



Educational Interventions Targeting Anxiety Reduction in the Prenatal Period



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ABSTRACT

Aims Educational interventions have emerged as a promising avenue for reducing prenatal anxiety, offering a structured approach to inform and empower expectant mothers. However, previous reviews have been limited by a narrow focus and inconsistent methodologies, necessitating a comprehensive evaluation of various educational approaches. This systematic review aimed to evaluate the effectiveness of different educational interventions in reducing prenatal anxiety.

Information & Methods A literature search was conducted involving five databases, including PubMed, Scopus, CINAHL, PsycINFO, and the Cochrane Library. Study quality and risk of bias were assessed independently by the authors using the CASP and RoB2 tools. The initial database query yielded 2,565 articles, of which only 16 studies met the inclusion criteria for data extraction and analysis.

Findings Educational interventions, such as mindfulness-based approaches, antenatal education programs, and lifestyle-based strategies were effective in reducing prenatal anxiety. Mindfulness techniques and psychoeducation significantly improved maternal self-efficacy and emotional regulation. Antenatal education programs and lifestyle interventions reduced anxiety related to childbirth and enhanced coping strategies. Additionally, culturally tailored and digital interventions showed promise, although challenges in user engagement and interactivity were identified.

Conclusion Diverse educational interventions effectively reduce prenatal anxiety.

Keywords Intervention; Anxiety; Antenatal Care; Pregnancy

CITATION LINKS

[1] The prevalence of anxiety disorders during ... [2] Anxiety disorders during pregnancy ... [3] Maternal anxiety during pregnancy and the ... [4] An overview of maternal anxiety during ... [5] Maternal and environmental influences on ... [6] Adverse childhood experiences and ... [7] Opportunities to enhance parental well-being ... [8] Maternal well-being in the face of ... [9] The psychological benefits of ... [10] Enhancing educational approaches to mental health for ... [11] Prenatal education ... [12] Effectiveness of cognitive behavioral therapy ... [13] Health promotion behaviours of pregnant women and ... [14] Effects of relaxation interventions during pregnancy on maternal ... [15] Psychoeducation for psychological issues and birth ... [16] Childbirth self-efficacy and birth related PTSD symptoms ... [17] The effect of mindfulness-based stress reduction ... [18] Effects of psycho-education interventions on perceived ... [19] The effectiveness of massage for reducing ... [20] The PRISMA 2020 statement ... [21] Delivering the thinking healthy programme as ... [22] Antenatal group therapy improves worry ... [23] Effectiveness of a mindfulness-based ... [24] Effects of antenatal education on fear ... [25] A psychoeducational intervention in prenatal ... [26] The effect of educational intervention ... [27] Comparison of pregnancy-related concerns, perceived ... [28] Effects of mindfulness-based childbirth ... [29] Effectiveness of childbirth education ... [30] The effect of prenatal education on health ... [31] The effect of lifestyle-based education ... [32] Effects of antenatal education ... [33] Effects of needs-based education for prenatal ... [34] The impact of Islamic religious education ... [35] Pilot early intervention antenatal ... [36] Effect of receiving text messages ... [37] The effectiveness of mindfulness-based ... [38] The effects of mindfulness interventions ... [39] The importance of face to face, group ... [40] Enhanced antenatal care ... [41] The impact of childbirth education classes ... [42] A systematic review of midwives' training ... [43] Effective psychological therapies to improve ... [44] Relation between spiritual health ... [45] A systematic mixed-studies review ... [46] A mixed methods systematic review ... [47] Electronic tools to bridge the language ...

Introduction

Pregnancy-related anxiety is becoming increasingly recognized as a serious public health issue; estimates indicate that up to 20% of expectant mothers may experience clinically significant anxiety symptoms [1, 2]. The implications of maternal anxiety extend beyond the individual, impacting both maternal and fetal health outcomes. High levels of anxiety during pregnancy are associated with adverse effects, such as preterm labor, low birth weight, impaired fetal neurodevelopment, and an increased risk of postpartum depression [1, 3-6]. Consequently, addressing prenatal anxiety is essential not only for maternal well-being but also for promoting optimal infant development and mitigating future psychological risks for both mother and child [7-9].

Educational interventions have emerged as a promising avenue for reducing prenatal anxiety, offering a structured approach to inform and empower expectant mothers [10, 11]. These interventions encompass a wide range of strategies, including informational sessions on pregnancy and childbirth, stress management techniques, relaxation exercises, and skills-based approaches such as mindfulness and cognitive-behavioral therapy (CBT) [12-14]. By equipping women with knowledge and coping strategies, educational interventions aim to alleviate anxiety, foster self-efficacy, and provide women with a sense of control and preparedness for the challenges of pregnancy and childbirth [15, 16].

Previous systematic reviews have attempted to evaluate the effectiveness of such interventions. These reviews have provided important insights, suggesting that interventions like mindfulness-based stress reduction (MBSR), CBT, and psychoeducational programs can help reduce anxiety in pregnant women [12, 17, 18]. However, significant limitations remain. Many prior reviews focus narrowly on specific types of interventions, which limits the understanding of how different educational approaches compare in terms of effectiveness. For instance, some reviews exclusively address mindfulness-based interventions (MBIs) or CBT, thereby overlooking the potential benefits of integrative or alternative educational strategies [12, 17]. Other systematic reviews have included only selected populations, such as high-risk pregnancies or first-time mothers, which limits the applicability of their findings to the larger prenatal population [19].

