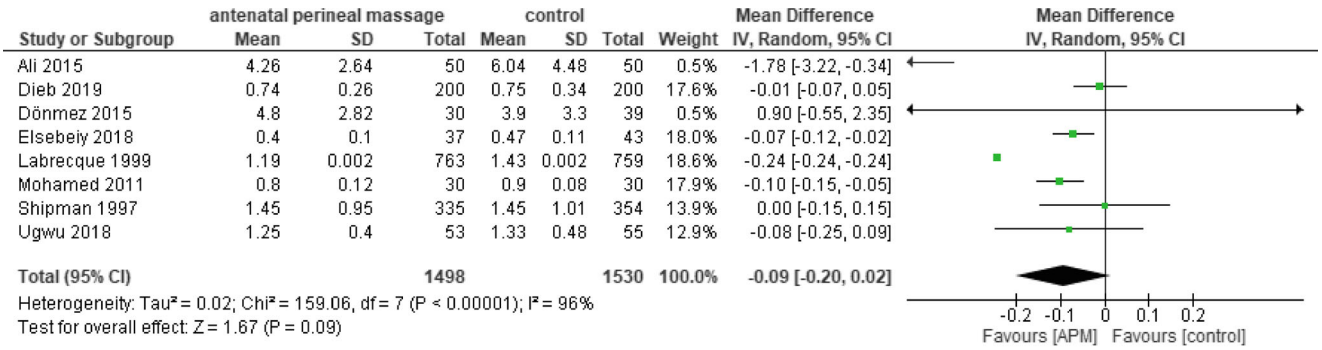
Fig. 4 Forest plot for episiotomy

Fig. 7. The pooled studies were heterogeneous ($p = 0.002$, $I^2 = 83\%$). We solved the heterogeneity by excluding one study [13] ($p = 1.00$, $I^2 = 0\%$) and still we found improvement in wound healing among the antenatal perineal massage group (MD = −1.47, 95% CI [−1.89, −1.05], $p < 0.001$).

Anal incontinence

We found no significant difference in anal incontinence between the two groups (RR = 0.57, 95% CI [0.19, 1.69], $p = 0.31$), as shown in Fig. 8A. The pooled studies were heterogeneous ($p = 0.01$, $I^2 = 78\%$). After solving the reported

