

Non-Pharmacological Interventions for Pregnancy-Specific Anxiety Among Pregnant Women

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ABSTRACT

Pregnancy specific anxiety is one of the most common mental health problems experienced by pregnant women and may negatively affect maternal and fetal outcomes. Various non-pharmacological interventions have been developed to reduce anxiety during pregnancy; however, evidence regarding the comparative effectiveness of these interventions remains heterogeneous. This study aimed to compare the effectiveness of non-pharmacological health promotion interventions in reducing pregnancy-specific anxiety among pregnant women. This study used a Systematic Literature Review design following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guideline. Literature searches were conducted through PubMed, Scopus, and ScienceDirect databases for articles published between 2021-2025. A total of 16 articles met the inclusion criteria and were analyzed narratively using the JBI Critical Appraisal Tool. The findings showed that mindfulness-based interventions were the most consistently effective intervention in reducing pregnancy specific anxiety, stress, emotional distress, and fear of childbirth. Other interventions such as prenatal yoga, relaxation techniques, music therapy, antenatal education, psychological, digital interventions, and structured social support also demonstrated positive effects on maternal psychological wellbeing during pregnancy. In conclusion, non-pharmacological health promotion interventions have the potential to support maternal mental health and can be integrated into antenatal care services.

Keywords: pregnancy specific anxiety; pregnant women; health promotion; non-pharmacological intervention

INTRODUCTION

Pregnancy is a complex biological, psychological, and social process that requires substantial physical, hormonal, and emotional adjustments among women [1–4]. Throughout gestation, women undergo rapid physiological changes; including cardiovascular, endocrine, and metabolic adaptations that may influence emotional regulation and heighten susceptibility to stress. These changes make pregnancy a critical transitional period for maternal mental health, during which women may experience heightened emotional sensitivity, fluctuating mood, and increased vulnerability to psychological distress [2,3]. Beyond biological and psychological transformations, pregnant women also navigate significant social, environmental, cultural, and economic adjustments. These include shifts in family roles, changes in social expectations, workplace demands, financial pressures, and cultural norms surrounding pregnancy and childbirth, all of which may shape maternal mental wellbeing [5].

The World Health Organization has emphasized that perinatal mental disorders; particularly anxiety and depression constitute major global public health concerns that should be systematically integrated into maternal and child health services [6,7]. In recent years, the prevalence of anxiety during pregnancy has risen markedly worldwide. A global meta-analysis reported that anxiety symptoms during pregnancy range from 15% to 37%, while another systematic review estimated that approximately 20.7% of pregnant women experience clinically significant anxiety disorders, underscoring the substantial burden of maternal mental health problems across diverse populations [8]. Anxiety during pregnancy has been associated with numerous adverse outcomes, including prolonged labor, low birth weight, preterm birth, impaired maternal–infant bonding, maternal morbidity, and long-term psychosocial difficulties among children [9–12]. These consequences highlight the importance of early identification and management of anxiety during pregnancy as part of comprehensive antenatal care.

Pregnant women may also experience pregnancy-specific anxiety, a distinct form of anxiety directly related to pregnancy, childbirth, fetal health, pregnancy complications, and maternal role adaptation [13]. Pregnancy-specific anxiety is shaped by a combination of biological, psychological, and social determinants. Hormonal fluctuations, previous mental health conditions, inadequate social support, traumatic pregnancy experiences, and socioeconomic challenges have all been identified as contributing factors [14,15]. Unlike general anxiety disorders, pregnancy-specific anxiety is closely tied to maternal concerns about fetal wellbeing, labor outcomes, and the transition to motherhood, making it a unique and clinically relevant construct in perinatal mental health research.

Pharmacological treatment for anxiety during pregnancy often raises concerns regarding fetal safety, teratogenic risks, and potential neonatal complications. Consequently, non-pharmacological interventions have gained increasing attention as safer and more acceptable strategies for promoting maternal mental health [16]. A growing body of evidence demonstrates that psychosocial counseling, cognitive behavioral therapy (CBT), relaxation techniques, mindfulness-based interventions, prenatal yoga, music therapy, digital mental health interventions, and group-based psychosocial programs can significantly reduce maternal anxiety and emotional distress during pregnancy [16–22]. These interventions not only address psychological symptoms but also enhance maternal coping skills, emotional resilience, and perceived social support.

Structured social support interventions have shown particular promise in reducing pregnancy-specific anxiety by providing emotional reassurance, strengthening maternal confidence, and fostering social connectedness during pregnancy [28]. Such interventions align with Nudge Theory proposed by Thaler and Sunstein, which emphasizes behavioral support through choice architecture, reminders, simplified information, and supportive environments without coercion [29]. Nudge-based approaches have increasingly been applied in public health programs to encourage preventive health behaviors, improve healthcare engagement, and support vulnerable populations, including pregnant women [30,31]. These approaches are especially relevant in antenatal care settings where behavioral reinforcement, timely reminders, and supportive communication can help reduce anxiety and promote healthier maternal behaviors.

Despite the growing interest in non-pharmacological interventions for pregnancy-specific anxiety, existing evidence remains heterogeneous. Studies vary widely in intervention types, duration, intensity, outcome measurements, and research contexts, making it difficult to draw definitive conclusions regarding comparative effectiveness [32]. Furthermore, researchers employ different instruments to measure pregnancy-specific anxiety, such as the Pregnancy-Related Anxiety Scale (PrAS), Pregnancy-Specific Anxiety Tool (PSAT), and Perinatal Anxiety Screening Scale (PASS), reflecting the absence of standardized assessment tools and contributing to variability in reported outcomes [33]. Although anxiety among pregnant women is highly prevalent, no comprehensive systematic literature review has yet compared the effectiveness of various non-pharmacological interventions specifically targeting pregnancy-specific anxiety [34].

Therefore, this study aimed to compare the effectiveness of diverse non-pharmacological health promotion interventions in reducing pregnancy-specific anxiety among pregnant women. By synthesizing evidence across multiple intervention modalities, this systematic literature review is expected to strengthen evidence-based recommendations for integrating maternal mental health interventions into antenatal care services, ultimately contributing to improved maternal wellbeing and healthier pregnancy outcomes.

METHODS

This study employed a Systematic Literature Review (SLR) design guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 framework, which provides a standardized structure for ensuring methodological transparency, reproducibility, and rigor in evidence synthesis [35]. The PRISMA approach was selected because it offers a comprehensive guideline for documenting each stage of the review process; from identification and screening to eligibility assessment and final inclusion thereby strengthening the validity of the synthesized findings (Figure 1).