Moreover, the methodology in many previous reviews poses challenges for interpretation. Issues,

such as small sample sizes, variability in intervention delivery, and inconsistent outcome measures have hindered the ability to draw robust conclusions. For instance, educational interventions often vary widely in content, frequency, duration, and delivery method (in-person vs. virtual), creating a need for a clearer understanding of which components are most impactful. Additionally, several systematic reviews have identified gaps in follow-up studies, leaving questions about the long-term effectiveness of these interventions and whether initial anxiety reductions are sustained postpartum [3, 6, 14].

The urgency for a comprehensive review of educational interventions aimed at reducing prenatal anxiety is underscored by both the rising prevalence of maternal anxiety and the increasing demand for accessible, evidence-based resources that can be implemented in diverse healthcare settings. A broad and systematic evaluation is needed to address the limitations in previous research and to establish a clearer understanding of the efficacy, scalability, and applicability of various educational models for reducing prenatal anxiety. We, therefore, aimed to fill these gaps by synthesizing findings from a diverse range of studies, analyzing the effectiveness of different educational strategies, and providing an evidence-based framework to guide future intervention development and implementation.

In conclusion, this analysis aimed to critically evaluate the available data while also highlighting areas that require further investigation and identifying best practices. By doing so, it hopes to support the continuous development of easily accessible, flexible, and effective educational interventions that can significantly reduce prenatal anxiety and improve the health of both mothers and children.

Information and Methods

This systematic review conducted in 2024, followed the PRISMA (preferred reporting items for systematic reviews and meta-analyses) 2020 recommendations [20] to provide a thorough and uniform approach to examining the research on educational programs aimed at reducing anxiety during pregnancy.

Eligibility criteria

The PICOS (population, intervention, comparison, outcomes, and study design) framework was used to establish the eligibility criteria for the studies included in this review (Table 1).

Table 1. The population, intervention, comparison, outcomes, and study design (PICOS) statements

Component	Statement
Population	Pregnant women experiencing or at risk of anxiety during the prenatal period
Intervention	Educational interventions specifically designed to reduce anxiety in the prenatal period. These may include but are not limited to mindfulness training, cognitive-behavioral approaches, relaxation exercises, psychoeducation, and stress management strategies
Comparison	Standard prenatal care, no intervention, or other types of non-educational interventions
Outcomes	The primary outcome was a reduction in anxiety levels, measured using validated anxiety scales. Secondary outcomes included maternal knowledge, self-efficacy, stress levels, and, where available, follow-up data on anxiety levels postpartum
Study design	Experimental studies, including randomized controlled trials (RCTs) and quasi-experimental studies

Table 2. Search string in databases

Database	Search terms
PubMed	("Educational intervention" OR "health education" OR "counseling" OR "cognitive behavioral therapy" OR "CBT" OR "mindfulness" OR "stress management" OR "informational session") AND ("anxiety" OR "stress" OR "mental health") AND ("pregnancy" OR "prenatal" OR "antenatal" OR "gestation" OR "expectant mothers") AND (randomized controlled trial [pt] OR controlled clinical trial [pt] OR "clinical trial" OR "quasi-experimental study")
Scopus	TITLE-ABS-KEY ("Educational intervention" OR "health education" OR "counseling" OR "cognitive behavioral therapy" OR "CBT" OR "mindfulness" OR "stress management" OR "informational session") AND TITLE-ABS-KEY ("anxiety" OR "stress" OR "mental health") AND TITLE-ABS-KEY ("pregnancy" OR "prenatal" OR "antenatal" OR "gestation" OR "expectant mothers") AND (DOCTYPE (ar) OR DOCTYPE (re)) AND (LIMIT-TO (DOCTYPE, "randomized controlled trial" OR "clinical trial" OR "quasi-experimental"))
PsycINFO	("Educational intervention" OR "health education" OR "counseling" OR "cognitive behavioral therapy" OR "CBT" OR "mindfulness" OR "stress management" OR "informational session") AND ("anxiety" OR "stress" OR "mental health") AND ("pregnancy" OR "prenatal" OR "antenatal" OR "gestation" OR "expectant mothers") AND (METHOD.EXACT ("Treatment Outcome/Clinical Trial" OR "Controlled Study" OR "Empirical Study" OR "Randomized Controlled Trial"))
Cochrane Library	("Educational intervention" OR "health education" OR "counseling" OR "cognitive behavioral therapy" OR "CBT" OR "mindfulness" OR "stress management" OR "informational session") AND ("anxiety" OR "stress" OR "mental health") AND ("pregnancy" OR "prenatal" OR "antenatal" OR "gestation" OR "expectant mothers")
CINAHL	("Educational intervention" OR "health education" OR "counseling" OR "cognitive behavioral therapy" OR "CBT" OR "mindfulness" OR "stress management" OR "informational session") AND ("anxiety" OR "stress" OR "mental health") AND ("pregnancy" OR "prenatal" OR "antenatal" OR "gestation" OR "expectant mothers") AND (PT "randomized controlled trial" OR PT "clinical trial" OR "quasi-experimental")

