



Non-Pharmacological Strategies for Managing Peri-operative Anxiety Among Women Undergoing Cesarean Delivery: A Systematic Review

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Abstract

Background: Maternal anxiety during cesarean delivery is a common perioperative concern associated with adverse psychological and physiological outcomes, including increased stress responses, heightened pain perception, delayed recovery, and reduced maternal satisfaction. Non-pharmacological interventions have emerged as safer alternatives to pharmacologic anxiolytics for managing anxiety during cesarean section.

Objective: To evaluate the effectiveness of non-pharmacological interventions in reducing perioperative maternal anxiety among women undergoing cesarean delivery.

Methods: A systematic review was conducted following PRISMA 2020 guidelines. Electronic searches were performed in PubMed/MEDLINE, Cochrane Library, ProQuest, ScienceDirect, and Google Scholar for studies published between 2016 and 2026. Randomized controlled trials, quasi-experimental studies, evaluating non-pharmacological anxiety-reduction strategies during cesarean delivery were included. Methodological quality was assessed using Joanna Briggs Institute critical appraisal tools, and findings were synthesized narratively.

Results: Of 1,184 records identified, 23 studies met the inclusion criteria. Interventions included aromatherapy (n = 6), music therapy (n = 4), virtual reality (n = 4), massage/reflexology/relaxation interventions (n = 4), and educational or psychological support interventions (n = 5). Most studies reported significant reductions in maternal anxiety and improvements in perioperative emotional well-being. Aromatherapy, music therapy, and virtual reality demonstrated the most consistent anxiolytic effects.

Conclusion: Current evidence supports the effectiveness of non-pharmacological interventions in reducing perioperative maternal anxiety during cesarean delivery. These approaches offer feasible, patient-centered strategies that may enhance maternal psychological outcomes while avoiding pharmacologic risks. Further high-quality studies are needed to support standardization and wider clinical implementation.

Keywords: Cesarean section; Maternal anxiety; Non-pharmacological interventions; Obstetric nursing; Perioperative care

1. Introduction

Cesarean delivery is one of the most frequently performed surgical procedures worldwide, accounting for approximately 21% of all births, with rates continuing to rise globally [4]. Although often a life-saving intervention for both mother and infant, cesarean delivery is commonly associated with perioperative maternal anxiety, which may adversely affect psychological well-being and clinical outcomes.

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Perioperative anxiety is characterized by feelings of fear, uncertainty, apprehension, and emotional distress occurring before, during, or after surgery. Among women undergoing cesarean delivery, anxiety may arise from concerns regarding anesthesia, postoperative pain, surgical complications, maternal and neonatal safety, and the unfamiliar operating room environment [20]. Because many cesarean procedures are performed under regional anesthesia, women remain conscious throughout surgery, which may further contribute to anxiety and emotional discomfort [32].

Maternal anxiety during cesarean delivery has been associated with adverse physiological and psychological outcomes, including increased stress responses, elevated cortisol levels, greater postoperative pain, delayed recovery, reduced maternal satisfaction, and poorer postpartum emotional outcomes [16, 26, 28]. Although pharmacologic anxiolytic agents may be effective, their use in obstetric populations is often limited because of concerns regarding maternal and neonatal safety [32].

Consequently, increasing attention has been directed toward non-pharmacological interventions such as music therapy, aromatherapy, massage and relaxation techniques, virtual reality, and educational or psychological support interventions. Previous studies have reported favorable effects of these approaches on maternal anxiety and perioperative experiences [2, 9, 10, 33].

Despite growing evidence, findings remain dispersed across multiple intervention categories, study designs, and outcome measures, making it difficult to determine the overall effectiveness and clinical applicability of these interventions. Furthermore, previous reviews have frequently focused on individual interventions rather than providing a comprehensive synthesis of non-pharmacological strategies relevant to obstetric nursing practice.

Therefore, this systematic review aimed to synthesize current evidence regarding the effectiveness of non-pharmacological interventions in reducing perioperative maternal anxiety among women undergoing cesarean delivery and to identify interventions that may support evidence-based and patient-centered obstetric nursing care.