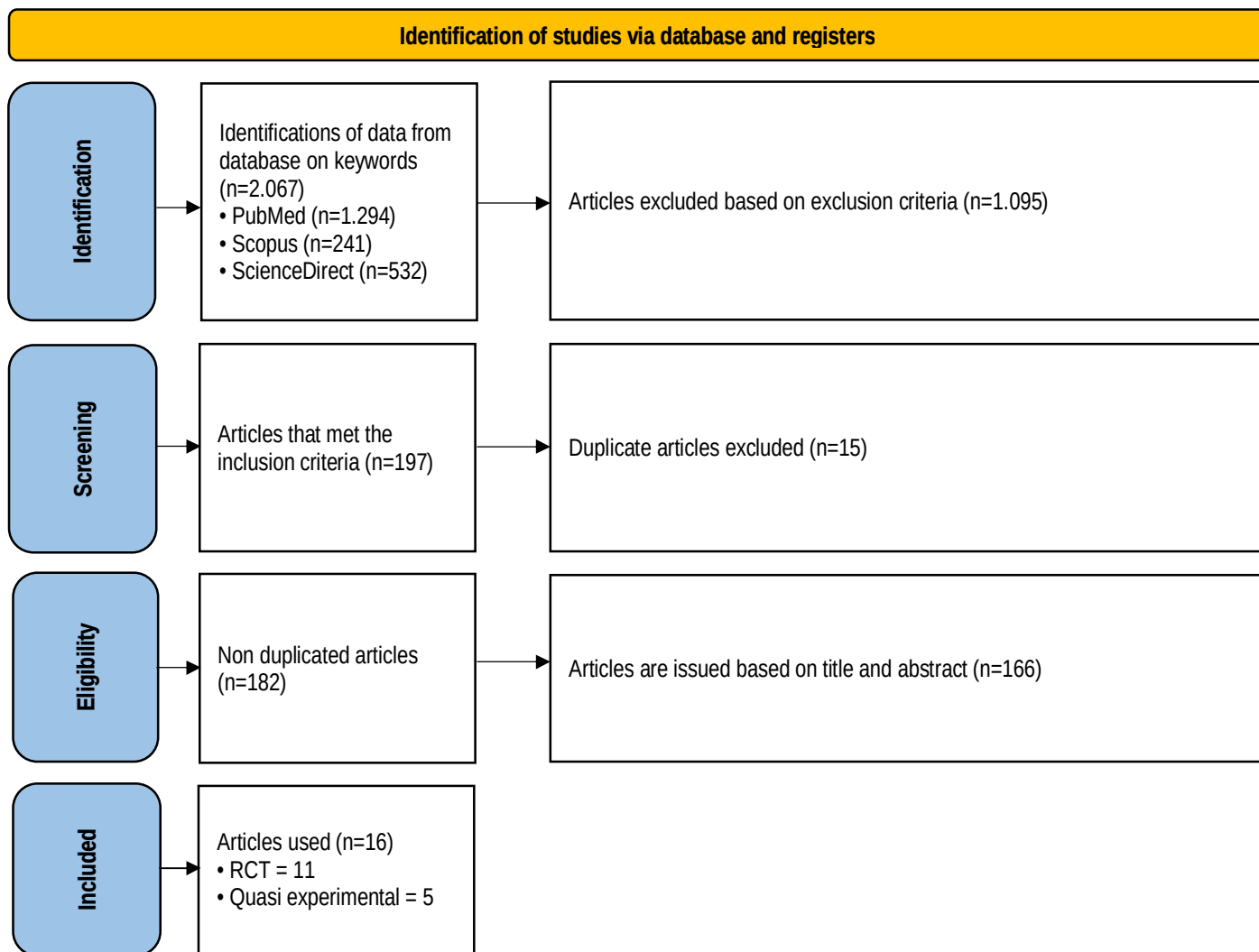


Figure 1. PRISMA flow diagram for article selection

The literature search was conducted systematically across three major international databases: PubMed, Scopus, and ScienceDirect, which were selected due to their extensive coverage of biomedical, psychological, and public health research. The search targeted articles published between 2021 and 2025, reflecting the most recent evidence on non-pharmacological interventions for pregnancy-specific anxiety. The search strategy was developed using the PICO framework, encompassing Population, Intervention, Comparison, and Outcome components relevant to pregnant women, pregnancy-specific anxiety, health promotion strategies, and non-pharmacological interventions. This structured approach ensured that the search captured studies aligned with the conceptual scope of the review.

The search process was conducted from January to February 2025, using combinations of keywords derived from the PICO elements, including "pregnant women", "pregnancy-related anxiety", "pregnancy-specific anxiety", "health promotion", "non-pharmacological intervention", "mindfulness", "prenatal yoga", "music therapy", "counseling", and "digital intervention". Boolean operators such as AND and OR were applied to refine and optimize the search strategy, enabling the identification of studies that addressed multiple dimensions of pregnancy-specific anxiety and its management.

During the identification stage, a total of 2,067 articles were retrieved from the database searches: PubMed (n = 1,294), Scopus (n = 241), and ScienceDirect (n = 532). In the screening stage, 15 duplicate articles were removed, resulting in 182 unique records. Title and abstract screening was then performed, leading to the exclusion of 166 articles that did not meet the inclusion criteria, primarily due to irrelevant populations, interventions, or outcomes.

In the eligibility stage, full-text articles were assessed based on predefined inclusion and exclusion criteria. A total of 1,095 articles were excluded because they failed to meet eligibility requirements, including inappropriate study populations, absence of non-pharmacological

interventions, unsuitable study designs, irrelevant outcomes, or incomplete full-text availability. After this rigorous assessment, 16 articles met all inclusion criteria and were included in the final narrative synthesis.

The study selection process; including title and abstract screening, full-text assessment, and final inclusion was conducted independently by two reviewers to minimize selection bias. Any disagreements regarding study eligibility were resolved through discussion until consensus was reached. This dual-reviewer approach enhanced the reliability and objectivity of the selection process.

Following study selection, data extraction was performed independently by the same two reviewers using a standardized data extraction form specifically developed for this review. Extracted information included the first author, publication year, country of study, study design, population characteristics, intervention type, comparison group, outcome measures, and principal findings. To ensure accuracy and consistency, all extracted data were cross-checked against the original articles before proceeding to narrative synthesis.

The inclusion criteria for this review were: (1) original research articles; (2) studies involving pregnant women; (3) studies examining non-pharmacological interventions targeting pregnancy-specific anxiety; (4) articles published in English between 2021 and 2025; and (5) full-text accessible articles. Exclusion criteria included review articles, conference abstracts, studies unrelated to pregnancy-specific anxiety, and studies lacking intervention components.

The methodological quality of the included studies was independently assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Tool for randomized controlled trials and quasi-experimental studies [36]. This tool evaluates key aspects of study quality, including randomization, allocation concealment, blinding, outcome measurement reliability, and statistical analysis. Any discrepancies in quality assessment were resolved through discussion until consensus was achieved.

To facilitate comparative analysis, the included studies were grouped according to the type of non-pharmacological intervention, allowing thematic comparison across intervention categories such as mindfulness-based interventions, yoga, music therapy, counseling, and digital health interventions. Data were synthesized narratively using comparative thematic synthesis, which enables the integration of findings from heterogeneous study designs and outcome measures while highlighting patterns, similarities, and differences in intervention effectiveness [37]. This approach was appropriate given the diversity of intervention modalities and measurement tools used across studies.

RESULTS

Based on Table 1, a total of 16 studies were included in this systematic literature review after completing the identification, screening, eligibility, and inclusion stages in accordance with the PRISMA 2020 guideline. These studies represented a diverse range of research designs, with the majority consisting of randomized controlled trials (RCTs) and quasi-experimental studies, reflecting the growing emphasis on rigorous evaluation of maternal mental health interventions. The included studies were conducted across various countries and healthcare settings, including community-based antenatal clinics, tertiary hospitals, maternal health centers, and digital health platforms. This geographical and contextual diversity provides a broad perspective on how non-pharmacological interventions are implemented in different cultural, socioeconomic, and healthcare environments.