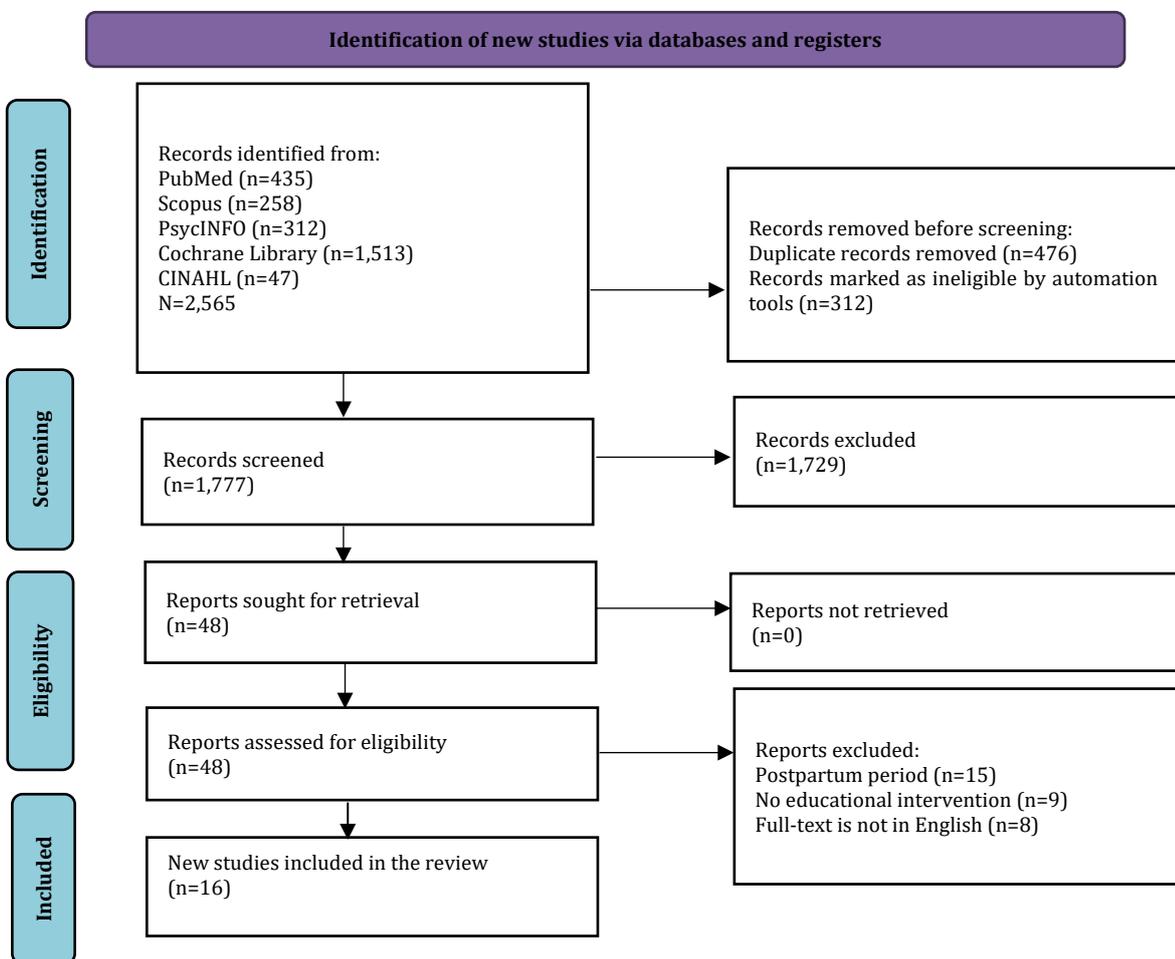


Figure 1. PRISMA flowchart of study selection

Literature search

Several electronic databases, including PubMed, Scopus, CINAHL, PsycINFO, and the Cochrane Library, were thoroughly searched. The search was not restricted by publication date to capture the full scope of relevant literature. Additional sources included Google Scholar, manual reference list searching from qualified research, and grey literature

sources, such as dissertations and conference proceedings.

Inclusion criteria

Inclusion criteria included clinical trials, randomized controlled trials, quasi-experimental studies, and articles written in English that assessed prenatal or pregnant women.

Search strategy

To ensure sensitivity and relevance, a customized search strategy was developed with guidance from a seasoned librarian. Boolean operators were used to combine keywords with Medical Subject Headings (MeSH) terms, which included terms, like “prenatal anxiety,” “pregnancy,” “educational intervention,” “stress reduction,” and “self-management.” An illustration of a PubMed search query included the terms (“prenatal anxiety” OR “maternal anxiety” OR “pregnancy anxiety”) AND (“educational intervention” OR “psychoeducation” OR “mindfulness” OR “cognitive-behavioral therapy” OR “stress management”); Table 2).

Selection process

Duplicate records were eliminated once all records obtained through database searches were imported into reference management software. Two reviewers individually assessed the abstracts and titles. The next step involved a full-text review of studies that met the initial eligibility criteria. Discussions or, if necessary, consultation with a third reviewer were used to resolve disagreements regarding the selection of studies. The PRISMA flow diagram illustrates the study selection process (Figure 1).