1.1. Theoretical Framework

This review was informed by the Stress and Coping Theory of Lazarus and Folkman [17], which explains how individuals respond to stressful situations through cognitive appraisal and coping processes. Women undergoing cesarean delivery may perceive surgery, anesthesia, postoperative pain, and concerns regarding maternal and neonatal outcomes as significant stressors. Non-pharmacological interventions such as music therapy, aromatherapy, relaxation techniques, virtual reality, and educational support may reduce anxiety by promoting emotional regulation, enhancing perceived control, and strengthening coping mechanisms. The theory provides a useful framework for understanding how nursing interventions may influence maternal psychological responses during the perioperative period.

2. Methods

2.1. Review Design

This systematic review was conducted to synthesize current evidence regarding the effectiveness of non-pharmacological interventions in reducing perioperative maternal anxiety among women undergoing cesarean delivery. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines to ensure methodological transparency, reproducibility, and comprehensive reporting of findings [25].

The review focused on studies published between January 2016 and May 2026. Only primary intervention studies, including randomized controlled trials, quasi-experimental studies, were included in the final synthesis. Systematic reviews and meta-analyses identified during the search process were excluded from the synthesis dataset but were used to contextualize and compare findings within the discussion. This review protocol was not prospectively registered in PROSPERO or any other systematic review registry.

2.2. Eligibility Criteria

The review question was formulated using the Population, Intervention, Comparison, and Outcome (PICO) framework. The population comprised women undergoing cesarean delivery, the intervention included non-pharmacological anxiety-reduction strategies, the comparison was standard perioperative care, and the primary outcome was reduction in perioperative maternal anxiety.

Table 1 Eligibility Criteria

Component	Inclusion Criteria
Population	Women undergoing elective or emergency cesarean delivery
Intervention	Non-pharmacological interventions for anxiety reduction
Comparison	Standard or routine perioperative care
Outcome	Maternal anxiety measured using validated assessment tools
Study Design	Randomized controlled trials, and quasi-experimental studies
Publication Period	January 2016 to May 2026
Language	English
Accessibility	Full-text articles available

Studies were excluded if they primarily evaluated pharmacological anxiety-management interventions, included mixed obstetric populations without separate cesarean-specific findings, failed to assess anxiety-related outcomes, or were review articles, systematic reviews, meta-analyses, editorials, conference abstracts, protocols, dissertations, case reports, or non-English publications. Studies with insufficient methodological information or inaccessible full texts were also excluded.

2.3. Information Sources

Electronic database searches were conducted in PubMed/MEDLINE, Cochrane Library, ProQuest, ScienceDirect, and Google Scholar. Additional studies were identified through manual screening of reference lists from eligible studies and relevant review articles.

The literature search yielded 1,184 records prior to duplicate removal.

2.4. Search Strategy

A comprehensive search strategy was developed using Medical Subject Headings (MeSH), free-text keywords, synonyms, and Boolean operators. Searches focused on three principal concepts: cesarean delivery, maternal anxiety, and non-pharmacological interventions.

Representative search terms included: "cesarean section" OR "caesarean section" OR "c-section"; "maternal anxiety" OR "perioperative anxiety" OR "preoperative anxiety"; "music therapy" OR "aromatherapy" OR "virtual reality" OR "massage" OR "reflexology" OR "relaxation" OR "education" OR "psychological support".

A sample PubMed search strategy was: ("Cesarean Section"[Mesh] OR cesarean OR caesarean OR "c-section") AND ("Anxiety"[Mesh] OR anxiety OR stress OR fear OR "psychological distress") AND ("non-pharmacological" OR "nursing intervention*" OR music OR aromatherapy OR "virtual reality" OR massage OR reflexology OR relaxation OR education OR "psychological support").

Database-specific modifications were applied as necessary. Complete search strategies are presented in Supplementary Appendix A.