Collectively, the studies examined the effectiveness of multiple non-pharmacological approaches aimed at reducing pregnancy-related anxiety among pregnant women. Through thematic synthesis, the interventions were categorized into several major groups, allowing clearer comparison across intervention modalities. These categories included mindfulness-based interventions, prenatal yoga, relaxation-based interventions, music therapy, prenatal education programs, cognitive behavioral counseling (CBT), digital and mobile-based interventions, structured social support interventions, and body awareness therapy. Each intervention type targeted different psychological, behavioral, or physiological mechanisms associated with pregnancy-specific anxiety, thereby offering a comprehensive overview of available maternal mental health strategies.

Across the included studies, most interventions demonstrated statistically significant reductions in anxiety scores, with p-values commonly reported at $p < 0.05$, indicating meaningful improvements in maternal emotional wellbeing. These findings suggest that non-pharmacological interventions can effectively mitigate anxiety symptoms during pregnancy, even when implemented in relatively short durations or within routine antenatal care settings. Beyond anxiety reduction, several interventions also produced additional maternal health benefits. These included improvements in overall maternal wellbeing, emotional adaptation to pregnancy, sleep quality, maternal self-efficacy, stress regulation, and maternal-fetal attachment. Such multidimensional outcomes highlight the broader psychosocial impact of non-pharmacological interventions and their potential role in enhancing holistic maternal health.

Mindfulness-based interventions and prenatal yoga were among the most frequently evaluated approaches, reflecting their increasing popularity in maternal mental health promotion. These interventions were shown to enhance emotional regulation, reduce physiological stress responses, and promote relaxation. Music therapy and relaxation-based interventions also demonstrated consistent benefits, particularly in reducing acute anxiety symptoms and improving sleep patterns. Cognitive behavioral counseling (CBT) and structured social support interventions provided more targeted psychological support, addressing cognitive distortions, maladaptive beliefs, and social isolation commonly experienced during pregnancy. Meanwhile, digital interventions; such as mobile applications and online counseling platforms offered accessible and scalable alternatives, especially in settings with limited mental health resources.

Overall, the findings of this review indicate that non-pharmacological interventions represent effective, safe, and adaptable strategies for reducing pregnancy-specific anxiety. Their demonstrated benefits across diverse populations and settings underscore the importance of integrating such interventions into routine antenatal care. The collective evidence also highlights the need for continued research to refine intervention protocols, standardize outcome measurements, and explore long-term maternal and infant outcomes associated with these approaches.

Table 1. Summary of articles

No	Title	Design	Population	Intervention	Comparison	Outcome
1	Effects of a prenatal mindfulness program on longitudinal changes in stress, anxiety, depression, and mother-infant	Randomized Controlled Trial (RCT)	104 pregnant women with tendencies toward perinatal mood and anxiety disorder; randomized	Participants attended an 8-week prenatal mindfulness program consisting of breathing awareness, body scanning, mindfulness meditation, stress	Pregnant women receiving standard prenatal care without mindfulness intervention	Anxiety, stress, and depression scores significantly decreased after intervention compared with

No	Title	Design	Population	Intervention	Comparison	Outcome
	bonding of women with a tendency to perinatal mood and anxiety disorder [13]		controlled trial with random allocation	management training, emotional awareness exercises, and home mindfulness practice modules supervised by trained facilitators		control group ($p < 0.05$)
2	Effectiveness of mindfulness-based stress reduction on depression, anxiety, and stress of women with the early loss of pregnancy in Southeast Iran: A randomized control trial [14]	Randomized Controlled Trial (RCT)	64 women with previous early pregnancy loss; randomized sampling technique	The intervention consisted of structured Mindfulness-Based Stress Reduction (MBSR) sessions conducted weekly involving meditation training, breathing exercises, body awareness practice, emotional regulation techniques, and mindfulness coping strategies	Participants receiving routine pregnancy care without MBSR sessions	Significant reduction in anxiety, stress, and depression scores after intervention ($p < 0.05$)
3	Mindfulness-based childbirth education and prenatal anxiety among pregnant women [15]	Quasi Experimental	80 pregnant women experiencing prenatal anxiety; purposive sampling	Participants received mindfulness-based childbirth education including breathing relaxation, mindfulness meditation, childbirth preparation education, coping strategies during labor, and emotional self-regulation exercises	Pregnant women receiving conventional antenatal childbirth education	Prenatal anxiety significantly decreased and childbirth readiness improved after intervention ($p < 0.05$)
4	Using an Electronic Mindfulness-Based Intervention (eMBI) to improve maternal mental health during pregnancy [16]	Randomized Controlled Trial (RCT)	160 pregnant women experiencing emotional distress and pregnancy-related anxiety; randomized sampling	Participants used an electronic mindfulness-based intervention platform providing guided meditation videos, mindfulness audio recordings, self-reflection exercises, stress management modules, and online support sessions	Pregnant women receiving standard antenatal care without electronic mindfulness support	Pregnancy-related anxiety and emotional distress significantly decreased following intervention ($p < 0.05$)
5	Effects of mindfulness yoga during pregnancy on psychological and pregnancy outcomes in multiparous women of advanced maternal age [17]	Randomized Controlled Trial (RCT)	68 multiparous pregnant women of advanced maternal age; convenience sampling	The intervention included structured prenatal mindfulness yoga sessions combining stretching, breathing techniques, guided relaxation, mindfulness meditation, and pregnancy-adapted body movement exercises performed routinely during pregnancy	Pregnant women receiving routine antenatal services without prenatal yoga intervention	Anxiety and fear of childbirth significantly decreased, while sleep quality improved after intervention ($p < 0.05$)
6	The effect of relaxation exercises training on pregnancy-related anxiety after perinatal loss: a pilot randomized control trial [18]	Randomized Controlled Trial (RCT)	60 pregnant women with previous perinatal loss experiencing pregnancy-related anxiety; randomized sampling	Participants received relaxation exercise training involving breathing control exercises, guided relaxation, calming techniques, and muscle relaxation exercises conducted regularly throughout pregnancy	Pregnant women receiving standard prenatal care without relaxation exercise training	Pregnancy-related anxiety scores significantly decreased after intervention ($p < 0.05$)