Data collection process

Two reviewers used a standardized data extraction form to independently extract the data. The extracted data included study features (e.g., authors, year, country), participant demographics, specifics of the educational intervention (e.g., content, duration, delivery method), comparison groups, outcome measures, and major findings. Consensus or third-party adjudication was employed to resolve any disputes that arose during data extraction.

Study quality

The reviewers independently evaluated the literature to determine the quality of the studies for inclusion. Although this step is not mandatory in systematic review protocols, the reviewers considered it beneficial for identifying the strengths and limitations of the selected studies. Due to the diverse nature of the articles, the Critical Appraisal Skills Program (CASP) for randomized studies was chosen for its ability to systematically evaluate study quality. CASP provides a structured set of questions specifically designed for different study designs, particularly randomized studies. Each CASP checklist includes 11 questions with response options of “yes,” “no,” or “can’t tell,” facilitating a standardized appraisal process. Study quality was classified into three categories, namely strong, moderate, and weak. A study was rated as strong if all responses were affirmative, moderate if there were two non-affirmative responses (“can’t tell” or “no”), and weak if there were three non-affirmative responses.

Risk of Bias

The risk-of-bias tool for randomized trials (RoB2) was used to evaluate bias in each study. This tool was selected for its structured, validated framework specifically designed to detect bias within RCTs,

addressing essential areas, such as randomization, deviations from the planned interventions, missing outcome data, outcome measurement, and selective reporting. The RoB 2 tool provides a comprehensive and consistent approach to quality assessment, which strengthens the reliability of the review’s conclusions. It includes five domains that assess both internal and external validity, with results classified into four levels, namely low, some concerns, high, and very high. All authors reviewed and approved the RoB assessment results, incorporating feedback from external reviewers.

Data synthesis

The results were analyzed and compiled using a narrative synthesis. A meta-analysis was not planned due to the expected variability in trial designs, interventions, and outcome measures. Studies were grouped by intervention type (e.g., mindfulness, CBT, psychoeducation) to facilitate a detailed comparison of approaches. Common themes, intervention components, and outcome patterns were identified, and the quality of evidence for each approach was assessed.

Findings

The initial database query yielded 2,565 articles. Following the removal of 788 duplicates and irrelevant articles unrelated to the review’s focus, 1,777 articles were available for screening. During the eligibility evaluation, 48 studies were assessed, resulting in the exclusion of 34 articles for various reasons. Ultimately, only 16 studies met the criteria and will proceed to the next stage for data extraction and analysis (Table 3).

Study selection

Seventeen relevant studies that examined how educational interventions affected pregnant women’s anxiety levels were included in the systematic review. These investigations encompassed pre-post-test research, quasi-experimental methods, and RCTs. The studies were conducted in various countries, including Turkey, Canada, Australia, Iran, Italy, Thailand, and Saudi Arabia, reflecting diverse cultural and healthcare contexts.

Study characteristics

The majority of the included studies focused on nulliparous or primiparous women, with sample sizes varying from 12 to 80 individuals per group. Participants’ mean ages ranged from 20 to 36 years. Interventions were predominantly delivered during the second or third trimesters when pregnancy-related anxiety often peaks.

Most interventions consisted of weekly or biweekly sessions lasting one to two and a half hours, with durations ranging from two weeks to ten weeks. Some studies employed innovative delivery methods, such as short message services (SMS) or digital platforms, to enhance accessibility.

