Midwifery 102 (2021) 103126

Contents lists available at ScienceDirect

Midwifery

journal homepage: www.elsevier.com/locate/midw

Review Article

Non-pharmacological interventions to reduce anxiety in pregnancy, labour and postpartum: A systematic review

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ARTICLE INFO

Keywords:
Anxiety
Childbirth
Non-drug therapies
Postpartum
Pregnancy

ABSTRACT

Background: The anxiety mothers experience during pregnancy is well known and may have negative consequences for the emotional, psychological, and social development of newborns. Anxiety must therefore be reduced using different strategies.
Objective: To determine published non-pharmacological interventions to reduce anxiety during pregnancy, childbirth and postpartum.
Methods: A systematic peer-review of experimental and quasi-experimental studies was conducted using the PubMed, Scopus, Web of Science (WOS), and CINAHL databases. The quality of the studies was assessed using the Spanish version of the PEDro scale. Two researchers participated independently in the data selection and extraction process.
Findings: 587 articles were identified, of which 21 met the eligibility criteria. In eleven studies the intervention was performed during pregnancy, in three of them during labour, in four of them during the postpartum period, and in three of them during pregnancy and postpartum. During pregnancy, the most effective interventions were behavioural activation, cognitive behavioural therapy, yoga, music therapy, and relaxation; during childbirth: aromatherapy; during pregnancy and postpartum: antenatal training, massage by partners, and self-guided book reading with professional telephone assistance.
Conclusion and Implications: The most effective interventions to reduce anxiety were performed either during pregnancy or during the postpartum period, not during labour. Most of the interventions were performed on the women, with few of them being performed on both partners. Non-pharmacological interventions may be applied by nurses and midwives to reduce anxiety during pregnancy, labour and postpartum.

Introduction

Pregnancy, labour, and postpartum may cause stress and increase the risk of anxiety in women and their partners (Salehi et al., 2016). Anxiety is a whole psychobiological process that causes changes at the cognitive, affective, physiological, and behavioural levels (Chang et al., 2008), and is experienced as a warning signal of an imminent threat or danger (Bastani et al., 2005).

Currently, a high proportion of women, approximately 20–25%, suffer from anxiety during the transition to parenthood (Alder et al., 2011; Arranz et al., 2017; Brotherson, 2007; Chang et al., 2008; Hamdamian et al., 2018; McHale and Huston, 1985), of which 10–20% will have depressive episodes (Alder et al., 2011; Arranz et al., 2017; Chang et al., 2008; Feinberg and Kan, 2008). According to the World Health Organization (WHO), there is an increased risk of depression in pregnant women who have anxiety (Sainz et al., 2013). Moreover, anxiety disorders during pregnancy and postpartum may be more common than depression, and when anxiety disorders occur during pregnancy, they often precede postpartum depression (Navarrete et al., 2012). The prevalence of anxiety in fathers ranged between 3.4% and 25.0% during the antenatal period and 2.4% and 51.0% during the postnatal period. (Philpott et al., 2019). The 10% of fathers have paternal depression between the first trimester of pregnancy and 1 year postpartum (Paulson and Bazemore, 2010). Ramchandani et al. (2008) found paternal prenatal depressive and anxiety symptoms to be the strongest predictors of paternal postnatal depression. One of the factors contributing to anxiety in fathers is partner' anxiety and depression. (Philpott et al., 2019).

The presence of anxiety during pregnancy, birth and postpartum in the mother has been associated with a higher incidence of perinatal

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https://doi.org/10.1016/j.midw.2021.103126
Received 5 May 2020; Received in revised form 1 June 2021; Accepted 6 August 2021

complications for mother and child. In addition, the appearance of anxiety during these periods has been shown to precede the development of depression in a high percentage of occasions. (Alder et al., 2011; Chang et al., 2008; Navarrete et al., 2012: Sainz et al., 2013). Antenatal depression is associated with an increased risk of spontaneous abortion, pre-eclampsia and higher rates of surgical births. Infants born of mothers with depression are more likely to experience an increased risk for preterm birth, lower Apgar scores, lower birth weight, less frequent and shorter duration of breastfeeding, and twice the rate of admission to neonatal intensive care, and changes in fetal blood circulation. (Alder et al., 2011; Chang et al., 2008). A postpartum mother who is depressed may not be able to provide the best care to her infant, which may interfere with mother-baby attachment and produce insecurely attached infants. (Alder et al., 2011; Galbally et al., 2017; Roncallo et al., 2015; Arranz et al., 2017). These neonates are at a greater risk for developmental psychological challenges as they mature, they are fussier and are more likely to fail to thrive. (Levine et al., 2003; Bowen et al., 2012). In this way, if we prevent or treat the anxiety, we will avoid or reduce these alterations during the transition to parenthood and newborn development. On the other hand, anxiety suffered by fathers is associated with a child's long-term social–emotional and cognitive outcome through its impact on the parent–child interaction and with an increased risk of interparental conflict and higher levels of difficulties in infant temperament. (Ramchandani et al., 2005, 2011; Wilson and Durbin, 2010).

Regarding treatment for anxiety during pregnancy, labour, and postpartum, many women are reluctant to take medication for fear of possible side effects for the foetus or newborn (Alder et al., 2011). Previous studies reflect the mothers' desire for and high degree of satisfaction with non-pharmacological therapies. Several authors claim that non-pharmacological interventions may reduce and treat stress, anxiety, and depression under these circumstances. These interventions might also improve adherence to treatment and decrease dropout rates (Alder et al., 2011; Chang et al., 2008; Henrique et al., 2018).

Nurses and midwives may be expected to consciously contribute to the detection and treatment of anxiety during these stages in life (International Confederation of Midwives, 2019). However, in order to achieve this, these professionals must be aware of the most appropriate evidence-based interventions.

Previous systematic reviews of non-pharmacological interventions have been aimed to reducing or preventing stress, anxiety, and/or depression during pregnancy, childbirth, or postpartum. For instance, in a systematic review by Bastos et al. (2015), these authors assessed the effects of debriefing interventions compared with standard postnatal care for the prevention of psychological trauma in women postpartum. Other authors have focused their studies on evaluating other interventions such as family psychosocial and psychological intervention, hypnosis, high feedback in antenatal ultrasound appointments or mind-body interventions to prevent mental health problems in mothers during the transition to parenthood. (Dennis et al., 2007; Marc et al., 2011; Nabhan and Aflaifel, 2015; Sado et al., 2012)

However, there are no reviews to date that compare different non-pharmacological interventions throughout all stages of pregnancy, labour, and postpartum in a comprehensive way. As a result, the present study was proposed to determine which non-pharmacological interventions are known to be effective in reducing anxiety during pregnancy, childbirth, and postpartum.