No	Title	Design	Population	Intervention	Comparison	Outcome
7	Effectiveness of progressive muscle relaxation technique on anxiety caused by Covid-19 in pregnant women: a randomized clinical trial [19]	Randomized Controlled Trial (RCT)	126 pregnant women experiencing anxiety during the COVID-19 pandemic; randomized clinical trial sampling	Progressive Muscle Relaxation (PMR) intervention involved sequential muscle contraction-relaxation exercises combined with breathing control and guided relaxation sessions	Pregnant women receiving routine antenatal care during the COVID-19 pandemic	Anxiety scores significantly decreased in intervention group compared with control group ($p < 0.001$)
8	Specialized antenatal music therapy for pregnant women with mental health problems [20]	Mixed-Methods	72 pregnant women with mental health problems during pregnancy; purposive sampling	Participants attended antenatal music therapy sessions involving calming music exposure, therapeutic listening, guided emotional relaxation, and music-assisted coping sessions supervised by therapists	Pregnant women receiving standard antenatal mental health support	Anxiety symptoms decreased and maternal wellbeing improved after intervention ($p < 0.05$)
9	Music therapy and maternal attachment during pregnancy [21]	Quasi Experimental	40 pregnant women during the antenatal period; convenience sampling	The intervention consisted of prenatal singing activities, relaxation music sessions, maternal-fetal interaction through music stimulation, and emotional expression activities	No comparison group reported in the study	Maternal anxiety decreased and maternal attachment improved after intervention
10	Needs-based prenatal education for advanced multiparous women [22]	Randomized Controlled Trial (RCT)	86 advanced multiparous pregnant women experiencing pregnancy-related concerns; purposive sampling	Participants received individualized prenatal education tailored to maternal needs, including pregnancy information, childbirth preparation, stress management, coping education, and maternal adaptation counseling	Pregnant women receiving routine prenatal education services	Pregnancy anxiety scores significantly decreased and physiological indicators improved ($p < 0.05$)
11	Psychoeducational Intervention for pregnant women with inflammatory bowel disease [23]	Randomized Controlled Trial (RCT)	50 pregnant women diagnosed with inflammatory bowel disease (IBD); convenience sampling	Psychoeducational intervention included disease-related education, pregnancy counseling, emotional coping education, stress management, and self-care guidance related to chronic illness during pregnancy	Pregnant women receiving routine obstetric and medical care without psychoeducational intervention	Pregnancy-related anxiety significantly decreased ($p = 0.003$) and maternal self-efficacy significantly improved ($p < 0.001$)
12	Effectiveness of counseling in reducing pregnancy-related anxiety among primigravida women – A quasi experimental study [24]	Quasi Experimental	100 primigravida pregnant women experiencing pregnancy-related anxiety; total sampling	Participants attended periodic counseling sessions discussing maternal mental health, emotional adaptation during pregnancy, childbirth preparation, anxiety management, and psychological support strategies	Primigravida women receiving routine antenatal counseling services	Anxiety scores significantly decreased after 8 weeks of intervention ($p < 0.05$)
13	The effect of cognitive behavioral counseling on anxiety and worry level of women with intermediate risk during first trimester	Randomized Controlled Trial (RCT)	72 pregnant women with intermediate risk results during first trimester Down syndrome screening;	Cognitive Behavioral Therapy (CBT) counseling sessions focused on identifying negative thoughts, anxiety management, cognitive restructuring,	Pregnant women receiving standard prenatal screening counseling	Anxiety and worry levels significantly decreased compared with control group ($p < 0.001$)

No	Title	Design	Population	Intervention	Comparison	Outcome
	screening for down syndrome [25]		randomized sampling	emotional coping, and adaptive behavioral strategies		
14	Digital guided self-help mindfulness training for pregnancy-related anxiety symptoms among pregnant women [26]	Randomized Controlled Trial (RCT)	114 pregnant women experiencing pregnancy-related anxiety symptoms and psychological distress; convenience sampling	Participants accessed online mindfulness self-help modules consisting of guided meditation, breathing exercises, mindfulness videos, relaxation techniques, and stress management training through digital platforms	Pregnant women receiving standard antenatal care without digital mindfulness training	Pregnancy-related anxiety symptoms significantly decreased following intervention ($p < 0.05$)
15	Thinking healthy programme and structured social support intervention for maternal mental health during pregnancy [27]	Randomized Controlled Trial (RCT)	88 pregnant women requiring emotional and psychosocial support during pregnancy; purposive sampling	The intervention provided structured psychosocial support involving counseling, peer group support, family engagement, emotional reinforcement, and maternal mental health education sessions	No comparison group reported in the study	Emotional wellbeing and maternal psychological adaptation improved after intervention
16	The effect of basic body awareness therapy on awareness, stress and anxiety in pregnant women [28]	Quasi Experimental	60 pregnant women experiencing stress and anxiety during pregnancy; convenience sampling	Participants received body awareness therapy involving breathing awareness, relaxation movement exercises, posture training, mindfulness body exercises, and guided stress reduction activities	Pregnant women receiving standard antenatal care without body awareness therapy	Stress and anxiety scores significantly decreased after intervention ($p < 0.05$)

DISCUSSION

This systematic literature review synthesized evidence from 16 experimental studies evaluating a broad spectrum of non-pharmacological interventions designed to reduce pregnancy-specific anxiety among pregnant women. Collectively, the findings demonstrate that non-pharmacological approaches constitute an essential component of maternal mental health promotion, as all intervention categories reviewed produced beneficial effects on maternal psychological wellbeing. These benefits were observed across diverse populations, clinical contexts, and intervention modalities, indicating that non-pharmacological strategies can be flexibly adapted to different antenatal care environments. Nevertheless, the strength, consistency, and generalizability of evidence varied substantially across intervention types, reflecting differences in methodological rigor, sample characteristics, and intervention standardization.

Among the intervention categories examined, mindfulness-based interventions emerged as the most consistently supported approach. This category was backed by the largest number of high-quality experimental studies, including multiple randomized controlled trials conducted in varied cultural and healthcare settings. Across these studies, mindfulness-based interventions consistently demonstrated significant improvements in pregnancy-specific anxiety, general anxiety symptoms, perceived stress, emotional distress, and fear of childbirth. These effects were observed regardless of whether mindfulness was delivered through structured programs such as Mindfulness-Based Stress Reduction (MBSR), mindfulness-based childbirth education, or digital mindfulness modules. The consistency of these findings suggests that mindfulness interventions possess robust therapeutic mechanisms; such as enhanced emotional regulation, reduced rumination, and improved present-moment awareness that are broadly applicable to pregnant women experiencing anxiety.

In contrast, although other intervention categories including prenatal yoga, relaxation techniques, music therapy, antenatal education, cognitive behavioral counseling, digital interventions, structured social support, and body awareness therapy also produced positive psychological outcomes, the evidence supporting these approaches was generally derived from fewer studies or more specific clinical populations. For example, prenatal yoga and body awareness therapy were shown to reduce anxiety and improve emotional relaxation, but these findings were based on a smaller number of trials, often involving targeted groups such as multiparous women of advanced maternal age or women with heightened obstetric risk. Relaxation techniques and Progressive Muscle Relaxation (PMR) demonstrated effectiveness particularly among women with previous perinatal loss or those experiencing heightened stress during public health emergencies, such as the COVID-19 pandemic. Music therapy and prenatal singing interventions improved maternal wellbeing and maternal-fetal attachment, but were evaluated in limited cultural contexts. Similarly, antenatal education and psychoeducational interventions reduced anxiety by enhancing maternal knowledge and preparedness, yet were often applied to specific subgroups such as women with chronic medical conditions. Cognitive Behavioral Therapy (CBT) interventions showed strong effectiveness in restructuring maladaptive thoughts and reducing anxiety, but were evaluated in relatively small samples or specialized clinical scenarios such as prenatal genetic screening. Digital interventions demonstrated promising results due to their accessibility and scalability, but the evidence base remains emergent and requires further validation. Structured social support interventions improved emotional adaptation and reduced feelings of isolation, yet were often implemented in culturally specific or community-based settings.

Taken together, these patterns indicate that while all intervention categories reviewed have demonstrated therapeutic potential, the consistency of evidence differs markedly. Mindfulness-based interventions stand out not because they are inherently superior to all other approaches, but because they have been evaluated more extensively, across more diverse populations, and with more rigorous experimental designs. The broader evidence base supporting mindfulness interventions enhances confidence in their generalizability and applicability across antenatal care settings. Conversely, the smaller number of studies supporting other intervention categories suggests that their effectiveness may be context-dependent or requires further investigation through larger, more diverse, and methodologically robust trials.