a



b

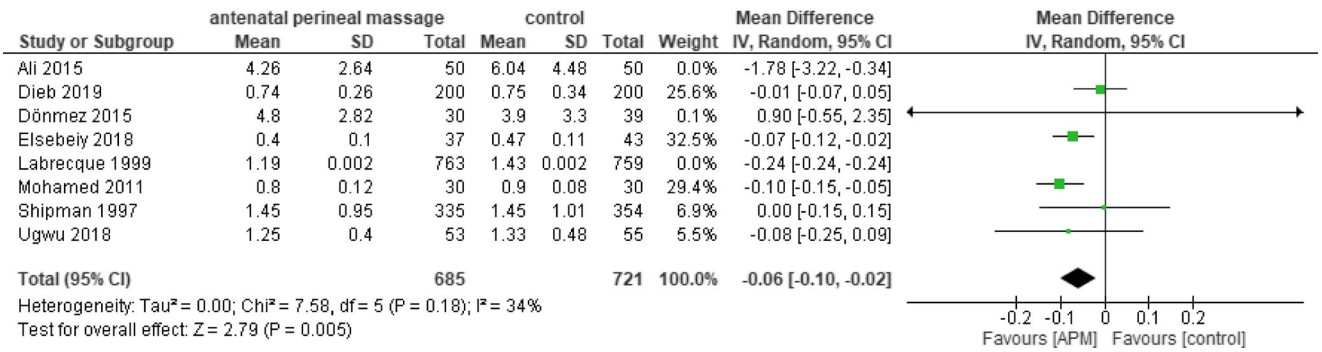


Fig. 5 Forest plot for the second stage of labor duration

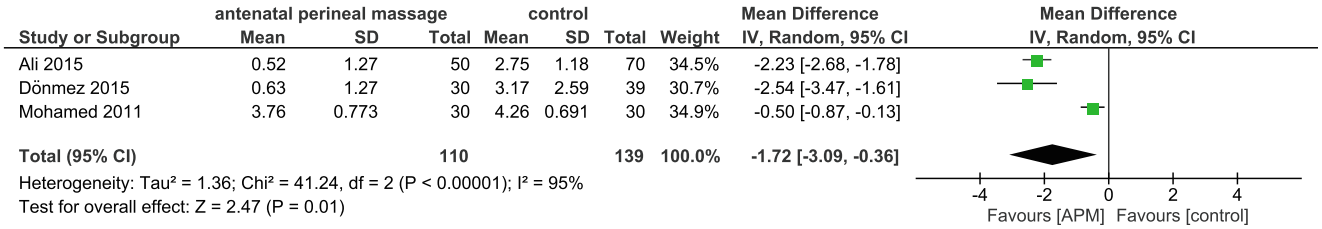


Fig. 6 Forest plot for perineal pain

heterogeneity by removing the Labrecque et al. study [24] ($p = 0.95$, $I^2 = 0\%$), we found a significant reduction in anal incontinence risk in the antenatal perineal massage group (RR = 0.30, 95% CI [0.14, 0.66], $p = 0.003$), as shown in Fig. 8B.

Urinary incontinence

We did not find any significant difference in urinary incontinence between the antenatal perineal massage and control groups (RR = 0.90, 95% CI [0.75, 1.09], $p = 0.27$), as shown in Fig. 9. The pooled studies were homogeneous ($p = 0.83$, $I^2 = 0\%$).

Apgar score at 1 min

We did not report any significant difference in Apgar score at 1 min between the antenatal perineal massage and control groups (RR = 0.97, 95% CI [−0.50, 2.43], $p = 0.20$), as shown in Fig. 10a. The pooled studies were heterogeneous ($p < 0.001$, $I^2 = 98\%$). However, after solving the reported heterogeneity by excluding one study [12] ($p = 0.69$, $I^2 = 0\%$), we found a significant improvement in Apgar score at 1 min in the antenatal perineal massage group (RR = 0.30, 95% CI [0.06, 0.54], $p = 0.01$), as shown in Fig. 10b.

Apgar score at 5 min

Antenatal perineal massage resulted in significant improvement in Apgar score at 5 min (RR = 0.59, 95% CI [0.10, 1.09], $p = 0.02$), as shown in Fig. 10c. The pooled studies were heterogeneous ($p < 0.001$, $I^2 = 86\%$). The reported heterogeneity was solved by excluding one study [12] ($p = 0.24$, $I^2 = 29\%$), and the results still showed the significant benefits from antenatal perineal massage in improving Apgar score at 5 min (RR = 0.31, 95% CI [0.09, 0.52], $p = 0.005$).

Discussion

In this meta-analysis, we found that antenatal perineal massage significantly reduced the incidence of episiotomies and perineal tears, especially the third- and fourth-degree perineal tears. Furthermore, prenatal perineal massage caused a significant decrease in the second stage of labor duration, postpartum perineal pain, and anal incontinence. We did not find a significant difference in urinary incontinence between antenatal perineal massage and control groups. Wound healing and Apgar scores at 1 and 5 min were significantly improved with antenatal perineal massage. The improvement in Apgar scores in antenatal perineal massage could be due to the shorter second stage of labor and less perineal trauma with a subsequently easier delivery and lower risk of fetal hypoxia.

In decreasing the incidence of episiotomies and perineal tears, previous studies agreed with our pooled analysis results and demonstrated such benefits [12, 13, 17]. Additionally, our study demonstrated the beneficial effects of antenatal perineal massage in decreasing the risk of severe perineal trauma, which involves third- and fourth-degree perineal tears, which contradicts the results of a previous Cochrane systematic review and meta-analysis [14]. In Beckmann and Stock's [14] Cochrane systematic review, antenatal digital perineal massage reduced the likelihood of perineal trauma (mainly episiotomies) and ongoing perineal pain and was generally well accepted by women. However, they demonstrated no differences in rates of different degrees of perineal tears between the intervention and control groups. This discrepancy in results between the Beckmann and Stock systematic review and our study could be attributed to the small number of included