Methods

The research question was prepared following the PICO methodology. The recommendations of the PRISMA Declaration were followed to conduct the literature review (Moher et al., 2009). The review protocol was registered in the international prospective register of systematic reviews PROSPERO, under the number CRD42019127505 (National Institute of Health Research of the NHS, 2019).

Search strategy

The search was conducted by peers in the PubMed, Scopus, Web of Science (WOS), and CINAHL databases in December 2018. The search strategies (Table 1) were reviewed by health sciences library staff and included only terms related to or describing the intervention. The searches were conducted using the thesauri of each database, as well as using the free search feature of each database when this was not an option or in order to complement the search. The descriptors used for the free search were the following: pregnancy; labour; obstetric birth; postpartum period; postnatal period; anxiety; therapy; treatment; therapeutics; pharmacological treatment. To limit the search strategy, only studies using a quasi-experimental design or a randomised clinical trial design were included. There were no limitations based on year or language to avoid missing any interventions which could be potentially useful to this study (Higgins and Green, 2011).

Selection criteria

Articles meeting the following predefined criteria were included

Regarding the study design: (1) randomised clinical trials or quasi-experimental designs; (2) detailed description of the interventions for reducing anxiety in women during pregnancy, labour, and postpartum; (3) self-report measurement of results; (4) moderate-to-strong scientific quality (the quality was measured with the Spanish version of the PEDro scale (Escala PEDro. Physiotherapy Evidence Database, 2021)). The following articles were excluded: (1) impossibility to access the full text; (2) limited sample size ($n < 80$). Since many non-pharmacological interventions come from the traditional medicine of Eastern countries, no languages were excluded. Nonetheless, we were unable to translate two articles originally written in Pashto.

Regarding the intervention articles were included that studied: (1) non-pharmacological interventions; (2) non-invasive interventions to reduce anxiety. The following articles were excluded: (1) studies conducted during invasive tests.

Regarding the study sample articles were included that studied: (1) low-risk pregnant women; (2) healthy women with healthy newborns, (3) women with full-term newborns. Excluded were studies of women who had: (1) pregnancy terminated in abortion; (2) a history of substance abuse; (3) previous psychiatric issues; (4) current psychological conditions other than anxiety; (5) post-traumatic stress disorder related to previous pregnancy.

Data extraction, quality assessment, and risk of bias

In order to reduce risk of bias, two researchers conducted the data extraction independently. Discrepancies were resolved by consensus.

To assess the quality of the studies, the Spanish version of the PEDro scale was used (Escala PEDro. Physiotherapy Evidence Database, 2021), a specific quality assessment tool for randomised clinical trials (Cascaes et al., 2013). This is an 11-item scale. However, the first item, which is related to external validity, is complementary and is not used to calculate the final score. As a result, the final score ranges from 0 to 10. If the indicator is present, it is rated with 1 point. If the indicator is not present, it is rated with 0 points. The criteria assessed by this scale are the following: randomisation, masking, blinding, attrition (in key measures), use of "intention-to-treat" analysis (if necessary), and effect size. As the scale does not have a cut-off point, we based on the works of the Armijo-Olivo et al. (2015) and Teasell et al. (2018) established a score greater than or equal to six like a moderate-to-high quality and a score below this threshold would represent low quality.

Summary and measures

Due to the great heterogeneity in the types of interventions, outcome measures, and time points of follow-up, the data were synthesised

Table 1
Search strategies.

Database	Search terms, connectors, truncation used	Records	Search Date
Pubmed	(((((((("Pregnancy"[*Mesh*])) OR "Parturition"[*Mesh*]) OR "Delivery, Obstetric"[*Mesh*]) OR "Postpartum Period"[*Mesh*]) AND "Anxiety/therapy"[*Mesh*]) NOT "Drug Therapy"[*Mesh*])) OR ((pregnan* OR parturition OR "delivery, Obstetric" OR "postpartum period" OR "posnatal period") AND anxiety AND (treatment OR therap*) NOT "drug therapy") Limits: Clinical trial.	387	28/12/2019
Scopus	(((pregnan* OR parturition OR "Delivery,Obstetric" OR "postpartum period" OR "posnatal period") AND anxiety AND (treatment OR therap*) not "drug therapy")) Limits: article.	52	31/12/2018
Web of Science (WOS)	((prenan* OR parturition OR "Delivery, Obstetric" OR "postpartum period" OR "posnatal period") AND anxiety AND (therap* OR treatment) NOT "drug therapy") Limits: article.	135	31/12/2018
CINAHL	((MH "Pregnancy") OR (MH "labour") OR (MH "Delivery, Obstetric") OR (MH "Postnatal Period") AND (MH "Anxiety/TH") NOT (MH "Drug Therapy") OR (pregnancy OR pregnant OR postpartum OR parturition OR "Delivery, Obstetric") AND anxiety AND (therapeutics OR therapy OR treatment) NOT ("drug therapy" or drugs or medications)) Limits: Clínical trial y exclude MEDLINE records.	13	27/12/2018

narratively and the included studies were summarised in tables. Whenever possible, the effect sizes were calculated considering the following interpretations: for the contingency coefficient ($r^2\varphi$): low = 0.10, medium = 0.30, large = 0.50; for qualitative variables, R^2, and partial R^2: low = 0.01, medium = 0.06, large = 0.14; for the comparison of inter-group means, differences in standardised means were used (d): low = 0.20, medium = 0.50, and large = 0.80. For quantitative variables, Pearson's correlation coefficient (r) was used, the values of which range between 0 and ± 1 (Cohen, 1988, 1992; Iraurgi, 2009). When the authors did not indicate the effect sizes, we calculated them in the cases where it was possible using the Practical Meta-Analysis Effect Size Calculator computer application (developed by David B. Wilson, Ph.D., George Mason University).

Results

The search yielded 587 articles, of which 21 items were identified as eligible for review. The search and selection process is shown in Fig. 1.