Therefore, the findings of this review indicate that mindfulness-based interventions demonstrate the most consistent evidence for reducing pregnancy-specific anxiety, while other non-pharmacological approaches remain promising but require additional high-quality research to establish comparative effectiveness. This conclusion underscores the importance of continued investment in experimental studies that evaluate diverse intervention modalities, employ standardized outcome measures, and include heterogeneous maternal populations to strengthen the evidence base for non-pharmacological maternal mental health interventions.

Effectiveness of prenatal yoga interventions in reducing pregnancy-related anxiety

Based on the findings of this review, prenatal yoga and body awareness interventions were identified as effective non-pharmacological health promotion strategies for reducing pregnancy-related anxiety among pregnant women. These interventions consistently demonstrated meaningful improvements in maternal psychological wellbeing across different study populations and antenatal care settings. As reported in the reviewed studies, Lu et al. [17] demonstrated that mindfulness yoga significantly reduced pregnancy-related anxiety and fear of childbirth among multiparous women of advanced maternal age, a population known to experience heightened obstetric risks and elevated psychological vulnerability. Likewise, Yüce et al. [28] found that basic body awareness therapy significantly reduced stress and anxiety among pregnant women, further supporting the therapeutic value of somatic and movement-based interventions during pregnancy.

The interventions evaluated in these studies typically incorporated a combination of stretching exercises, breathing techniques, posture training, mindfulness-based body movement, guided relaxation, and breathing awareness exercises adapted specifically to the physiological conditions of pregnancy. These components were designed to promote physical comfort, enhance bodily awareness, and facilitate emotional regulation. Participants who received these interventions not only experienced reductions in anxiety but also demonstrated improvements in sleep quality, emotional relaxation, and overall psychological wellbeing. Such multidimensional benefits highlight the holistic nature of yoga and body awareness therapy, which simultaneously target physical, emotional, and cognitive aspects of maternal health.

The effectiveness of prenatal yoga and body awareness interventions may be explained through several interconnected physiological and psychological mechanisms. First, these interventions are known to improve autonomic nervous system regulation, particularly by enhancing parasympathetic activity and reducing sympathetic arousal. This shift in autonomic balance contributes to lower heart rate, reduced muscle tension, and improved physiological calmness. Second, yoga and body awareness practices promote muscle relaxation, which can alleviate somatic symptoms of anxiety such as tightness, discomfort, and restlessness. Third, these interventions strengthen emotional regulation, enabling pregnant women to better manage intrusive thoughts, fears, and stressors associated with pregnancy and childbirth. Fourth, enhanced body awareness helps women adapt more effectively to rapid physiological changes during pregnancy, reducing feelings of bodily unfamiliarity and loss of control that often contribute to anxiety.

In addition to these mechanisms, yoga-based interventions encourage active maternal participation in maintaining physical and mental wellbeing. This participatory nature aligns closely with promotive and preventive principles in health promotion, which emphasize empowerment, self-efficacy, and proactive engagement in health-maintaining behaviors. By practicing yoga or body awareness exercises, pregnant women become more involved in their own psychological care, develop adaptive coping strategies, and cultivate a sense of agency over their emotional experiences. This empowerment is particularly important during pregnancy, a period characterized by significant physical changes, heightened emotional sensitivity, and increased vulnerability to stress.

Furthermore, prenatal yoga and body awareness interventions may foster a deeper connection between pregnant women and their developing fetuses. Through mindful movement, breathing awareness, and relaxation practices, women may experience enhanced maternal-fetal bonding, increased emotional attunement, and greater psychological readiness for childbirth. These outcomes contribute not only to reduced anxiety but also to improved maternal adaptation and healthier pregnancy experiences overall.

Taken together, the evidence indicates that prenatal yoga and body awareness interventions represent promising, accessible, and culturally adaptable non-pharmacological strategies for reducing pregnancy-related anxiety. Their demonstrated benefits across diverse populations and settings underscore their potential for integration into routine antenatal care, particularly as part of comprehensive maternal mental health promotion programs. Continued research with larger sample sizes, standardized intervention protocols, and long-term follow-up assessments is recommended to further strengthen the evidence base and optimize implementation strategies for these interventions.

Effectiveness of mindfulness interventions in reducing pregnancy-related anxiety

Mindfulness interventions were the most frequently identified interventions in this review and consistently demonstrated positive outcomes in reducing pregnancy-related anxiety. Across the included studies, mindfulness emerged as a central therapeutic approach with broad applicability, strong empirical support, and consistent effectiveness across diverse maternal populations. Pan et al. [13], Nasrollahi et al. [14], Innab et al. [15], and Hassdenteufel et al. [16] each reported significant reductions in anxiety, stress, depression, emotional distress, and birth-related anxiety following mindfulness-based interventions, demonstrating a robust pattern of psychological improvement. These findings were observed across different cultural contexts, healthcare systems, and intervention delivery methods, underscoring the adaptability and scalability of mindfulness-based approaches in antenatal care.

The interventions reviewed encompassed several structured mindfulness modalities, including Mindfulness-Based Stress Reduction (MBSR), prenatal mindfulness programs, mindfulness-based childbirth education, and electronic mindfulness-based interventions (eMBI). Although these programs varied in duration, frequency, and delivery format, they shared core components such as breathing exercises, meditation practices, emotional awareness training, mindfulness coping strategies, and stress management techniques. Importantly, these interventions were delivered both face-to-face and digitally, demonstrating that mindfulness can be effectively implemented through traditional clinical encounters as well as through mobile applications and online platforms.

Compared with the other intervention categories included in this review, mindfulness-based interventions demonstrated the strongest consistency of evidence. This consistency is attributable to several methodological strengths: mindfulness interventions were evaluated in four

randomized controlled trials, involved heterogeneous maternal populations, and were delivered through multiple modalities, including structured group programs, individualized sessions, and digital self-guided modules. Despite variations in participant characteristics; such as parity, maternal age, obstetric risk, and baseline psychological status and differences in intervention formats, all studies consistently reported significant reductions in pregnancy-related anxiety and related psychological outcomes. This convergence of findings across diverse contexts suggests that mindfulness-based interventions possess a high degree of generalizability and may be suitable for integration into a wide range of antenatal care settings.

The consistent effectiveness of mindfulness interventions may be explained by several underlying mechanisms. First, mindfulness enhances emotional regulation, enabling pregnant women to respond more adaptively to stressors and emotional triggers. Through regular practice, women learn to observe their thoughts and emotions without judgment, reducing emotional reactivity and improving psychological resilience. Second, mindfulness strengthens self-awareness, helping pregnant women recognize early signs of anxiety, tension, or distress and apply coping strategies before symptoms escalate. Third, mindfulness reduces intrusive thoughts, fear of childbirth, and worries related to fetal wellbeing by encouraging cognitive reframing and reducing catastrophic thinking patterns. Fourth, mindfulness promotes present-moment awareness, which may reduce excessive rumination; a key cognitive mechanism underlying anxiety during pregnancy. By focusing attention on the present rather than on hypothetical future threats, pregnant women may experience greater psychological stability and reduced cognitive anxiety.

Furthermore, mindfulness interventions may influence physiological pathways associated with stress reduction. Regular mindfulness practice has been shown to decrease sympathetic nervous system activation, reduce cortisol levels, and enhance parasympathetic activity, thereby promoting physiological calmness. These changes may be particularly beneficial during pregnancy, a period characterized by heightened hormonal fluctuations and increased vulnerability to stress.