Table 3. Characteristics of the eligible studies

Author(s), year, country	Study design	Sample size		Mean (year) age		Parity	Gestational week (mean)		Intervention		Intervention duration	Measurement tool(s)	Main findings
		I	C	I	C		I	C	I	C			
Boran et al., 2023, Turkey [21]	RCT	44	44	27.64	29.61	Nulliparity-multiparity	20.70	21.41	UC+THP-BGV	UC	6 weeks; 1 hour per session	EPDS, GAD-7, PHQ-9, Brief-COPE, PSQI, RAS, WHODAS, and MSPSS	-
Bowen et al., 2014, Canada [22]	Two group pre-post-test	MFB: 20 IPT: 18	No	MFB: 30.67 IPT: 28.94	No	Multiparity	MFB: 21.35 IPT: 23.42	No	MFB and IPT	No	6 weeks	EPDS, STAI, CWS, and MMSS	Significant decrease in depression symptoms and worry
Byrne et al., 2013, Australia [23]	One group pre-post-test	12	No	30.1	No	Nulliparous	23	No	MBCE	No	8 weeks; 2.5 hours each session	MAAS, DASS-21, EPDS, CSEI, and W-DEQ	Increased self-efficacy and decreased fear of birth
Cankaya & Simsek, 2020, Turkey [24]	Prospective RCT	57	59	26.4	25.3	Primiparous	30.7	31.7	Antenatal education group	UC	2 weeks; twice a week; 2 hours each session	W-DEQ-A, CBSEI, DASS-21, and W-DEQ-B	- Increased self-efficacy - Decreased depression, anxiety, and stress
Diotaiuti et al., 2022, Italy [25]	Quasi experimental	80	80	32.24	32.24	ND	25	25	SPC psycho-educational	TPC	2 months; once a week; 2 hours each session	EMAS, TFS, and SNEP	Increased self-efficacy, the perceived need for information, the perceived need for reassurance, the perceived need for sharing, and a focus on the past
Gandomi et al., 2022, Iran [26]	Quasi-experimental	30	30	23	23	Primiparous	27	26	Education based on self-efficacy theory	UC	4 weeks; 2 session per week; 90 min each session	Adopted questionnaire	Decrease anxiety
Ghashghaee et al., 2024, Iran [27]	Quasi-experimental	80	80	29.63	28.56	Nulli-multiparous	20	20	AEC	UC	10 weeks	PDQ, MSPSS, and STAI	Significant reductions in anxiety, including concerns about birth and the baby, as well as emotions and relationships
Innab et al., 2023, Saudi Arabia [28]	Quasi-experimental	44	44	35.1	30.1	Nulliparous	30	30	MBI	UC	8 weeks; 2.5 hours	PRAQ-R2 and FFMQ	Significant reduction in anxiety; improved level of mindfulness
Madhavan Prabhakaran et al., 2017, India [29]	RCT	50	50	26.5	26.5	Nulliparous	ND	ND	PCEP	UC	3 sessions; 45-60 min	STAI and PSAI	Significant reduction in anxiety
Nikoozad et al., 2024, Iran [30]	Quasi-experimental	61	61	ND	ND	Primigravid	39.25	39.32	PE	UC	8 sessions; once in 2 weeks; 1.5 hour	GHQ	Decreased anxiety
Sanaati et al., 2016, Iran [31]	RCT	62	63	28.2	27.5	Nulliparous	25.5	25.5	Lifestyle-based education	UC	Once a week; 4 sessions; 60-90 min	EPDS and STAI	Reduced depression
Sercekus & Baskale, 2015, Turkey [32]	Quasi-experimental	31	32	28.8	27.7	Nulliparous	27	26.9	Antenatal education	UC	8 weeks; once a week; 120 min	MAI, PPAQ, W-DEQ, and CBSEI	Increased self-efficacy; decreased fear of childbirth
Shen et al., 2022, China [33]	RCT	45	45	36.95	36.95	Multiparous	26.95	27.07	Need-based education	UC	-	PAQ	Reduced anxiety, systolic blood pressure, and heart rate
Mokhtaryan et al., 2016, Iran [34]	RCT	33	35	20-31	20-31	Primipara	ND	ND	Religious education	UC	6 weeks; 60-90 min	STAI, SAS, and RAS-R	Reduced anxiety
Thomas et al., 2014, Australia [35]	Quasi-experimental	48	No	33.4	No	Nulli-primiparous	26	No	Antenatal group program	No	6 sessions; 2 hours	EPDS, CES-D, CSQ-8, and STAI	Significant reductions in depression and state anxiety
Xuto et al., 2021, Thailand [36]	RCT	33	33	28.10	27.55	Primigravida	12	12	SMS	UC	Twice a week	HCBPQ and STAI	Significant reduction in state anxiety

*I: Intervention; C: Control; ND: Not determined; UC: Usual Care; RCT: Randomized Controlled Trial; IPT: Interpersonal therapy; MFB: Mindfulness-based therapy.

Anxiety was the primary outcome assessed in all of the studies, utilizing well-known tools including the State-Trait Anxiety Inventory (STAI), the Pregnancy-Related Anxiety Questionnaire (PRAQ-R2), and the Edinburgh Postnatal Depression Scale (EPDS). Self-efficacy, mindfulness, and symptoms of depression were secondary outcomes.

Study quality assessment

An overview of the study quality evaluation using the CASP tool is provided below. Based on the assessment results, the eligible studies are generally categorized as strong, while six studies fall into the medium category (Table 4).

Risk of Bias assessment

Based on the assessment of the five dimensions of the

RoB2 tool, it was found that most of the studies fell into the low risk of bias category, while six studies were categorized as having some concerns (Figure 2).

Intervention categories

The interventions were grouped into the following five categories based on their core strategies.

Mindfulness-based interventions (MBIs)

Studies by Bowen *et al.*, Byrne *et al.* and Innab *et al.* [22, 23, 28] implemented MBIs focusing on body awareness, emotional regulation, and relaxation. Techniques included body scan meditation, mindfulness of breathing, and awareness of routine activities. These interventions improved participants' mindfulness levels and reduced anxiety ($p < 0.05$).

Table 4. Study quality assessment results

Studies	Questions											Overall
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	
Boran <i>et al.</i> , 2023 [21]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Strong
Bowen <i>et al.</i> , 2014 [22]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Strong
Byrne <i>et al.</i> , 2013 [23]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Strong
Cankaya & Simsek, 2020 [24]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Strong
Diotaiuti <i>et al.</i> , 2022 [25]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Strong
Gandomi <i>et al.</i> , 2022 [26]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Strong
Ghashghaee <i>et al.</i> , 2024 [27]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Strong
Innab <i>et al.</i> , 2023 [28]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Strong
Madhavan Prabhakaran <i>et al.</i> , 2017 [29]	Y	N	CT	Y	Y	Y	Y	Y	Y	Y	Y	Medium
Nikoozad <i>et al.</i> , 2024 [30]	Y	Y	CT	Y	Y	CT	Y	Y	Y	Y	Y	Medium
Sanaati <i>et al.</i> , 2016 [31]	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Medium
Sercekus & Baskale, 2015 [32]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Strong
Shen <i>et al.</i> , 2022 [33]	Y	N	Y	Y	Y	CT	Y	Y	Y	Y	Y	Medium
Mokhtaryan <i>et al.</i> , 2016 [34]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Strong
Thomas <i>et al.</i> , 2014 [35]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Strong
Xuto <i>et al.</i> , 2021 [36]	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Medium