2.5. Study Selection

All retrieved records were imported into Zotero Reference Manager for organization and duplicate removal. Following deduplication, citations were exported to Rayyan systematic review software for independent blinded screening by two reviewers.

Study selection was conducted in two stages. First, titles and abstracts were screened against predefined eligibility criteria. Second, full-text articles of potentially eligible studies were assessed to determine final inclusion. Disagreements between reviewers were resolved through discussion and consensus, with consultation from a third reviewer when necessary.

Twenty-three studies met the final eligibility criteria and were included in the qualitative synthesis. The study selection process is presented in the PRISMA 2020 flow diagram Appendix B.

2.6. Data Extraction

A standardized data extraction form was developed and independently completed by two reviewers.

Table 2 Data Extraction Variables

Variable	Description
Author and Year	Study authors and publication year
Country	Country of study conduct
Study Design	Research design employed
Sample Size	Number of participants
Intervention Type	Type of non-pharmacological intervention
Comparator	Control or standard care condition
Anxiety Assessment Tool	Instrument used to measure anxiety
Timing of Intervention	Preoperative, intraoperative, or postoperative
Main Findings	Primary anxiety-related outcomes
Conclusions	Authors' conclusions

Additional information regarding participant characteristics, intervention duration, and relevant physiologic outcomes was extracted when available. Extracted data were cross-checked to ensure consistency and accuracy.

2.7. Quality Assessment

Methodological quality was independently assessed by two reviewers using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Randomized Controlled Trials and the JBI Critical Appraisal Checklist for Quasi-Experimental Studies, as appropriate.

Assessment domains included randomization procedures, allocation concealment, baseline comparability, blinding, outcome measurement, completeness of follow-up, and statistical analysis. Discrepancies were resolved through discussion and consensus.

Risk-of-bias findings were considered during interpretation of the results and are presented in tabular form.

2.8. Data Synthesis

A narrative thematic synthesis approach was employed because substantial heterogeneity existed across intervention types, outcome measures, intervention timing, and study methodologies.

Studies were grouped according to intervention category: (1) Aromatherapy interventions, (2) Music therapy interventions, (3) Virtual reality interventions, (4) Massage, reflexology, and relaxation interventions, and (5) Educational and psychological supportive interventions.

Patterns of effectiveness, consistency of findings, intervention characteristics, and methodological strengths and limitations were examined within and across categories.

A quantitative meta-analysis was not conducted because of significant heterogeneity in intervention protocols, anxiety assessment instruments, and outcome reporting.

2.9. Ethical Considerations

Ethical approval was not required because this review utilized data obtained exclusively from previously published studies and did not involve direct participation of human subjects. Principles of transparency, accurate reporting, and proper citation were maintained throughout the review process.

3. Results

3.1. Study Selection

The database search identified 1,184 records from PubMed/MEDLINE, Cochrane Library, ProQuest, ScienceDirect, and Google Scholar. After removal of 352 duplicate records, 832 studies remained for title and abstract screening. A total of 764 records were excluded during the screening stage because they did not meet the predefined eligibility criteria. Sixty-eight full-text articles were subsequently assessed for eligibility. Following full-text review, 45 studies were excluded due to ineligible populations, absence of anxiety-related outcomes, insufficient methodological information, or failure to meet other inclusion criteria. Ultimately, 23 studies were included in the qualitative synthesis.

Table 3 Study Selection Summary

PRISMA Stage	Records (n)
Records identified	1,184
Duplicates removed	352
Records screened	832
Records excluded	764
Full-text articles assessed	68
Full-text articles excluded	45
Studies included in qualitative synthesis	23

The study selection process is illustrated in the PRISMA 2020 flow diagram (Figure 1).

3.2. Characteristics of Included Studies

A total of 23 primary studies met the inclusion criteria and were included in the qualitative synthesis. Most studies employed randomized controlled trial designs, and one utilized quasi-experimental. The studies were conducted across multiple countries, including Iran, Turkey, China, Saudi Arabia, and the United States.