Taken together, the evidence indicates that mindfulness-based interventions represent a highly effective, adaptable, and evidence-based approach for reducing pregnancy-specific anxiety. Their demonstrated benefits across diverse populations, delivery methods, and psychological outcomes suggest that mindfulness may have broader applicability across antenatal care settings than other non-pharmacological approaches evaluated in the present review. As such, mindfulness-based interventions hold considerable promise for integration into routine maternal mental health promotion programs, particularly in contexts where scalable, low-cost, and accessible psychological support is needed.

Effectiveness of relaxation techniques interventions in reducing pregnancy-related anxiety

Relaxation techniques and Progressive Muscle Relaxation (PMR) were also found to be effective in reducing pregnancy-related anxiety, and the evidence from the included studies highlights their value as accessible, low-cost, and physiologically grounded non-pharmacological interventions. Duman et al. [18] reported that relaxation exercise training significantly reduced pregnancy-related anxiety among women with previous perinatal loss, a population known to experience heightened psychological vulnerability due to trauma, grief, and fear of recurrent adverse outcomes. This finding is particularly important because women with a history of perinatal loss often exhibit elevated baseline anxiety, hypervigilance, and emotional instability throughout subsequent pregnancies. Relaxation techniques may therefore serve as a stabilizing intervention that helps restore emotional balance and reduce anticipatory fear.

Similarly, Zendehdel et al. [19] demonstrated that Progressive Muscle Relaxation significantly reduced anxiety among pregnant women during the COVID-19 pandemic, a period marked by widespread uncertainty, heightened stress, and limited access to face-to-face antenatal services. The effectiveness of PMR in such a high-stress global context underscores its adaptability and relevance for maternal mental health promotion during public health emergencies. The interventions evaluated in these studies typically included guided breathing exercises, systematic muscle relaxation training, calming activities, and emotional relaxation sessions conducted routinely throughout pregnancy. These structured practices were designed to reduce physiological arousal, interrupt the stress response cycle, and promote a sense of bodily calmness.

Relaxation-based interventions may reduce pregnancy-related anxiety through several interconnected mechanisms. First, they help regulate physiological stress responses, particularly by reducing sympathetic nervous system activation and enhancing parasympathetic activity. This shift in autonomic balance contributes to lower heart rate, reduced muscle tension, and improved physiological calmness. Second, relaxation techniques directly target muscle tension, a common somatic manifestation of anxiety, thereby reducing physical discomfort and improving bodily comfort during pregnancy. Third, these interventions promote emotional calmness, enabling pregnant women to manage intrusive thoughts, fears, and stressors more effectively. Fourth, relaxation practices may improve sleep quality, which is often disrupted during pregnancy and closely linked to heightened anxiety levels.

The findings of this review suggest that relaxation techniques represent accessible, low-cost, and easily implementable interventions that can be integrated into routine antenatal care settings. Unlike more complex psychological interventions, relaxation exercises require minimal equipment, can be taught quickly, and can be practiced independently by pregnant women at home. This makes them particularly suitable for low-resource settings, rural communities, and healthcare systems with limited mental health infrastructure. Relaxation interventions may also be beneficial for pregnant women who face barriers to accessing psychological services, such as transportation difficulties, financial constraints, or limited availability of trained mental health professionals.

Furthermore, relaxation techniques may help pregnant women develop adaptive coping mechanisms during stressful pregnancy conditions, including previous pregnancy loss, high-risk pregnancies, or public health emergencies such as the COVID-19 pandemic. By practicing relaxation regularly, women may become more adept at recognizing early signs of anxiety, applying calming strategies, and maintaining emotional stability during challenging situations. This empowerment aligns with promotive and preventive health promotion principles, which emphasize self-efficacy, active participation, and proactive engagement in maintaining psychological wellbeing.

In addition, relaxation-based interventions may contribute to improved maternal-fetal bonding by reducing emotional distress and promoting a sense of calmness and connection. Pregnant women who feel emotionally stable and physically relaxed may be better able to engage in positive maternal-fetal interactions, visualize healthy pregnancy outcomes, and prepare psychologically for childbirth.

Taken together, the evidence indicates that relaxation techniques and Progressive Muscle Relaxation represent effective, adaptable, and scalable non-pharmacological strategies for reducing pregnancy-related anxiety. Their demonstrated benefits across diverse populations and contexts underscore their potential for integration into maternal mental health promotion programs, particularly in settings where accessible and low-cost interventions are needed. These approaches are especially valuable in antenatal care environments with limited psychological resources, as they can be taught quickly, practiced independently, and incorporated into routine maternal health education without requiring specialized equipment or intensive professional supervision.

In addition to reducing anxiety, relaxation-based interventions may contribute to broader improvements in maternal wellbeing by enhancing physiological regulation, reducing somatic discomfort, and promoting emotional stability throughout pregnancy. Their simplicity, cultural

adaptability, and suitability for both individual and group-based formats further strengthen their relevance for community-level maternal health initiatives. Future research should explore standardized relaxation protocols, long-term effects, and comparative effectiveness with other psychological interventions to further strengthen the evidence base for relaxation-based approaches in antenatal care. Expanding research across diverse maternal populations and healthcare settings will also help clarify optimal implementation strategies and support the development of more comprehensive, evidence-informed maternal mental health programs.

Effectiveness of music therapy interventions in reducing pregnancy-related anxiety

Music therapy interventions were also identified as effective approaches for reducing maternal anxiety during pregnancy. Cheung et al. [20] and Carvalho et al. [21] demonstrated that antenatal music therapy and prenatal singing interventions improved maternal wellbeing, reduced anxiety, and enhanced maternal attachment, indicating that auditory and expressive modalities can play a meaningful role in maternal mental health. The interventions involved calming music exposure, prenatal singing activities, relaxation music sessions, emotional expression through music, and maternal–fetal bonding stimulation. These components were intentionally designed to create soothing sensory environments, promote emotional release, and strengthen maternal connection with the developing fetus.

Music therapy may influence emotional regulation by providing relaxation stimuli and distraction from negative thoughts experienced during pregnancy. Exposure to calming rhythms and harmonies can reduce physiological arousal, slow breathing, and promote parasympathetic activation, thereby decreasing stress responses. In addition, music therapy may strengthen maternal attachment and emotional comfort during antenatal care by encouraging mothers to engage emotionally with their pregnancy, express feelings through music, and cultivate positive associations with fetal movement and maternal–fetal interaction. Such experiences may help pregnant women feel more connected, supported, and emotionally grounded throughout the gestational period.

These findings support the use of music therapy as a complementary intervention within maternal mental health promotion programs. Music-based interventions are also relatively easy to implement and culturally adaptable across different healthcare settings, as they can be tailored to local musical traditions, personal preferences, and cultural norms surrounding pregnancy and childbirth. Their flexibility allows integration into antenatal classes, community health programs, or home-based relaxation routines. Taken together, the evidence suggests that music therapy represents a gentle, enjoyable, and accessible non-pharmacological strategy that can enhance psychological wellbeing and enrich the emotional experience of pregnancy.