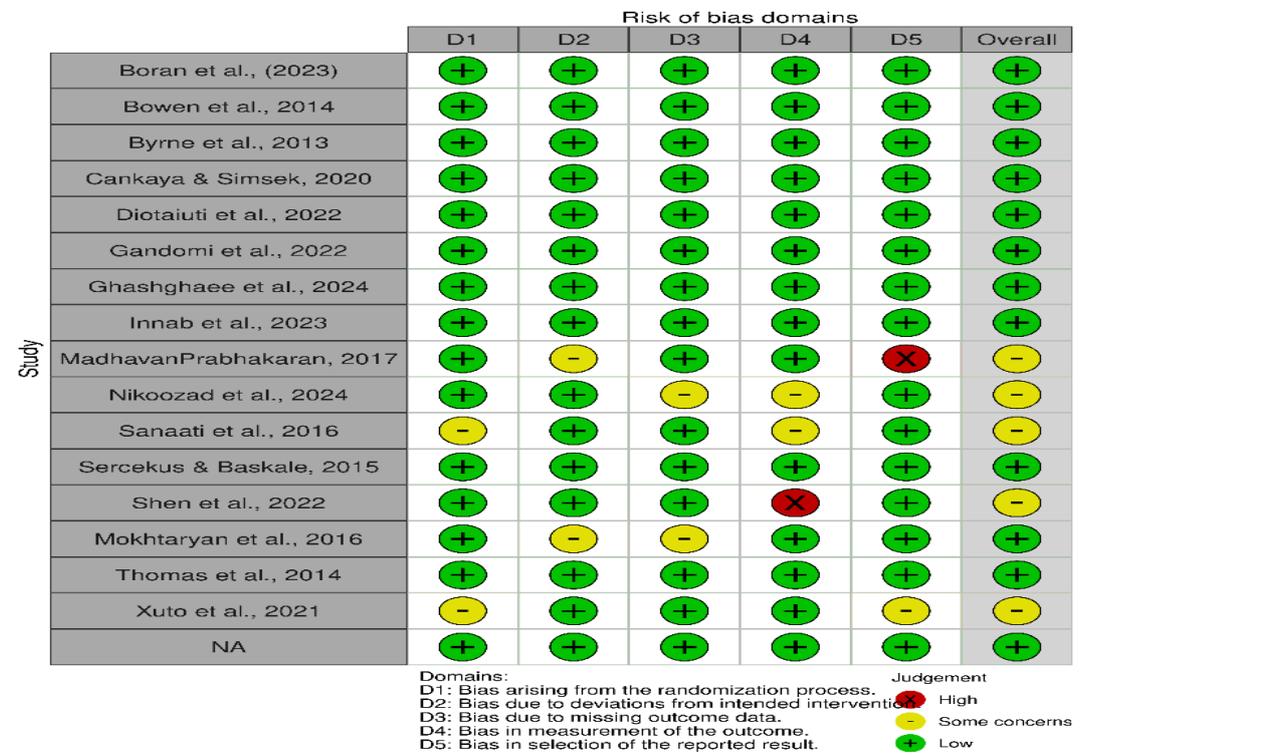


Figure 2. Summary of risk of bias assessment.

Antenatal education programs

Studies by Cankaya & Simsek and Sercekus & Baskale [24, 32] incorporated structured education on childbirth, nutrition, psychological changes, and labor preparation. These programs significantly improved participants' self-efficacy ($p < 0.01$) and reduced fear of childbirth and anxiety ($p < 0.01$).

Lifestyle-based and psychoeducational strategies

Interventions by Diotaiuti *et al.* and Sanaati *et al.* [25, 31] addressed lifestyle components such as sleep, nutrition, and physical activity. Psychoeducational elements included cognitive restructuring, relaxation techniques, and stress management strategies, which led to reduced anxiety and improved overall well-being ($p < 0.001$).

Cultural and religious interventions

Nikoozad *et al.* and Mokhtaryan *et al.* [30, 34] tailored interventions to cultural and religious contexts, integrating spiritual teachings and ethical values. These interventions significantly reduced anxiety levels ($p = 0.001$) and provided emotional and moral support.

Digital and remote interventions

Xuto *et al.* [36] delivered educational content via SMS, focusing on nutrition, mental health, and labor preparation. Although cost-effective and scalable,

these interventions showed moderate reductions in anxiety ($p = 0.02$), indicating the potential for enhancing digital strategies.

Outcomes

Anxiety reduction: All included studies reported statistically significant reductions in anxiety levels following the interventions. For instance, Gandomi *et al.* [26] observed a substantial decrease in anxiety scores ($p < 0.001$), and Shen *et al.* [33] reported reductions in systolic blood pressure and heart rate alongside improvements in anxiety ($p < 0.05$).