Characteristics of the studies

Almost all of the selected studies were randomised controlled clinical trials. For the most part, the control groups (CG) followed the treatment as usual. However, in some cases, the researchers performed other activities, such as providing information leaflets (Austin et al., 2008b; Feinberg and Kan, 2008), social support groups (Field et al., 2013), interactive reading (Salehi et al., 2016), or placebos (Mirghafourvand et al., 2017).

The majority of the studies performed a pretest and a posttest follow-up immediately after the intervention (n = 14). The rest of the studies assessed long-term effects (n = 7). The sample sizes ranged from 90 (Norouzi *et al.*, 2013) to 409 (Garcia, Ventura, Requena, Parron, and Alarcon, 2018). Most studies were conducted in Iran (n = 7). The most commonly used clinimetric instruments to measure anxiety were the Edinburgh Depression Scale (EDS) (n = 7) and Spielberger's State-Trait State Anxiety Inventory (STAI) (n = 16). The rest of the characteristics are shown in Table 2.

Quality assessment and risk of bias

All of the selected studies presented moderate-to-strong methodological quality. The main biases were related to selection bias, which may affect the generalisation of the results. For instance, in Mirghafourvand et al. (2017), most of the women included in the study were women who did not have employment outside the home. In Giallo et al. (2014), a large number of volunteers participated in the study (n = 537), when only n = 202 were deemed necessary. As a result, it is suspected that the participants might have been highly motivated. In Bittner et al. (2014), the study had a high dropout rate. This might be due to the participants having anxiety levels within the normal range, which could mean they were not sufficiently motivated. With respect to the limitations of the studies, the selection of the sample of two studies conducted with couples could be highlighted (Feinberg and Kan, 2008; Field et al., 2008), as in order for these couples to be included, authors chose as inclusion criteria just heterosexual couples. As a result, it is not possible to generalise the results of this intervention in other types of couples (Table 3).

Other cases were related to information bias. For example, in Chang et al. (2008), a music therapy-based intervention was tested. The women in the experimental group (EG) were not asked to report the time they were listening to music or the type of music they were listening to. A study by Bastani et al. (2005) based the frequency of relaxation practice at home on unverified, subjective self-reports of the participants in the EG.

Among other limitations is the possibility that group training might have masked the individual results of the intervention (Bastani et al., 2005; Satyapriya et al., 2013). Some of the interventions were intended to be brief as a measure to prevent participants from dropping out (Austin et al., 2008b; Chang et al., 2008; Field et al., 2013; Kafali et al., 2011), and there was also a lack of follow-up beyond post-intervention, meaning that the long-term effect could not be assessed (Bastani et al., 2005; Chang et al., 2008; Dimidjian et al., 2017; Salehi et al., 2016; Field et al., 2008).

Interventions to reduce anxiety

Most of the interventions involved women during pregnancy, labour, or postpartum (n = 18). Other interventions involved both mothers and fathers (n = 2) or fathers only (n = 1). The pregnant women were between 18 and 40 years old, with a mean age of 27 years. When age of fathers was informed, they had a mean age of 28 years old. In all the studies where the intervention was performed with couples, they were heterosexual couples. The interventions were most commonly conducted in hospitals (n = 10), followed by at home (n = 6), in the healthcare centres or medical clinics (n = 3), or in more than one setting: in hospital and at home (n = 1) and in the healthcare centre and at home (n = 1). The proportion of interventions performed at home during the postpartum period was higher than during pregnancy (57.14% vs 28.57%). All of the interventions carried out during labour took place in hospital. The interventions were implemented mainly (n = 11) by healthcare professionals (midwives, nurses, psychologists, physical therapists, and psychiatrists), but also by non-healthcare professionals (n = 5). In five studies (n = 5), this was not specified.

Except for one study (Henrique et al., 2018), which compared three interventions during labour (the use of warm shower hydrotherapy, perineal exercises with a ball, and the combination of both), the rest of the studies used a CG for comparison (n = 20). Fifteen of these studies compared the group receiving the intervention with another group receiving their treatment as usual. The other five studies devel-