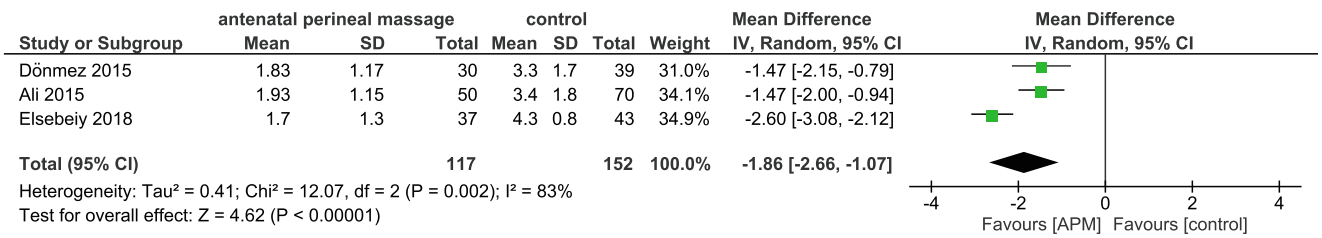


Fig. 7 Forest plot for wound healing

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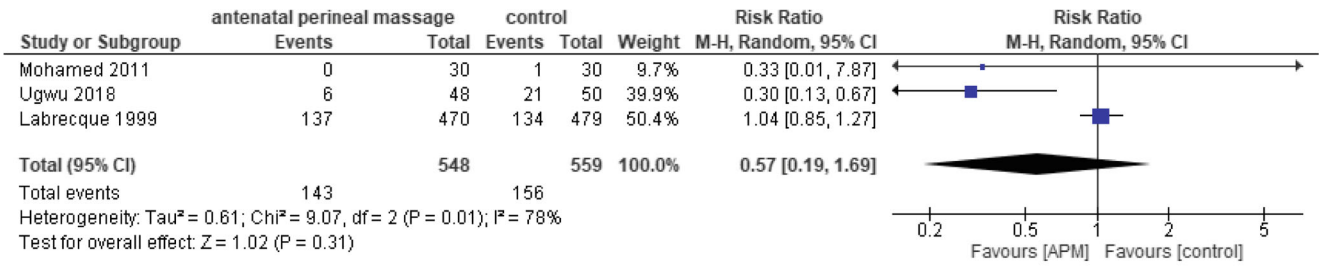

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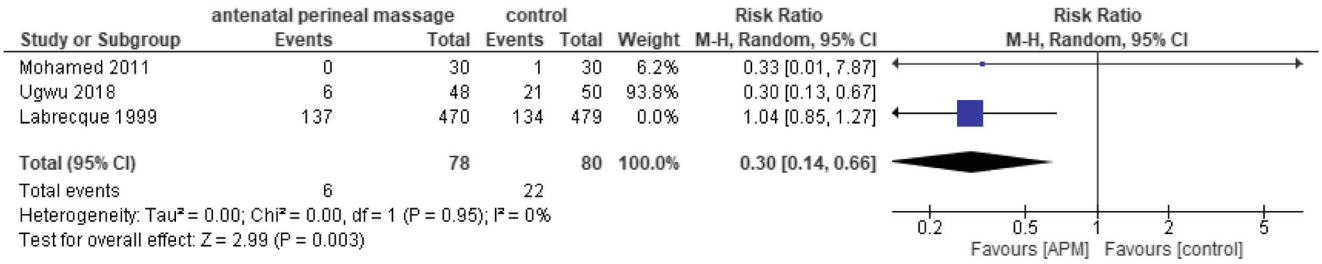

Fig. 8 Forest plot for anal incontinence

studies in their study (4 trials; 2497 women) compared with our study (11 trials; 3467 women). We added seven more trials to what was included in the Beckmann and Stock study, either published after this review [12, 13, 17, 28, 29, 31] or meeting our inclusion criteria [30].

The effect of antenatal perineal massage on the newborn Apgar scores at 1 and 5 min was debatable in previous studies. Although a randomized study demonstrated an improvement in Apgar scores with prenatal perineal massage [12], another study [13] showed no significant improvement in Apgar scores. However, on pooling this outcome in our metanalysis, a substantial improvement in Apgar scores was demonstrated, which further highlights the value of antenatal perineal massage.