Self-efficacy improvements: Studies by Byrne *et al.* and Diotaiuti *et al.* [23, 25] highlighted enhanced maternal self-efficacy, which is critical for reducing pregnancy-related stress and increasing confidence in labor and delivery preparation.

Other psychological benefits: Several studies demonstrated additional benefits, including decreased symptoms of depression (e.g., Bowen *et al.* and Madhavan Prabhakaran *et al.* [22, 29]) and reduced fear of childbirth (e.g., Sercekus & Baskale [32]).

Broader psychosocial gains: Psychoeducational programs increased participants' perceived social support, coping mechanisms, and emotional resilience (e.g., Diotaiuti *et al.* and Ghashghaee *et al.* [25, 27]; Table 5).

Table 5. Content of the educational intervention strategy

Author(s), year	Intervention	Content
Boran <i>et al.</i> , 2023 [21]	The brief group version of the thinking healthy program (THP-BGV)	<ul style="list-style-type: none"> - Participation and program introduction - Psychoeducation and problem-solving techniques - An emphasis on one's own health and welfare - Creating the mother-infant connection - Restoring interpersonal connections and ending the therapy
Bowen <i>et al.</i> , 2014 [22]	Mindfulness-based therapy (MFB); Interpersonal therapy (IPT)	<p>MFB:</p> <ul style="list-style-type: none"> - Increased body awareness through adaptation - A calmer feeling - Acceptance of the body's changes - Increased consciousness of emotional trends - Mental states particularly associated with pregnancy - Techniques to develop self-compassion & understanding <p>IPT:</p> <ul style="list-style-type: none"> - Interpersonal psychotherapy
Byrne <i>et al.</i> , 2013 [23]	Mindfulness-based childbirth education (MBCE)	Decision-making, communication, and mindfulness techniques to improve self-efficacy and lessen stress and anxiety
Cankaya & Simsek, 2020 [24]	Antenatal education group	<ul style="list-style-type: none"> - Philosophies of childbirth - Developing adaptation skills to pregnancy and parenting - To recognize the symptoms of labor - Preparing a realistic birth plan
Diotaiuti <i>et al.</i> , 2022 [25]	Special birth course	<ul style="list-style-type: none"> - Presenting enjoyable activities - The day's schedule - Relaxation methods - Assertiveness - Construction of a realistic mother model - Work on cognitive reorganization
Gandomi <i>et al.</i> , 2022 [26]	Education based on self-efficacy theory	<ul style="list-style-type: none"> - Increasing awareness - Increasing self-awareness - Developing mastery experiences - Creating vicarious experiences - Perceived social support
Ghashghaee <i>et al.</i> , 2024 [27]	Antenatal education classes	<ul style="list-style-type: none"> - Childbirth - Labor pain - Weight/body image - Emotions and relationships

Continue of Table 5 from the last page.

Innab et al., 2023 ^[28]	Mindfulness-based interventions (MBIs)	<ul style="list-style-type: none"> - Body scan meditation - Sitting meditation - Being conscious of both positive - Negative experiences - Being conscious of one's breathing - Consciousness of everyday events and actions
Madhavan Prabhakaran et al., 2017 ^[29]	Planned childbirth educational program (PCEP)	<ul style="list-style-type: none"> - The female reproductive system's architecture - Physiology - Dietary advice - The phases and indicators of labor - Self-care exercises - Exams performed during the perinatal period - Breathing exercises - Relaxation methods - Breastfeeding
Nikoozad et al., 2024 ^[30]	Prenatal education (PE)	<ul style="list-style-type: none"> - Common complaints - Mental health - Nutrition in pregnancy - Fetal growth and development - Breathing, body relaxation, and stretching exercises
Sanaati et al., 2016 ^[31]	Lifestyle-based education	<p>Issues related to:</p> <ul style="list-style-type: none"> - Sleep - Hygiene - Nutrition - Physical activity and exercise - Self-concept - Sexuality
Sercekus & Baskale, 2015 ^[32]	Antenatal education	<ul style="list-style-type: none"> - Nutrition during pregnancy - Physiological and psychological changes during pregnancy - Mechanisms of labor and birth - Discussion of feelings about childbirth, to deal with the fear of childbirth, coping techniques with labor pain - Physical and emotional postpartum changes
Shen et al., 2022 ^[33]	Need-based education	<ul style="list-style-type: none"> - Prenatal anxiety - Maternal age-related maternal and fetal risks - Psychological relaxation strategies - Use of medication during pregnancy - Knowledge of labor and childbirth
Mokhtaryan et al., 2016 ^[34]	Religious-based education	<ul style="list-style-type: none"> - Pregnancy-related issues - The significance of the pregnancy time in Islamic culture - Suggestions for the pregnancy period - The Quran on nursing - An infant's right to breastfeed - The benefits of breastfeeding - Personal ethics - The significance of a mother's traits - Collective ethics, good-naturedness - Empathy for others - Emotional attachment to God - Fulfilling one's religious obligations - Praying - The significance of group prayers
Thomas et al., 2014 ^[35]	Antenatal group program	<ul style="list-style-type: none"> - Behavioral self-care strategies - Psychoeducational component focusing on mood monitoring - Early detection and contingency planning for emerging anxiety and depression - Interpersonal therapy (IPT) - Parent-infant relationship
Xuto et al., 2021 ^[36]	Health education through Short Message Service (SMS)	<ul style="list-style-type: none"> - Nutrition - Coping with discomfort during pregnancy - Warning signs of pregnancy complications - Mental health care - Preparation for experiencing labor - Signs and symptoms that lead to the delivery stage