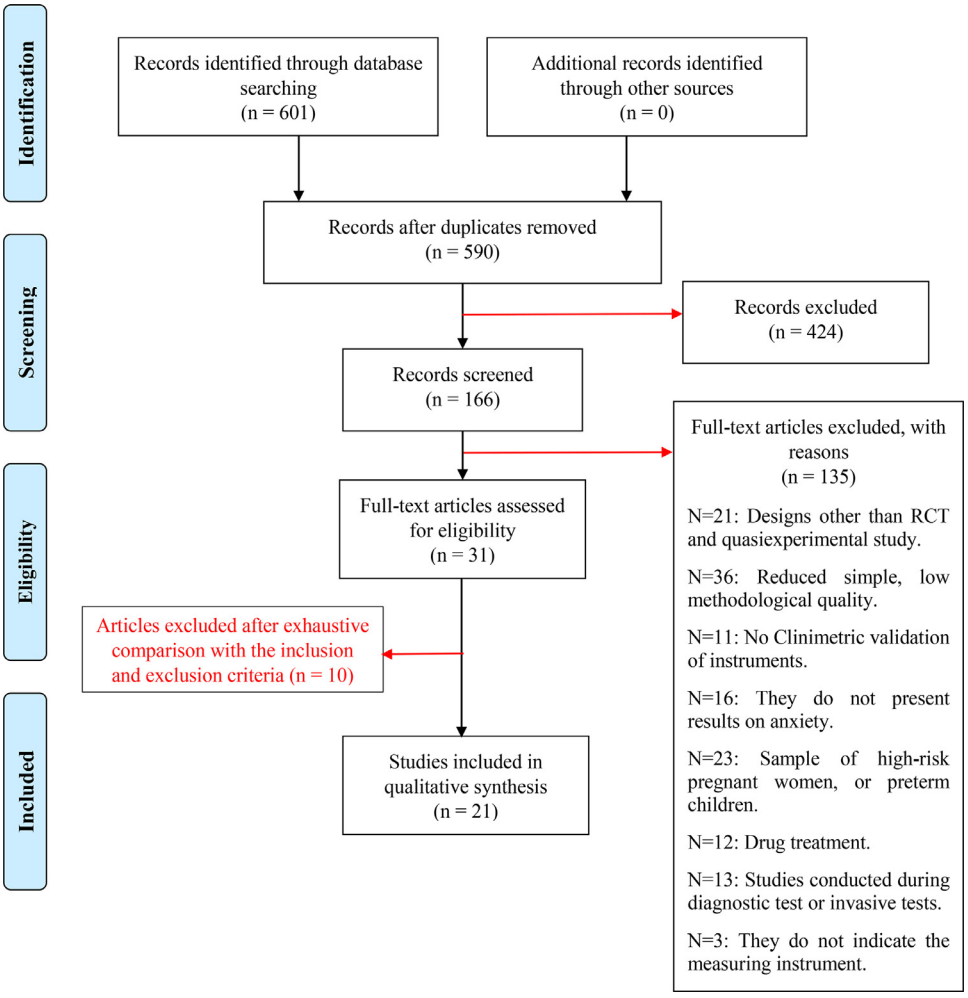

Fig. 1. Flow diagram.

oped specific interventions for the CG. Austin et al. (2008b) compared the use of cognitive-behavioural therapy (CBT) (EG) with delivering a booklet (CG). Feinberg and Kan (2008) compared coparenting (EG), which refers to how parents work together in their parenting roles, and how this affects the newborn, with delivering an information leaflet (CG). The program consisted of four prenatal and four postnatal sessions, in groups of 6–10 couples. Mirghafourvand et al. (2017) compared the use of essential oils (EG) with a placebo (CG) during labour; Hamdamian et al. (2018) compared the use of aromatherapy (EG) with a placebo (CG) during labour; and Field et al. (2013) compared attending a yoga group (EG) vs. attending a social support group (CG).

Approximately half of the analysed interventions were performed individually (n = 12). The rest of the interventions were performed in groups (n = 9). The intervention periods varied greatly, with 30 min being the shortest during labour for non-invasive diagnostic tests (Henrique et al., 2018) and up to several hours during labour (Hamdamian et al., 2018; Lemos et al., 2016). The longest intervention period lasted up to 6 months during pregnancy and postpartum (Charandabi et al., 2017). The mean number of sessions per week was between one and two (n = 18), except during labour (n = 3).

Fourteen of the interventions were conducted during pregnancy. Of these, eleven were implemented only during this period, and a further three during the postpartum period (Table 2). During pregnancy, CBT was used in three studies (Austin et al., 2008b; Bittner et al., 2014; Salehi et al., 2016), music therapy was used in three studies (Chang et al., 2008; Garcia et al., 2018; Kafali et al., 2011), and yoga was used in two (Field et al., 2013). One study also used telephone counselling (Satyapriya et al., 2013). Other interventions included behavioural activation, which is a type of a behavioural treatment for depression grounded in theory and applied clinical research conducted by behaviorists in the 1970s, addressing the lack of positive reinforcement and excess of avoidance behaviours (Dimidjian et al., 2017). Other interventions were massages (Field et al., 2008), antenatal training along with professional advice (Charandabi et al., 2017), coparenting (Feinberg and Kan, 2008), and self-guided book reading with telephone assistance (Milgrom et al., 2011).

Three interventions were conducted during labour (Table 2). Lemos et al. (2016) implemented a breathing training intervention. Hamdamian et al. (2018) used aromatherapy. Henrique et al. (2018) implemented three interventions: warm shower hydrotherapy, perineal exercises with a ball and the combination of the two interventions before.

Finally, seven interventions were performed during the postpartum period (Table 2) and three of them were continued from pregnancy: self-guided book reading (Milgrom et al., 2011), prenatal training (Charandabi et al., 2017), coparenting (Feinberg and Kan, 2008). Other authors used massages (Jahdi et al., 2016), psychotherapy (Giallo et al., 2014), kangaroo care and music therapy (Norouzi et al., 2013), and essential oils (Mirghafourvand et al., 2017).

Effectiveness of interventions to reduce anxiety

The STAI test was the most frequently used to assess anxiety in women. The range of possible scores for form Y of the STAI varies from a minimum score of 20 to a maximum score of 80 on both the STAI-T and STAI-S subscales. STAI scores are commonly classified as “no or low anxiety” (20–37), “moderate anxiety” (38–44), and “high anxiety”

Table 2
Characteristics of interventions of the included studies.