Trauma to the perineum during childbirth can affect women with different morbidities such as pain and long-term problems. Therefore, different techniques have been suggested to reduce the perineal trauma and the length of labor for improvement of the obstetric outcomes [5, 32–35], and our study demonstrated such benefits in the reduction of duration of labor and risk of perineal trauma with antenatal perineal massage. Reducing perineal lacerations has been deemed very important to improve women's health by the American College of Obstetricians and Gynecologists [36], and our meta-analysis confirms that perineal massage antenatally prevents third- and fourth-degree perineal lacerations, which are associated with the greatest morbidity.

Other benefits of prenatal perineal massage in our study, such as reduction in postpartum pain and anal incontinence with improvement in wound healing, were also demonstrated in previous studies [17, 26, 37], which recommended perineal massage antenatally to gain such benefits.

Lack of information and advice regarding this technique, women's resistance to touching themselves, the viscidity of oils administrated during perineal massage, the difficulty faced with a large abdomen, and tiring or cramping of the fingers are the main obstacles facing routine antenatal perineal massage implementation [38, 39]. Healthcare professionals should discuss and encourage all pregnant women to perform antenatal perineal massage even before 34 weeks of gestation

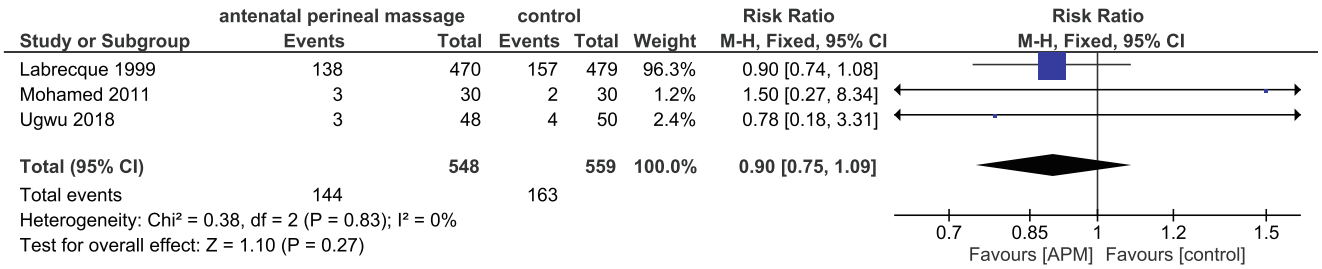

Fig. 9 Forest plot for urinary incontinence

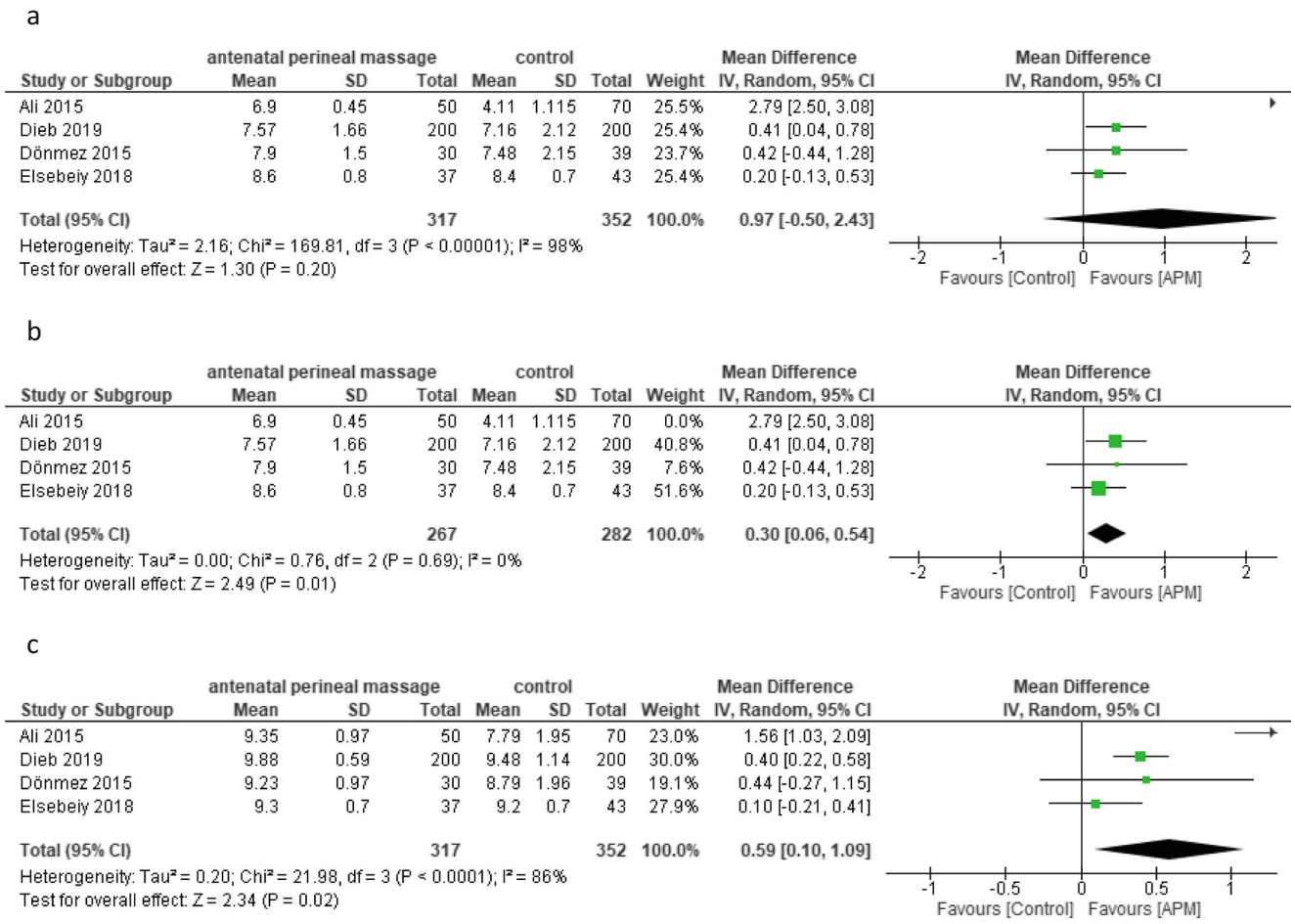

Fig. 10 Forest plot for Apgar scores

to aid them in practicing this technique and to help avoid the obstacles associated with a large abdomen [39]. In addition, different phone applications should be used as they provide valuable information and instructions regarding the importance and technique of antenatal perineal massage [38].