Sample sizes varied considerably, ranging from fewer than 50 participants in pilot studies to more than 300 participants in larger randomized trials. Most studies involved women undergoing elective cesarean delivery under spinal anesthesia.

The interventions were classified into five categories: aromatherapy (n = 6), music therapy (n = 4), virtual reality interventions (n = 4), massage, reflexology, and relaxation interventions (n = 4), and educational or psychological supportive interventions (n = 5).

The State-Trait Anxiety Inventory (STAI) was the most commonly used anxiety assessment instrument, followed by the Visual Analog Scale for Anxiety (VAS-A) and the Amsterdam Preoperative Anxiety and Information Scale (APAIS). Across intervention categories, most studies reported significant reductions in maternal anxiety compared with routine perioperative care.

Table 4 Summary of Included Studies

Variable	Summary Findings
Total included studies	23
Predominant study design	Randomized controlled trials
Common intervention timing	Preoperative and intraoperative
Most frequent anxiety assessment tool	State-Trait Anxiety Inventory (STAI)
Primary anesthesia type	Spinal anesthesia
Common outcomes	Reduced anxiety, improved comfort, and reduced physiologic stress indicators

Table 5 Distribution of Included Studies by Intervention Category

Intervention Category	Studies (n)
Aromatherapy	6
Music Therapy	4
Virtual Reality	4
Massage/Reflexology/Relaxation	4
Educational/Psychological Support	5
Total	23

Table 6 Characteristics of Included Studies

Aromatherapy Interventions

Author	Country	Design	Sample	Intervention	Outcome Measure	Main Findings
Abbasijahromi et al. (2020)	Iran	Double-blind RCT	Women post-cesarean	Aromatherapy (lavender & Damask rose)	STAI	Significant reduction in anxiety and pain
Burgess et al. (2022)	USA	Pilot RCT	Women post-cesarean	Lavender aromatherapy	Anxiety/comfort scale	Improved comfort and reduced anxiety
Çalışır et al. (2023)	Türkiye	RCT	Cesarean under spinal anesthesia	Lavender aromatherapy (intraoperative)	STAI	Reduced intraoperative anxiety
Cansızlar & Şahin (2025)	Türkiye	RCT	Women post-cesarean	Aromatherapy intervention	STAI	Reduced postoperative anxiety and improved comfort
Haryalchi et al. (2023)	Iran	RCT	Women pre-cesarean	Lemon verbena inhalation	Anxiety scale	Reduced preoperative anxiety
Mirhosseini et al. (2021)	Iran	RCT	Women post-cesarean	Orange essential oil massage aromatherapy	STAI	Significant reduction in post-cesarean anxiety

Music Therapy Interventions

Author	Country	Design	Sample	Intervention	Outcome Measure	Main Findings
Drzymalski et al. (2020)	USA	RCT	Cesarean patients	Patient/preselected music	STAI	Reduced perioperative anxiety
Fong & Drzymalski (2025)	USA	RCT	Elective cesarean patients	Structured music exposure	STAI	Significant preoperative anxiety reduction
Lin et al. (2025)	China	RCT	Cesarean patients	Intraoperative music therapy	Anxiety & stress markers	Reduced anxiety and physiological stress
Toker et al. (2021)	Turkey	RCT	Women post-cesarean	Turkish classical music	STAI	Reduced anxiety and improved comfort

Virtual Reality (VR) Interventions

Author	Country	Design	Sample	Intervention	Outcome Measure	Main Findings
Almedhesh et al. (2022)	Saudi Arabia	RCT	Cesarean patients	VR distraction	Anxiety & stress scales	Reduced anxiety and improved hemodynamics
Mohammadi et al. (2025)	Iran	RCT	Primigravida cesarean patients	VR technology	Anxiety scale	Reduced preoperative anxiety
Noben et al. (2019)	Netherlands	RCT	Cesarean candidates	VR informational video	Anxiety scale	Reduced preoperative anxiety
Xu et al. (2024)	China	RCT	Spinal cesarean patients	VR intervention	STAI	Reduced perioperative anxiety