Author and year	Study design; Sample size (N); Clinimetric instruments (anxiety); Follow-up period; Country; Condition; Type of Intervention; Period; Target population; Context of the Intervention; Intervention period; Implementer.
Austin et al., 2008b	RCT; *N* = 132; MINI, EDS, STAI; Start, after CBT (6 weeks after), 2 and 4 months after labour; Australia; CBT vs CG (booklet); Group; Pregnancy; Women; Hospital; 6 weeks; Clinical psychologist and midwife.
Bastani et al., 2005	RCT; *N* = 110; STAI, PSS; Pre and post intervention; Irán; Relaxation vs CG (TAU); Group; Pregnancy; Women; Hospital; 7 weeks; Instructor.
Bittner et al., 2014	RCT; *N* = 160; PDQ, EDS, BDI-V, STAI; pre and post intervention, and 3 months postpartum; Germany; CBT vs CG (TAU); Group: Pregnancy; Women; Hospital; 8 weeks; Clinical psychologist.
Chang et al., 2008	RCT; *N* = 136; PSS, STAI, EDS; Pre and post intervention; Taiwan; Music therapy vs CG (TAU); Individual; Pregnancy; Women; Medical centre; 2 weeks; Not specified.
Charandabi et al., 2017	RCT; *N* = 126; EDS, STAI; Start, 8 weeks after intervention, and 6 weeks after labour; Irán; Prenatal training + counselling vs CG (TAU); Group; Pregnancy and postpartum; Partners; Health centre and telephone; From 24sg to 6 weeks postpartum; Male psychologist.
Dimidjian et al., 2017	RCT; *N* = 163; BADS-SF; Start, 5 and 10 weeks after intervention, and 3 months after labour; EE.UU; behavioural Activation vs CG (TAU); Group; Pregnancy; Women; Obstetric Clinic, telephone and home; 10 weeks; Nurse, midwife and occupational therapist.
Feinberg and Kan, 2008	RCT; *N* = 169 (couples); Depression Scale and Dysfunctional Scale of Parental Stress Index Interaction; Pre and post intervention; EE.UU; Coparenting vs CG (booklet); Group; Pregnancy and postpartum; Parents; Home; 7–8 months; Not specified.
Field et al., 2008	RCT; *N* = 57 (couples); CES-D, STAI, STAXI; Pre and post intervention; EE.UU; Massage vs CG (TAU); Individual; Pregnancy; Parents; Home; 16 weeks; Therapist.
Field et al., 2013	RCT; *N* = 92; CES-D, SCID, EDS, POMS, STAI, STAXI; Pre and post intervention, and after 1–3 weeks postpartum; EE.UU; Yoga vs CG (social support group); Group; Pregnancy; Women; University Medical centre; 12 weeks; Yoga instructor.
Garcia et al., 2018	RCT; *N* = 409; STAI; Pre and post realization of NST; Spain; Music therapy vs CG (TAU); Individual; Pregnancy; Women; Hospital; From uptake (3TR) to labour; Nurse.
Giallo et al., 2014	RCT; *N* = 202; FAS, FSS, DASS-21; Pre intervention, 2 and 6 weeks post intervention; Australia; Psychotherapy, telephone support and home visit vs CG (TAU); Individual; Postpartum; Women; Home; 4 weeks; Healthcare professionals.
Hamdamian et al., 2018	RCT; *N* = 116; STAI; In two stages of cervical dilation: 4–7 and 8–10 cm; Irán; Aromatherapy vs CG (placebo); Individual; Labour; Women; Hospital; Cervical dilation; Not specified.
Henrique et al., 2018	RCT; *N* = 117, VAS; Pre and post intervention; Brazil; Warm shower hydrotherapy, perineal exercises with a ball vs combination of the two interventions; Individual; Labour; Women; Hospital; 30 min; Not specified.
Jahdi et al., 2016	RCT; *N* = 100, STAI, Pre and post intervention, and the morning post intervention; Irán; Massage vs CG (TAU); Individual; Postpartum; Women; Hospital; 20 min; Expert in traditional medicine.
Kafali et al., 2011	RCT; *N* = 201; STAI; Pre and post realization of NST; Turkey; Music therapy vs CG (TAU); Individual; Pregnancy; Women; Hospital; 30 min of NST; Nurse.
Lemos et al., 2016	RCT; *N* = 140; STAI, Modified Borg Scale; Start and two hours later; Brazil; Breathing vs CG (TAU); Individual; Labour; Women; Hospital; Cervical dilation; Physiotherapist.
Milgrom et al., 2011	RCT; *N* = 143; EDS, BDI, DASS, PSI, Pre and post intervention; Australia; Self-guided book + telephone assistance vs CG (TAU); Individual; Pregnancy and postpartum, Women; Home; From 2TR or 3TR up to 12 weeks postpartum; Midwife and psychologist.
Mirghafourvand et al., 2017	RCT; *N* = 96; STAI, EDS; Pre and post intervention; Irán; Essential oils vs CG (placebo); Individual; Postpartum; Women; Home; 8 weeks; Not specified.
Norouzi et al., 2013	RCT; *N* = 90; VAS, STAI; Pre and post intervention; Irán; Kangaroo method and music therapy vs CG (TAU); Individual; Postpartum; Women; Hospital; 30 min; Nurse.
Salehi et al., 2016	RCT; *N* = 114; STAI; Pre intervention, and 4 weeks later; Irán; Group CBT and interactive reading vs CG (TAU); Group (CBT) and Individual (Interactive reading); Pregnancy; Women; Clinic; 2 weeks; Midwife and psychiatrist.
Satyapriya et al., 2013	RCT; *N* = 105; STAI, HADS; Pres and post intervention; India; IAYT + telephone counselling vs CG (TAU); Group; Pregnancy; Women; Home + Hospital; From uptake (1TR) up to 36sg; Yoga instructors.

CG: control group; RCT: Randomized Clinical Trial; MINI: Mini International Neuropsychiatric Interview; EDS: Edimburg Postnatal Depression Scale; STAI: Spielberger State-Trait State Anxiety Inventory; CBT: cognitive behavioural therapy; PSS: Perceived Stress Scale; TAU: Treatment as Usual; PDQ: Prenatal Anguish Questionnaire; BDI-V: Simplified version of the Beck Depression Inventory; BADS-SF: behaviour activation for depression scale: short form; CES-D: centre for Epidemiological Studies-Depression Scale; STAXI: State Inventory of Anger; SCID: Structured clinical interview for depression; POMS: Profile of moods; NST: non-stressful *fetal* test; FAS: Fatigue Evaluation Scale; FSS: fatigue severity scale; DASS: Depression, Anxiety and Stress Scale; cm: centimetres; EVA: Visual analog Scale; BDI: Beck-II Depression Inventory; PSI: Parental stress index; HADS: Hospital anxiety depression scale; sg: weeks of gestation; 3TR: third quarter; min: minutes; 2TR: second quarter; IAYT: integrated approach to yoga therapy; 1TR: first quarter.

(45–80). (Spielberger et al., 1983: Kayikcioglu et al., 2017). The mean baseline anxiety levels were found to be 37.75 and 39.2 STAI points for both the EG and CC, respectively. In the latest measurement, it was 35.08 points and 41.01 points for EG and CG, respectively. Anxiety had thus been reduced in the EG, while it had increased in the CG.

The interventions performed during pregnancy reduced anxiety with different effect sizes. Large effect sizes were found for massage by the partners ($r = 0.26$ in fathers, $r = 0.53$ in mothers) by Field et al. (2008), music therapy ($d = 0.88$) by Garcia et al. (2018), as well as in the integrated approach to yoga therapy (IAYT) ($d = 0.993$ for anxiety status and $d = 0.43$ for anxiety trait) by Satyapriya et al. (2013). In contrast, small effect sizes were found for music therapy ($r = 0.044$ and $d = 0.088$) by Chang et al. (2008); behavioural activation ($d = 0.41$) by Dimidjian et al. (2017); and yoga ($d = 0.009$, $r = 0.004$) by Field et al. (2013). In the study of Bittner et al. (2014), CBT was not significant to reduce the anxiety (Table 4).