Effectiveness of prenatal education interventions in reducing pregnancy-related anxiety

Prenatal education and psychoeducational interventions were found to significantly reduce pregnancy-related anxiety among pregnant women, demonstrating that structured informational support plays a crucial role in strengthening maternal psychological readiness. Shen et al. [22] demonstrated that needs-based prenatal education significantly reduced prenatal anxiety among advanced multiparous women, a group that often experiences heightened concerns due to previous childbirth experiences and increased obstetric risks. Likewise, Jin et al. [23] found that psychoeducational interventions significantly reduced anxiety and improved maternal self-efficacy among pregnant women with inflammatory bowel disease (IBD), indicating that educational support is particularly beneficial for women with chronic medical conditions who may face additional pregnancy-related uncertainties.

The educational interventions reviewed in these studies included a wide range of components such as childbirth preparation, pregnancy-related information, stress management techniques, coping strategies, maternal adaptation counseling, and disease-specific self-care education. These components were designed not only to increase maternal knowledge but also to enhance psychological preparedness by addressing common fears, misconceptions, and uncertainties surrounding pregnancy and childbirth. By providing clear, evidence-based information, these interventions help pregnant women understand physiological changes, anticipate labor processes, and develop realistic expectations about maternal roles and responsibilities.

These findings suggest that increasing maternal knowledge and preparedness may reduce uncertainty and psychological distress during pregnancy. When pregnant women receive adequate information regarding pregnancy and childbirth, they are better equipped to interpret bodily sensations, manage emotional fluctuations, and respond to unexpected situations. This increased sense of control and understanding may enhance maternal confidence and reduce fear associated with labor, maternal role adaptation, and fetal health concerns. Furthermore, psychoeducational interventions may empower women to engage more actively in decision-making processes, communicate effectively with healthcare providers, and adopt healthier behaviors during pregnancy.

Therefore, educational interventions may strengthen maternal coping abilities while simultaneously improving psychological readiness during pregnancy. By reducing anxiety, enhancing self-efficacy, and promoting informed decision-making, prenatal education serves as a foundational component of maternal mental health promotion. Its structured, accessible, and adaptable nature also makes it suitable for integration into routine antenatal care, community-based maternal programs, and digital health platforms, ensuring that pregnant women across diverse settings can benefit from comprehensive and supportive educational resources.

Effectiveness of cognitive behavioral counseling (CBT) interventions in reducing pregnancy-related anxiety

Cognitive Behavioral Therapy (CBT)-based counseling interventions also demonstrated strong effectiveness in reducing pregnancy-related anxiety, reinforcing the importance of structured psychological support during the antenatal period. Aziz et al. [24] found that periodic counseling interventions significantly reduced anxiety scores among primigravida women after eight weeks of intervention, suggesting that CBT techniques can be effective even for women experiencing pregnancy for the first time, who often face heightened uncertainty and fear related to childbirth. Similarly, Kharaghani et al. [25] demonstrated that telephone-based CBT counseling significantly reduced anxiety and worry levels among pregnant women undergoing Down syndrome screening, a population that typically experiences elevated stress due to concerns about fetal health and diagnostic outcomes.

The CBT interventions reviewed in these studies focused on several core components, including identifying maladaptive thoughts, anxiety management, cognitive restructuring, emotional coping strategies, and adaptive behavioral responses. These elements are central to CBT's theoretical foundation, which posits that modifying dysfunctional thought patterns can lead to improved emotional regulation and healthier behavioral responses. By helping pregnant women recognize and challenge irrational fears, reinterpret stressful situations more positively, and replace catastrophic thinking with realistic and balanced perspectives, CBT interventions may reduce the intensity and frequency of anxiety symptoms during pregnancy.

Furthermore, CBT-based counseling may enhance psychological resilience by equipping pregnant women with practical coping mechanisms that can be applied during pregnancy, childbirth, and the postpartum period. Through structured sessions, women learn to manage anticipatory anxiety, regulate emotional responses, and develop problem-solving skills that support psychological stability. These benefits are particularly relevant for women facing high-risk pregnancies, complex diagnostic procedures, or heightened psychosocial stressors.

Taken together, these findings indicate that CBT-based counseling may significantly improve psychological resilience and coping mechanisms among pregnant women experiencing pregnancy-related anxiety. Because CBT interventions can be delivered in various formats; including face-to-face sessions, group counseling, and telephone-based or digital modalities they offer flexible and accessible options for maternal mental health support. CBT interventions are therefore considered important promotive and preventive strategies within maternal mental health services, with strong potential for integration into routine antenatal care, especially in settings where structured psychological support is limited or underutilized.

Effectiveness of digital interventions in reducing pregnancy-related anxiety

Digital interventions also emerged as promising non-pharmacological strategies for reducing pregnancy-related anxiety, reflecting the growing role of technology-assisted mental health support in contemporary antenatal care. Zhang et al. [26] demonstrated that digital guided self-help mindfulness training significantly reduced depression, anxiety, and pregnancy-related anxiety symptoms among pregnant women, indicating that digital platforms can effectively deliver psychological interventions traditionally provided in face-to-face settings. These interventions included online mindfulness modules, guided meditation videos, breathing exercises, relaxation activities, stress management training, and self-help psychological support delivered through mobile applications or online platforms. The structured yet flexible nature of these digital components allows pregnant women to engage with mental health resources at their own pace, in their preferred environment, and according to their personal schedules.

The effectiveness of digital interventions may be related to their accessibility, flexibility, and convenience for pregnant women who may experience barriers to face-to-face psychological services. Many pregnant women face logistical challenges such as limited mobility, time constraints, transportation difficulties, or geographical distance from healthcare facilities. Digital platforms help overcome these barriers by providing continuous access to psychological support without requiring physical attendance at clinics. In addition, digital interventions can be tailored to individual needs, offering personalized content, reminders, progress tracking, and adaptive modules that enhance user engagement and intervention adherence.

Digital interventions are also highly relevant to current maternal health promotion strategies because they allow continuous psychological support during pregnancy. Unlike traditional interventions that rely on scheduled appointments, digital approaches enable pregnant women to access coping tools, relaxation exercises, and educational materials at any time, thereby supporting ongoing emotional regulation throughout the gestational period. This continuous availability may be particularly beneficial during periods of heightened stress, such as medical complications, diagnostic procedures, or unexpected life events.

Furthermore, digital approaches align with the development of technology-based antenatal care services and may increase the reach of maternal mental health interventions. As healthcare systems increasingly adopt telehealth, mobile health (mHealth), and digital counseling platforms, integrating mental health modules into these systems can expand access to psychological support for broader maternal populations. Digital interventions also offer opportunities for scalability, cost-effectiveness, and cultural adaptability, as content can be easily modified to suit different languages, cultural contexts, and health system needs.

Taken together, these findings suggest that digital interventions represent a valuable addition to maternal mental health promotion programs. Their accessibility, adaptability, and potential for widespread dissemination make them particularly suitable for modern antenatal care frameworks, especially in regions with limited mental health resources. Continued research is needed to refine digital intervention designs, evaluate long-term outcomes, and compare digital approaches with traditional psychological interventions to optimize their role in reducing pregnancy-related anxiety.

Effectiveness of structured social support interventions in reducing pregnancy-related anxiety

Structured social support interventions were also identified as beneficial in reducing pregnancy-related anxiety among pregnant women. Boran et al. [27] demonstrated that psychosocial support interventions improved emotional wellbeing and maternal psychological adaptation during pregnancy, highlighting the central role of interpersonal relationships and supportive environments in shaping maternal mental health. The interventions reviewed in this category included peer support, family involvement, emotional reinforcement, psychosocial counseling, and maternal mental health education. These components were designed to provide pregnant women with both emotional reassurance and practical guidance, thereby creating a supportive network that helps buffer the psychological challenges commonly experienced during pregnancy.