Massage / Reflexology / Relaxation Interventions

Author	Country	Design	Sample	Intervention	Outcome Measure	Main Findings
Hassan Abdel-Ati & Elbhlwan (2022)	Egypt	Quasi-experimental	Cesarean women	Hand & foot massage	Comfort scale	Improved comfort and reduced distress
Navaee et al. (2020)	Iran	RCT	Primiparous women	Foot reflexology	STAI	Reduced preoperative anxiety
Saatsaz et al. (2016)	Iran	RCT	Women post-cesarean	Therapeutic massage	STAI	Reduced anxiety and pain
Vahedparast et al. (2024)	Iran	RCT	Women post-cesarean	Reflexology & Benson relaxation	STAI	Reduced anxiety and improved physiologic stability

Educational / Counseling / Supportive Care

Author	Country	Design	Sample	Intervention	Outcome Measure	Main Findings
Abarghooe et al. (2022)	Iran	RCT	Primiparous women	Benson relaxation + music therapy	STAI	Reduced preoperative anxiety
Che et al. (2020)	China	RCT	Elective cesarean women	Informational video	STAI	Reduced pre- and postoperative anxiety
Kalliyath et al. (2019)	India	RCT	Cesarean patients	Preoperative education	VAAS	Reduced anxiety and pain
Liu et al. (2024)	China	RCT	Women post-cesarean	Psychological nursing + acupressure	STAI	Reduced postoperative anxiety
Ye et al. (2025)	China	RCT	Cesarean patients	Psychological nursing (HIS-based)	Anxiety scale	Reduced anxiety and improved outcomes

Risk of Bias Assessment

Overall methodological quality was considered moderate to high across the included studies. Most randomized controlled trials demonstrated appropriate randomization procedures, comparable baseline groups, valid outcome measurements, and suitable statistical analyses according to the Joanna Briggs Institute (JBI) Critical Appraisal Checklist.

Blinding procedures varied across intervention categories and were inherently difficult for interventions such as music therapy, massage, reflexology, educational support, and virtual reality. However, most studies employed validated anxiety assessment instruments and clearly defined outcome measures.

The quasi-experimental study generally demonstrated acceptable methodological quality, although lacked random allocation procedures and comprehensive control of potential confounding variables.

Common limitations identified across studies included relatively small sample sizes, single-center recruitment, variability in intervention protocols, and differences in anxiety assessment methods. Despite these limitations, the consistency of findings across intervention categories supports moderate confidence in the overall evidence base.

3.3. Narrative Synthesis of Findings

3.3.1. Aromatherapy Interventions

Aromatherapy emerged as one of the most consistently supported intervention categories. Most studies reported significant reductions in maternal anxiety and improvements in perioperative comfort among women undergoing cesarean delivery.

Abbasijahromi et al. [2] demonstrated that both lavender and Damask rose essential oils significantly reduced maternal anxiety and postoperative pain compared with routine care. Similarly, Çalışır et al. [17] found that intraoperative lavender aromatherapy significantly decreased anxiety levels among women undergoing cesarean delivery under spinal anesthesia.

Mirhosseini et al. [21] reported that orange essential oil aromatherapy massage reduced post-cesarean anxiety, while Haryalchi et al. [12] observed improvements in anxiety scores and hemodynamic parameters following administration of lemon verbena essential oil. Burgess et al. [5] likewise reported reductions in anxiety symptoms and improved maternal comfort following lavender aromatherapy after cesarean birth.

Collectively, aromatherapy interventions demonstrated consistent anxiolytic effects across multiple studies and appeared particularly beneficial among women undergoing elective cesarean delivery under spinal anesthesia.

3.3.2. Music Therapy Interventions

Music therapy demonstrated strong and consistent evidence for reducing maternal anxiety during cesarean delivery. Drzymalski et al. [10] reported that both patient-selected and standardized music significantly reduced maternal anxiety and improved perioperative satisfaction. Similarly, Toker et al. [29] found that Turkish classical music reduced postpartum anxiety and postoperative pain among women undergoing cesarean section.