During labour, the use of aromatherapy with *Rosa damascena* (Hamdamian et al., 2018) had a significant low effect (4–7cm: $d = 4,25$; $r = 0,9$; 7–10 cm: $d = 5,84$; $r = 0,94$), while Hydrotherapy plus perineal exercises with a ball (Henrique et al., 2018) and breathing training intervention (Lemos *et al.*, 2016) were not found to be significant (Table 4).

During the postpartum period, the most effective intervention was massage ($d = 0.86$) by Jahdi et al. (2016), kangaroo care with music therapy had a medium effect size ($d = 0.63$) by Norouzi et al. (2013). In the other hand, small effect sizes were found for essential oils ($d = 0.20$ for state anxiety and $d = 0.08$ for trait anxiety) by Mirghafourvand et al. (2017), kangaroo care ($d = 0.41$) by Norouzi et al. (2013), and telephone support with home visit ($\eta 2 = 0.03$) by Giallo et al. (2014). (Table 4).

Among the interventions that took place during pregnancy and postpartum, all the interventions had small to medium effect size: antenatal training with fathers (anxiety state: $d = 0.61$ / $r = 0.29$; anxiety trait: $d = 0.58$ / $r = 0.28$), by Charandabi et al. (2017), self-guided book reading with telephone counselling (average effect size: $d = 0.58$), by Milgrom et al. (2011) and coparenting ($d = 0.38$, no significant) by Feinberg and Kan (2008). (Table 4).

Moreover, Salehi et al. (2016) found both interventions to have significant effects: both CBT (state anxiety: $d = 0.69$; trait anxiety:

Table 3
Bias and limitations of studies.

Study (author and year)	Quality assessment (PEDro) *	Biases and limitations
Austin et al., 2008b	8 points	*Selection bias*: the sample selected had baseline low anxiety levels, which makes it difficult to observe a large change after the intervention.
Bastani et al., 2005	6 points	*Information bias*: the frequency of relaxation practice at home was based on self-verified subjective reports. *Limitation*: EG results may be influenced by the training group.
Bittner et al., 2014	7 points	*Selection bias:* the sample selected had baseline low anxiety levels, there was a high dropout rate (48.75%).
Chang et al., 2008	6 points	*Information bias*: EG patients were not asked for a self-report with the time they had been listening to the music, nor the type of it. Confounding bias: The effects of self-selected music vs. investigator-selected music were not compared (music was selected by the researcher).
Charandabi et al., 2017	7 points	*Confounding bias*: the number of training sessions were not met, because the parents were very busy, so it was supplied with telephone guidance.
Dimidjian et al., 2017	7 points	*Information bias*: the level of satisfaction in CG women was not measured, only in the EG women.
Feinberg and Kan, 2008	8 points	*Confounding bias*: The constructs targeted by the program do show intervention effects, yet we cannot rule out the possibility that generic features of the program—such as attention and time together as a couple—or demand characteristics evoked by program participation were responsible for the changes.
Field et al., 2008	6 points	*Information bias*: the long-term effect is unknown (there was no follow-up).
Field et al., 2013	8 points	*Information bias:* The SCID was administered only at the start of the study. The use of a standardized interviewer-administered scale such as the Hamilton Rating Scale for Depression or the Inventory of Depression Symptomatology might have been better measures of depression severity outcome in this intervention study. In addition, this study is not readily comparable to other yoga studies because the yoga sessions were shorter than those used in the previous research
Garcia et al., 2018	6 points	*Confounding bias*: the study was only conducted in a health centre and the double blind method could not be applied.
Giallo et al., 2014	7 points	*Selection bias*: there were a great number of volunteers to participate in the study, being the majority of women English-speakers, with a partner and tertiary education. *Information bias*: poor psychometric properties for some scales.
Hamdamian et al., 2018	6 points	*Confounding bias*: could not be performed double blind. Information bias: the stressful condition of participants during labour may confound their responses to the pain and anxiety assessments.
Henrique et al., 2018	7 points	*Information bias*: the intervention was not blinded.
Jahdi et al., 2016	8 points	*Confounding bias*: This study did not evaluate some interfering factors, such as satisfaction with the behaviour of the hospital staff, the enjoyment level of the social protection, and other life stressors during the past year.
Kafali et al., 2011	7 points	*Confounding bias*: the duration of the NST was shorter than in previous studies, which may prevent comparison of the results.
Lemos et al., 2016	7 points	*Confounding bias*: contamination of the control group by doulas, on average, three times a week or external conditions related to hospital environment, such as noise and group hospitalization.
Milgrom et al., 2011	8 points	*Selection bias*: poor engagement of men in the first version.
Mirghafourvand et al., 2017	8 points	*Selection bias*: most of the women in the study were housewives.
Norouzi et al., 2013	8 points	*Confounding bias*: None of the participants had a chance to select the type of music post-operatively, more-over, a culturally unfamiliar type of music was used
Salehi et al., 2016	6 points	*Selection bias*: participants' demographic characteristics (e.g., nulliparity) might limit the generalizability of the findings.
Satyapriya et al., 2013	6 points	*Information bias*: there was an unexpected dropout rate.

* Quality assessment: all studies have a moderate-strong quality.
CG: control group; EG: experimetal group; CBT: Cognitive-behavioural Therapy; SCID: Structured Clinical Interview for Depression; NST: non-stressful fetal test; n: sample size.

d = 0.57) and the interactive reading group during pregnancy (state anxiety: d = 0.56; trait anxiety: d = 0.49) compared to the CG. No statistically significant differences between the two types of intervention were found. The study by Norouzi et al. (2013), which compares the effect of kangaroo care vs kangaroo care together with music therapy during the postpartum period also found both interventions to be effective when compared to the CG, with the effect sizes being d = 0.41 and d = 0.63, respectively (Table 4).

Discussion

The aim of the present study was to systematically review the literature on non-pharmacological interventions to reduce anxiety throughout the gestation process and subsequent periods. We identified 21 studies with good methodological quality where different interventions, generally aimed at women during pregnancy, labour, and postpartum, are tested. It is worth noting the limited number of interventions targeting partners, despite the fact that, when implemented, they yielded positive results in terms of anxiety and improved the marital relationship.