Emotional and informational support from healthcare providers, family members, and peer groups may reduce feelings of isolation and improve maternal coping mechanisms when facing pregnancy-related stressors. Pregnancy is often accompanied by uncertainty, fear of childbirth, concerns about fetal health, and significant physiological and emotional changes. When women receive consistent encouragement, empathetic listening, and clear information from trusted individuals, they may feel more secure and better equipped to manage these stressors. Peer support, in particular, allows pregnant women to share experiences with others undergoing similar transitions, fostering a sense of solidarity and reducing the perception of facing pregnancy challenges alone.

These findings indicate that social support plays an important role in maternal mental health promotion. Supportive interactions can enhance maternal confidence, reduce emotional vulnerability, and strengthen adaptive coping strategies. Pregnant women who receive adequate emotional and psychosocial support may feel more secure, emotionally stable, and psychologically prepared during pregnancy and childbirth. Social support may also contribute to improved maternal-fetal bonding, greater satisfaction with antenatal care, and more positive childbirth experiences. Furthermore, structured social support interventions are relatively easy to implement within community-based maternal programs, antenatal classes, and family-centered care models, making them a practical and culturally adaptable component of comprehensive maternal mental health services.

Comparative strength of evidence

Although all intervention categories demonstrated positive effects, direct comparisons between interventions should be interpreted cautiously because of differences in study design, sample characteristics, intervention duration, outcome measurements, and clinical settings. The heterogeneity across studies; such as variations in methodological rigor, cultural contexts, baseline maternal psychological status, and the intensity or frequency of interventions makes it difficult to draw definitive conclusions regarding the superiority of one intervention over another. These

methodological differences may influence effect sizes, intervention responsiveness, and the generalizability of findings, thereby limiting the validity of direct cross-intervention comparisons.

Therefore, the present review identifies mindfulness-based interventions as having the most consistent evidence based on the number of supporting studies and the consistency of significant findings, rather than concluding that they are universally superior to all other interventions. Mindfulness interventions appear more robust primarily because they have been evaluated in a greater number of high-quality randomized controlled trials and across more diverse populations and delivery modalities. This breadth of evidence strengthens confidence in their reliability and applicability, but does not diminish the potential value of other interventions, which may be equally effective in specific contexts or among particular maternal subgroups.

Future head-to-head comparative trials are required to determine the relative effectiveness of each intervention. Such trials should employ standardized outcome measures, comparable intervention durations, and similar participant characteristics to allow more accurate comparisons. Additionally, multi-arm randomized controlled trials and network meta-analyses would provide stronger evidence regarding which interventions yield the greatest benefits for specific types of pregnancy-related anxiety. Conducting these rigorous comparative studies will help clarify optimal intervention strategies and support the development of more targeted, evidence-based maternal mental health programs.

Implications for health promotion and Nudge Theory

The findings of this review demonstrate that non-pharmacological interventions are closely related to health promotion principles because they emphasize preventive, promotive, participatory, and empowering approaches for pregnant women. These interventions do not merely aim to reduce symptoms of anxiety; rather, they encourage pregnant women to become active agents in maintaining their psychological wellbeing. Most interventions encouraged pregnant women to actively participate in managing their emotional health through adaptive coping strategies, emotional regulation, and supportive behavioral changes. This participatory nature aligns with the core philosophy of health promotion, which prioritizes empowerment, self-efficacy, and the development of sustainable health-enhancing behaviors.

In addition, these findings are relevant to the Nudge Theory proposed by Thaler and Sunstein. Nudge Theory suggests that subtle, supportive cues can guide individuals toward healthier decisions without restricting their freedom of choice. Within the context of maternal mental health, interventions such as mindfulness reminders, digital counseling, psychoeducation, and structured social support may function as behavioral nudges that encourage healthier coping behaviors and greater utilization of maternal mental health services. These nudges work by simplifying decision-making, reducing psychological barriers, and creating environments that make positive behaviors easier to adopt.

For example, digital mindfulness reminders may prompt pregnant women to pause, breathe, and regulate their emotions during stressful moments. Psychoeducational materials may nudge women to seek accurate information rather than rely on fear-based assumptions. Social support interventions may encourage women to share concerns with peers or family members instead of internalizing stress. Through supportive environments and simplified behavioral support, pregnant women may become more motivated to maintain their psychological wellbeing during pregnancy. These mechanisms illustrate how non-pharmacological interventions can subtly shift maternal behaviors toward healthier patterns without coercion, thereby reinforcing the principles of autonomy and empowerment central to modern health promotion.

Taken together, the integration of health promotion principles and Nudge Theory highlights the broader significance of non-pharmacological interventions. They not only reduce anxiety but also cultivate long-term behavioral changes, strengthen maternal resilience, and promote proactive engagement with antenatal mental health services.

Limitations of the review

This review has several limitations. The included studies demonstrated considerable heterogeneity in intervention duration, outcome measurements, research settings, and study designs, limiting direct comparison across studies. Variations in sample characteristics—such as maternal age, parity, obstetric risk, cultural background, and baseline psychological status—further complicate the interpretation of findings and reduce the generalizability of conclusions. Differences in intervention intensity, frequency, and delivery format also introduce methodological variability that may influence effect sizes and intervention responsiveness. As a result, caution is required when comparing the effectiveness of one intervention category with another, as observed differences may reflect methodological inconsistencies rather than true variations in therapeutic impact.

Furthermore, the review used narrative synthesis rather than meta-analysis; therefore, pooled effect sizes and quantitative comparisons between interventions could not be statistically analyzed. Narrative synthesis allows for descriptive integration of findings but does not provide statistical estimates of overall intervention effectiveness or comparative strength across intervention types. Without meta-analytic techniques, it is not possible to determine the magnitude of intervention effects, assess heterogeneity quantitatively, or evaluate publication bias. This limits the ability to draw stronger, evidence-based conclusions regarding which interventions may be most effective for specific maternal populations or clinical contexts.

Future systematic reviews are recommended to conduct meta-analyses and evaluate long-term intervention effectiveness across broader maternal populations and healthcare settings. Meta-analytic approaches would enable more precise estimation of pooled effect sizes, facilitate subgroup analyses, and support comparative evaluations across intervention modalities. Additionally, future research should incorporate standardized outcome measures, uniform intervention protocols, and long-term follow-up assessments to better understand sustained psychological benefits beyond pregnancy. Expanding research across diverse cultural, socioeconomic, and healthcare environments will also strengthen the evidence base and support the development of more comprehensive, equitable, and context-appropriate maternal mental health promotion strategies.

CONCLUSION

Non-pharmacological health promotion interventions demonstrated positive effects in reducing pregnancy-specific anxiety among pregnant women. Mindfulness-based interventions demonstrated the most consistent evidence across the included studies, while prenatal yoga, relaxation techniques, music therapy, antenatal education, cognitive behavioral counseling, digital interventions, structured social support, and body awareness therapy also showed beneficial effects on maternal psychological wellbeing. These findings support the integration of non-pharmacological interventions into routine antenatal care while highlighting the need for further comparative studies to determine the relative effectiveness of each intervention.

Ethical consideration, competing interest and source of funding

- This study had obtained ethical approval from the Health Research Ethics Commission of Universitas Negeri Semarang, number: 303/KEPK/FK/KLE/2026
- There is no conflict of interest related to this publication.
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