Lin et al. [18] further observed reductions in anxiety scores, heart rate, blood pressure, and stress-related indicators among women exposed to music therapy during cesarean delivery. Overall, music therapy emerged as a low-cost, non-invasive, and clinically feasible intervention that may enhance perioperative emotional well-being.

3.3.3. Virtual Reality Interventions

Virtual reality interventions represented an emerging but promising strategy for perioperative anxiety management. Noben et al. [24] demonstrated that virtual reality informational videos significantly reduced anxiety before cesarean delivery by improving procedural understanding and reducing uncertainty.

Almedhesh et al. [3] reported that virtual reality exposure reduced anxiety, stress, and adverse hemodynamic responses during cesarean section. Similarly, Xu et al. [33] and Mohammadi et al. [22] found significant reductions in maternal anxiety among women exposed to virtual reality interventions before or during cesarean delivery.

Although intervention protocols differed across studies, the overall evidence suggested that virtual reality may be an effective tool for reducing perioperative anxiety and enhancing maternal coping.

3.3.4. Massage, Reflexology, and Relaxation Interventions

Massage therapy, reflexology, and relaxation-based interventions consistently demonstrated beneficial effects on maternal anxiety and emotional well-being. Navaee et al. [23] reported that foot reflexology significantly reduced anxiety among primiparous women undergoing cesarean delivery.

Same as with the study of Vahedparast et al. [30], demonstrated that both foot reflexology and Benson's relaxation techniques improved anxiety and physiologic outcomes following cesarean surgery. Saatsaz et al. [27] also reported reductions in maternal anxiety and postoperative pain following massage therapy.

These interventions were generally inexpensive, safe, and feasible for nursing implementation across a variety of healthcare settings.

3.3.5. Educational and Psychological Supportive Interventions

Educational and psychological supportive interventions demonstrated meaningful effects on maternal anxiety reduction by improving procedural understanding, emotional preparedness, and coping ability.

Che et al. [9] reported that informational videos regarding spinal anesthesia significantly reduced both preoperative and postoperative anxiety. Kalliyath et al. [15] similarly found that structured preoperative education reduced maternal anxiety and postoperative pain perception.

Ye et al. [34] reported improvements in emotional well-being and perioperative outcomes following hospital information system-based psychological nursing interventions. Likewise, Liu et al. [19] found that psychological nursing combined with acupressure improved postoperative recovery and reduced anxiety symptoms among cesarean patients.

Overall, educational support, therapeutic communication, and psychological nursing interventions appeared to reduce maternal fear, uncertainty, and emotional distress while promoting positive perioperative experiences.

4. Discussion

4.1. Principal Findings

This systematic review synthesized evidence from 23 primary intervention studies examining the effectiveness of non-pharmacological interventions for reducing perioperative maternal anxiety among women undergoing cesarean

delivery. Overall, the findings demonstrated that non-pharmacological interventions were consistently associated with reductions in maternal anxiety and improvements in perioperative emotional well-being.

Across the included studies, aromatherapy, music therapy, virtual reality interventions, massage and relaxation techniques, and educational or psychological supportive interventions demonstrated beneficial effects compared with routine perioperative care. Women receiving these interventions generally reported lower anxiety levels, greater emotional comfort, improved coping, and enhanced perioperative satisfaction.

Among the intervention categories, aromatherapy and music therapy demonstrated the most consistent evidence across randomized controlled trials. Lavender, Damask rose, orange essential oil, and lemon verbena interventions were associated with significant reductions in anxiety and improvements in emotional comfort. Similarly, music-based interventions consistently reduced anxiety scores and were frequently associated with favorable physiologic outcomes, including lower heart rate and blood pressure.

Virtual reality interventions emerged as a promising strategy for anxiety reduction by improving procedural understanding and providing distraction from stressful perioperative stimuli. Massage therapy, reflexology, relaxation techniques, and educational or psychological supportive interventions also demonstrated meaningful benefits and appeared particularly attractive because of their feasibility, low cost, and compatibility with routine nursing care.