Heron et al. (2004), as well as Marc et al. (2011), state that pregnancy is the stage in which women present with the highest levels of anxiety, which is why they believe it is the ideal stage for implementing these interventions. In contrast, Teixeira et al. (2009), as well as Alder et al. (2011), assert that postpartum is the stage in which it is principally primiparous women that present with the highest levels of anxiety. Although Austin et al. (2008a) agrees that postpartum is the stage posing the greatest risk for the onset of anxiety and depression, they also consider that the ideal stage for prevention is pregnancy. In this review, we have found that the levels of baseline anxiety are similar during all three stages. However, most of the selected studies applied the interventions during pregnancy.

The interventions where the effect was significant were the following: during pregnancy, yoga, music therapy, the massage performed by the partner, and CBT; during labour, aromatherapy, hydrotherapy; during the postpartum period, kangaroo care along with music therapy, massage; and during pregnancy and postpartum, antenatal training, and self-guided book reading with telephone assistance. Moreover, the interventions performed during pregnancy and postpartum had larger effect sizes than those carried out during labour, probably because during this stage, specific factors with a more complex approach appear and interfere with the anxiety reaction (García, 2011; Ya-Ling et al., 2017). Taking these aspects into account, it would be interesting to be able to develop interventions during pregnancy, but also throughout all the three stages, once the causal factors of anxiety and the most effective ways to reduce it in each stage are known.

Few studies address the importance of treating anxiety in fathers or the impact of anxiety on couple and family relationships. Studies may be refocused on other broader target populations, as these

Table 4
Main outcomes.

Period	Study	Intervention EG vs CG	Effect sizes* / P value
Pregnancy	Austin et al. (2008b)	CBT vs booklet	$p > 0.005$
	Bastani et al. (2005)	Relaxation vs TAU	$d = 2.38$; $r = 0.76$ / $p < 0.001$
	Bittner et al. (2014)	CBT vs TAU	$\eta 2 = 0.006$ / $p = 0.529$
	Chang et al. (2008)	Music therapy vs TAU	$d = 0.088$; $r = 0.044$ / $p = 0.01$
	Dimidjian et al. (2017)	Behavioural Activation vs TAU	$d = 0.41$ / $p = 0.014$
	Field et al. (2008)	Massage vs TAU	$r = 0.26$ in fathers, $r = 0.53$ in mothers / $p = 0.01$
	Field et al. (2013)	Yoga vs social support group	$d = 0.009$; $r = 0.004$ / $p = 0.001$
	Garcia et al. (2018)	Music therapy vs TAU	$d = 0.88$; $r = 0.40$ / $p = 0.001$
	Kafali et al. (2011)	Music therapy vs TAU	$d = 0.53$; $r = 0.26$ /$p < 0.001$
	Salehi et al. (2016)	Group CBT and interactive reading vs TAU	CBT (state anxiety: $d = 0.69$; trait anxiety: $d = 0.57$ / $p = 0.011$); the interactive reading group (state anxiety: $d = 0.56$; trait anxiety: $d = 0.49$ / $p = 0.016$)
	Satyapriya et al. (2013)	IAYT + telephone counselling vs TAU	State anxiety: $d = 0.993$; trait anxiety: $d = 0.43$ / $p = 0.001$
Labour	Hamdamian et al. (2018)	Aromatherapy vs placebo	4–7cm: $d = 4.25$; $r = 0.9$ / 7–10 cm: $d = 5.84$; $r = 0.94$ / $p < 0.05$
	Henrique et al. (2018)	Warm shower hydrotherapy (GA), perineal exercises with a ball (GB) vs combination of the two interventions (GC)	GA-GC: $d = 0.01$; GB-GC: $d = 0.365$ GA-GB: $d = 0.37$/ $p = 0.99$
	Lemos et al. (2016)	Breathing vs TAU	$d = 0.18$ / $p = 0.910$
Postpartum	Giallo et al. (2014)	telephone support and home visit vs TAU	$\eta 2 = 0.03$ / $p < 0.01$
	Jahdi et al. (2016)	Massage vs TAU	$d = 0.86$ / $p = 0.001$
	Mirghafourvand et al. (2017)	Essential oils vs placebo	state anxiety: $d = 0.20$ / $r = 0.10$/ $p = 0.197$; trait anxiety: $d = 0.08$ / $r = 0.04$ / $p = 0.726$
	Norouzi et al. (2013)	Kangaroo method and Kangaroo care with music therapy vs TAU	kangaroo care ($d = 0.41$); kangaroo care and music therapy ($d = 0.63$) / $p = 0.191$
Pregnancy and postpartum	Charandabi et al. (2017)	Prenatal training + counselling vs TAU	state anxiety: $d = 0.61$ / $r = 0.29$ /$p < 0.001$; trait anxiety: $d = 0.58$ / $r = 0.28$/ $p < 0.001$
	Feingerg y Kan (2008)	Coparenting vs booklet	$d = 0.38$ / $p = 0.569$
	Milgrom et al. (2011)	Self-guided book + telephone assistance vs TAU	$d = 0.58$ / $p < 0.01$

*Effect size interpretation: (d) small = 0.20, medium = 0.50, and large = 0.80; (r) small = 0.10, medium = 0.30 and large = 0.50; ($\eta 2$) small = 0.01, medium = 0.06, and large = 0.14. In a few of cases it was not possible to estimate the effect size.
EG: experimental group; CG: control group; TAU: Treatment as Usual; CBT: cognitive behavioural therapy; IAYT: integrated approach to yoga therapy.

too may observe an increase in their anxiety levels during these stages, since they play the role of family support and protection and should be actively involved in the upbringing and care of children (Charandabi et al., 2017; Feinberg, 2002; Feinberg and Kan, 2008; Matthey et al., 2003; Tohotoa et al., 2012). As with women, partners who feel anxiety may interfere with their baby's future psycho-affective development (Alder et al., 2011; Galbally et al., 2017; Roncallo et al., 2015; Arranz et al., 2017). Moreover, Goodman (2004) highlights that health must be addressed at the family level, because anxiety acts as a stressor for the family unit and may alter its functioning. However, none of the studies found in this review included families as a health unit. Most of the interventions included in our study are individual. Between group and individual interventions there is no clear evidence of which method is most effective. We found individual interventions with a large effect size such as that of García et al. (2018) during pregnancy and Jahdi et al. (2016) during the postpartum period as well as group interventions such as Satyapriya et al. (2013) during pregnancy. We found individual and group interventions as well with small effect size or it was not significant that have been made in the three period (pregnancy, birth and postpartum). Therefore, we cannot conclude that working individually produces better results, or vice versa. In the case of group interventions, the authors also reflected limitations that could affect to the validity of data. For instance, Bastani et al. (2005), that carried out a group relaxation training during pregnancy, discussed that the results could had been not directly related to the relaxation intervention, because it could be masked due to women belonged to a group of equals.