The main strengths of the present meta-analysis are its high quality as it is based on RCTs, well-defined, comprehensive search methodology and eligibility criteria, a large sample size of included participants, and strict adherence to the steps reported in the Cochrane Handbook for Systematic Reviews for Interventions. To our knowledge, no prior meta-analysis on this issue is as large, up to date, or comprehensive.

Our limitations are the small number of included studies and the heterogeneity reported in some outcomes, and most studies were not blinded. The reported heterogeneity was mainly due to lack of blinding in some studies, divergence in outcome definitions between studies, and differences in inclusion criteria.

Further RCTs are needed with a large sample size to confirm our findings. The future trials should assess the benefits of antenatal perineal massage performance before 34 weeks of gestation. Future trials should further confirm the effect of antenatal perineal massage on improving postpartum sexual satisfaction and reducing the risk of incontinence after delivery.

Conclusion

Antenatal perineal massage reduces the incidence of episiotomy, third- and fourth-degree perineal tears, postpartum perineal pain, and anal incontinence. It also leads to a shorter second stage of labor, better wound healing, and improvement in Apgar scores. Thus, healthcare professionals should consider and recommend antenatal perineal massage as a routine practice for labor preparation.

Authors' participation Ahmed Mohamed Abdelhakim: Project development, Data Collection, and Manuscript writing.
Elsayed Eldesouky: Manuscript editing.
Ibrahim Abo Elmagd: Manuscript editing.
Attia Mohammed: Manuscript editing.
Elsayed Aly Farag: Manuscript editing.
Abd Elhalim Mohammed: Manuscript revision.
Khaled M. Hamam: Project development and Data collection.

Ahmed Salah hussien: Data analysis.
Ahmed Said Ali: Data analysis.
Nawal Hamdy Ahmed Keshta: Manuscript revision.
Mohamed Hamza: Manuscript revision.
Ahmed Samy: Manuscript writing.
Ali Abdelhafeez Abdel-Latif: Manuscript writing.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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