Collectively, these findings support the use of non-pharmacological interventions as valuable adjuncts to perioperative obstetric care and reinforce the importance of holistic approaches to maternal psychological well-being during cesarean delivery.

4.2. Interpretation and Comparison with Previous Reviews

The findings of this review are consistent with previous evidence supporting the effectiveness of non-pharmacological interventions for perioperative anxiety management in obstetric populations. Reviews examining music-based interventions have similarly reported reductions in maternal anxiety and improvements in childbirth experiences among women undergoing cesarean delivery. The present review extends these findings by incorporating more recent studies and evaluating additional intervention categories beyond music therapy alone.

The findings also align with broader obstetric and perioperative nursing literature emphasizing the importance of emotional support, procedural preparation, and patient-centered care during childbirth. Previous reviews have identified maternal anxiety as an important contributor to adverse perioperative experiences, reduced satisfaction, and poorer postpartum psychological outcomes. By focusing specifically on cesarean delivery, the present review provides a more clinically targeted synthesis of available evidence.

The effectiveness of the included interventions may be interpreted using Lazarus and Folkman's Stress and Coping Theory. Cesarean delivery is frequently perceived as a stressful event characterized by uncertainty, loss of control, fear of complications, and concerns regarding maternal and neonatal outcomes. Non-pharmacological interventions may reduce anxiety by influencing cognitive appraisal processes, strengthening coping resources, and promoting emotional regulation. Educational and psychological supportive interventions may improve perceived control and preparedness, whereas music therapy, aromatherapy, relaxation techniques, and virtual reality interventions may reduce physiologic arousal and emotional distress.

Taken together, the findings suggest that maternal anxiety during cesarean delivery can be effectively addressed through interventions that support both psychological coping and physiologic relaxation.

4.3. Implications for Nursing Practice

The findings have important implications for obstetric nursing practice. Nurses are often the healthcare professionals with the greatest direct contact with women before, during, and after cesarean delivery and are therefore uniquely positioned to identify anxiety, provide emotional support, and implement evidence-based interventions.

Several interventions identified in this review, including music therapy, aromatherapy, relaxation techniques, therapeutic communication, and structured patient education, are inexpensive, noninvasive, and readily integrated into routine perioperative nursing care. The incorporation of standardized anxiety assessment and individualized supportive interventions may improve maternal experiences and contribute to more holistic obstetric care.

Healthcare institutions may also benefit from developing structured perioperative anxiety-management protocols that include educational preparation, emotional support strategies, and evidence-based non-pharmacological interventions as components of routine cesarean care.

4.4. Strengths and Limitations

This review has several strengths. First, it was conducted in accordance with PRISMA 2020 guidelines, supporting methodological transparency and reproducibility. Second, the review focused exclusively on women undergoing cesarean delivery, thereby improving clinical relevance and population specificity. Third, the synthesis incorporated multiple categories of non-pharmacological interventions, providing a comprehensive overview of available strategies for anxiety reduction. Finally, the inclusion of recent studies published between 2016 and 2026 enhanced the contemporary relevance of the findings.

Several limitations should also be acknowledged. Considerable heterogeneity existed across studies with respect to intervention protocols, timing of administration, anxiety assessment tools, and outcome reporting. Sample sizes were frequently small, and many studies were conducted within single institutions, limiting generalizability. The review was restricted to English-language publications and may therefore be subject to language bias. In addition, most studies evaluated short-term perioperative outcomes, limiting understanding of the long-term psychological effects of these interventions.

Despite these limitations, the consistency of findings across intervention categories supports moderate confidence in the overall conclusion that non-pharmacological interventions may effectively reduce maternal anxiety during cesarean delivery.

5. Conclusion

This systematic review synthesized evidence from 23 primary studies investigating non-pharmacological interventions for reducing maternal anxiety during cesarean delivery. The findings indicate that aromatherapy, music therapy, virtual reality interventions, massage and relaxation techniques, and educational or psychological supportive interventions are associated with significant reductions in perioperative maternal anxiety and improvements in emotional well-being.