Regarding the interventions with couples/fathers, we cannot conclude about their effectiveness, given only three out of the 21 studies included such kind of interventions. However, there is evidence that support that quality of the early parenting relationship is an important and potentially modifiable influence on parents and child outcomes. Moreover, the childrearing of infants not only depends on the parents, it could depend of family environment, for this reason a research line of potential interest is working with couples/mother and with families, and observe the results on maternal anxiety and psycho-affective development of the newborn, being necessary to develop further research to stablish clear conclusions.

Strengths and limitations

This review has attempted to make a comprehensive comparison between the different types of non-pharmacological interventions developed to present during pregnancy, labour, and postpartum in different regions of the world. All of the selected studies were randomised clinical trials with high sample sizes and a moderate-to-strong methodological quality. These characteristics support the relevance of their findings. Finally, whenever possible, the effect sizes reported in the different studies were taken into account, which made it possible to summarise and compare not only the effectiveness of the interventions, but also the strength of their effects.

This review has some limitations. Firstly, the search could have been made in more than five databases. However, we considered these databases to be the most relevant in this field of research. Secondly, the exclusion of the word "depression" from our search terms may have filtered out some studies that addressed both depression and anxiety. Thirdly, due to the diversity of the instruments assessing anxiety and the wide variety in the reporting of the results, a meta-analysis could not be performed. Fourthly, the PEDro scale was chosen for measuring the quality of the articles. However, this scale has no cut-off point. As a result, we had to use a cut-off point establish to another studies before (Armijo-Olivo et al., 2015; Teasell et al., 2018). Fifthly, as it can be observed from the characteristics of the studies, very few interventions were conducted in European countries, which could be related to the level of medicalisation present in these cultures. In our study, we found that the country that publishes more articles on non-pharmacological treatment is Iran. This may constitute a limitation, however, it wor-

thy to say that the disparity between countries on the choice between pharmacological and non-pharmacological, is directly influenced by the culture (Laine and Räisänen, 2020; Preis et al., 2018; Christiaens et al., 2012). Nevertheless, we collected a large number of articles from different countries.

Sixthly, regarding the study selection process, we did not include studies with biological data measurements. Instead, we selected studies that assessed anxiety levels using self-report scales with the aim of improving the comparability of results between interventions and facilitating the development and subsequent study of the results in case of replication of any of the interventions. This is because assessing self-reported measurements is easier, involves fewer ethical issues, and is less costly than biological data measurements. In addition, the nature of the disorder we are studying requires the collection of subjective psychological information, not simply biological data (Brugha and Meltzer, 2017).

Finally, other interventions, such as acupuncture (Ormsby et al., 2016), acupressure (Kuo et al., 2016), and mindfulness (Byrne et al., 2014; Beattie et al., 2017) have not been included in this review due to the characteristics of the studies: pilot studies with small sample sizes, protocol studies with low methodological quality score, their target population was not healthy women or did not specifically measure the anxiety. However, it may be of interest continue studying the effect on anxiety of such kind of interventions in the future.

Most of the studies included in this review have positive effects on stress, levels of depression and pain. We also can find other studies such as that of Moghimi et al. (2014) where foot reflexology also reduced anxiety and at the same time, reduced labour pain, increased the number of natural births and improved the Apgar score of the newborn. Conversely, Shulman et al. (2017) shown that mindfulness intervention has potential as a non-pharmacological complementary treatment for postpartum depression and anxiety, when it does not resolve completely with pharmacotherapy. The latest was also used in the study by Woolhouse et al. (2014) for reducing the psychological stress, and by Beattie et al. (2017), for promoting an internalized locus of self-acceptance.

Clinical implications

The presence of anxiety in mothers and fathers during *the transition to parenthood* is a clinical problem that may cause both maternal and paternal postnatal depression and may negatively affect foetal development by generating emotional, psycho-affective, and social alterations in the future. Thus, in order to prevent high rates of postnatal depression, more non-pharmacological interventions are needed, as these have been shown to be the choice of women during pregnancy and have no side effects that may hinder therapeutic adherence.

Nurses and especially midwives are responsible for the care process and education of mothers and fathers during pregnancy and are the first to identify and treat anxiety. Introducing these practices into their daily work could therefore contribute to reducing the levels of anxiety present in these stages.

Firstly, we could improve the training of nurses and midwifes in evidence based non-pharmacological method for anxiety and depression prevention and treatment, highlighting the importance of preventing these problems for the benefit of the mothers and newborns. Secondly, midwives who do prenatal training and monitoring of the pregnancy process could use this review to select the more effective and applicable non-pharmacological interventions in their practice to prevent or reduce anxiety level during pregnancy, childbirth and postpartum, given they use to be of chose by women.

Future research

There is a need for further measurement of the long-term effects of non-pharmacological interventions to prevent anxiety during pregnancy, labour, and postpartum, as well as for further research into the effects on the psycho-affective development of the newborns whose mothers and fathers with anxiety symptoms were treated with these interventions.

Finally, further studies should be developed to assess interventions involving partners and family units. This could be a new line of research, since no interventions to reduce anxiety in the family unit in these stages have been found.

Conclusions

There is evidence that non-pharmacological interventions to reduce anxiety in the transition to parenthood, particularly during pregnancy and the postnatal period, can be effective. The interventions which effect was significant were the following: during pregnancy, massage by the partners, music therapy and yoga; during labour, aromatherapy; during the postpartum period, massage; and during pregnancy and postpartum, antenatal training and self-guided book reading with telephone counselling. According to the results of this study, it would be advisable to refocus interventions on other target populations, such as partners or family units. Nurses and midwives are the healthcare professionals who serve as access points to this type of non-pharmacological treatment to reduce anxiety, which highlights the importance of their training in this area.

Declaration of Competing Interest

None declared.

Ethical Approval

Not applicable.

Funding Source

This research did not receive any specific grant from funding agencies in the public, commercial or non-profit sectors.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.midw.2021.103126.

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