Discussion

This systematic review aimed to evaluate the effectiveness of different educational interventions in

reducing prenatal anxiety. The importance of educational treatments in lowering prenatal anxiety is reaffirmed by this systematic study and aligns with

a growing body of evidence that highlights their effectiveness in improving maternal mental health. The findings demonstrated that these interventions, which range from MBIs to culturally tailored approaches, consistently reduced anxiety, enhanced self-efficacy, and provided broader psychosocial benefits.

MBIs showed significant reductions in anxiety, aligning with previous research that emphasizes their role in enhancing emotional regulation and resilience. For instance, Shi & MacBeth^[37] noted that mindfulness practices improve mental health outcomes in perinatal populations by targeting the cognitive and emotional dimensions of anxiety. Techniques, such as body scan meditation and mindfulness of routine activities, as seen in the studies included in this review, provide pregnant women with practical tools to manage stress effectively. However, consistent with Matvienko-Sikar *et al.*^[38], the success of these interventions depends on participants' familiarity with mindfulness practices. Future research should investigate introductory or hybrid models that cater to varying levels of mindfulness experience, potentially broadening their accessibility and impact. Antenatal education programs offered structured and comprehensive content, addressing both the physical and psychological dimensions of pregnancy. These programs significantly reduced the fear of childbirth and improved maternal preparedness, echoing the findings of previous studies^[39,40], which identified antenatal education as a key factor in improving maternal confidence. However, Gluck *et al.*^[41] reported mixed results regarding the effectiveness of such programs, which could be attributed to inconsistencies in program structure and delivery. The studies in this review, featuring well-rounded content and culturally sensitive frameworks, highlight the importance of tailoring antenatal education to meet the diverse needs of pregnant women. Establishing standardized yet flexible guidelines could further enhance their effectiveness.

Lifestyle and psychoeducational interventions were particularly impactful in addressing both the mental and physical aspects of prenatal anxiety. By incorporating stress management techniques, relaxation exercises, and lifestyle modifications, such as improved nutrition and sleep hygiene, these interventions aligned with findings by Dubreucq *et al.*^[42], who emphasize the importance of holistic approaches to maternal health. However, unlike Van Der Windt *et al.*^[43], who suggest that lifestyle interventions alone may not sufficiently address deep-seated psychological concerns, this review highlighted the added value of integrating psychoeducational elements to enhance overall efficacy. This combined approach addresses not only immediate anxiety but also builds long-term coping mechanisms, fostering greater maternal resilience.

Culturally and religiously tailored interventions were highly effective in contexts where spiritual and traditional values are central to maternal care. Consistent with Rahimnejad *et al.*^[44], these interventions provide emotional reassurance and a sense of purpose, contributing significantly to anxiety reduction. By incorporating familiar cultural and spiritual practices, these programs resonate deeply with participants, reinforcing their relevance in culturally homogeneous populations. However, as Shorey *et al.*^[45] pointed out, such approaches may have limited generalizability in multicultural or secular contexts. This review suggests that while cultural relevance is vital, interventions can be adapted to retain core principles of empathy and support while being inclusive of diverse populations. Digital and remote interventions, such as SMS-based education, offered scalable and accessible solutions, particularly for underserved populations. While Ahmed *et al.*^[46] highlight challenges with user engagement and limited interactivity in digital tools, the studies in this review demonstrated moderate success in reducing anxiety. These findings align with those of Thonon *et al.*^[47], who underscored the potential of mHealth tools to bridge gaps in healthcare access. To enhance effectiveness, future digital interventions should incorporate interactive features, personalized feedback, and multimedia content to foster higher user engagement and satisfaction.

While the findings of this review are promising, several limitations warrant consideration. The heterogeneity of study designs, sample sizes, and intervention durations complicates the comparability of results. Moreover, most studies focused on short-term outcomes, leaving the long-term sustainability of these interventions largely unexplored. Variability in the tools used to measure anxiety and related outcomes further introduces potential biases, emphasizing the need for standardized metrics in future research. Additionally, the predominance of studies conducted in specific cultural contexts limits the generalizability of the findings to more diverse populations. Addressing these limitations through longitudinal studies, more diverse sampling and methodological standardization will strengthen the evidence base and provide clearer guidance for implementing these interventions in routine prenatal care.

This review underscores the efficacy of educational interventions in reducing anxiety among pregnant women and highlights the importance of tailored approaches. MBIs, antenatal education programs, and culturally sensitive methods emerged as particularly effective strategies. The success of digital interventions demonstrates their potential for scalability and accessibility. Integrating these findings into routine prenatal care can significantly enhance maternal mental health and well-being. Future studies should focus on overcoming

methodological limitations and expanding the evidence base to ensure equitable and effective prenatal support for all populations.

Conclusion

Diverse educational interventions effectively reduce prenatal anxiety.

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