Among the identified interventions, aromatherapy and music therapy demonstrated the most consistent evidence across randomized controlled trials, while virtual reality interventions emerged as a promising area for future development. Educational and psychological supportive approaches also demonstrated important benefits by enhancing maternal preparedness, coping ability, and perceived control during the perioperative period.

Overall, the evidence supports the integration of non-pharmacological, patient-centered, and nursing-focused interventions into routine cesarean care. These approaches may enhance maternal experiences, improve psychological outcomes, and contribute to more holistic obstetric practice.

Recommendations

For Clinical Practice: (1) Integrate evidence-based non-pharmacological anxiety-reduction interventions into routine perioperative cesarean care; (2) Incorporate standardized maternal anxiety assessment during preoperative nursing evaluation; (3) Utilize feasible interventions such as music therapy, aromatherapy, relaxation techniques, therapeutic communication, and structured patient education.

For Nursing Education: (1) Strengthen educational preparation related to maternal anxiety assessment and perioperative psychological care; (2) Provide continuing professional development opportunities focused on evidence-based supportive interventions.

For Future Researches: (1) Conduct large-scale, multicenter randomized controlled trials to strengthen the evidence base; (2) Improve methodological standardization regarding intervention protocols and anxiety measurement tools; (3) Investigate long-term maternal psychological outcomes following non-pharmacological interventions; (4) Compare the relative effectiveness of different intervention categories to guide clinical implementation; and lastly, (5) Continue evaluating emerging technologies, including virtual reality and digital psychological support interventions, within obstetric perioperative care.

Compliance with ethical standards

The present research work does not contain any studies performed on animals/human subjects by any of the authors.

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Appendix A

Full Search Strategy

- PubMed/MEDLINE

("Cesarean Section"[Mesh] OR cesarean[tiab] OR caesarean[tiab] OR "c-section"[tiab] OR "cesarean delivery"[tiab] OR "caesarean delivery"[tiab]) AND ("Anxiety"[Mesh] OR anxiety[tiab] OR "preoperative anxiety"[tiab] OR "maternal anxiety"[tiab] OR "perioperative anxiety"[tiab]) AND (("music therapy"[tiab] OR aromatherapy[tiab] OR massage[tiab] OR reflexology[tiab]) OR ("virtual reality"[tiab] OR distraction[tiab]) OR (counseling[tiab] OR psychotherapy[tiab] OR relaxation[tiab]) OR ("educational intervention"[tiab] OR "patient education"[tiab] OR "video intervention"[tiab] OR "video education"[tiab]) OR ("non-pharmacological"[tiab] OR "nonpharmacological"[tiab] OR "behavioral intervention"[tiab] OR "supportive care"[tiab]))

- Cochrane Library

(cesarean OR caesarean OR "cesarean section" OR "c-section") AND (anxiety OR "preoperative anxiety" OR "maternal anxiety") AND (music OR "music therapy" OR aromatherapy OR "virtual reality" OR reflexology OR massage OR counseling OR education OR video OR "non-pharmacological" OR "behavioral intervention")

- ProQuest

("cesarean section" OR caesarean OR "c-section") AND (anxiety OR "maternal anxiety" OR "preoperative anxiety") AND ("non-pharmacological" OR "music therapy" OR aromatherapy OR "virtual reality" OR reflexology OR massage OR counseling OR education OR video)

- ScienceDirect

"cesarean section" AND (anxiety OR "maternal anxiety") AND ("non-pharmacological" OR "music therapy" OR aromatherapy OR "virtual reality" OR reflexology OR massage OR counseling OR education OR video)

- Google Scholar

("cesarean section" OR caesarean OR "c-section") AND (anxiety OR "maternal anxiety" OR "preoperative anxiety") AND ("non-pharmacological" OR "music therapy" OR aromatherapy OR "virtual reality" OR reflexology OR massage OR counseling OR education OR video)

Appendix B

