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Review Article

Types and Effectiveness of Digital Interventions for Labor Pain Management and Maternal Labor Experiences in Maternity Services: A Systematic Review

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Abstract

Background: Labor pain is a complex physiological and psychological experience that occurs globally and influences maternal outcomes and labor satisfaction, thus emphasizing the importance of effective non-pharmacological management strategies. ***Objective***: This systematic review synthesizes digital technology-based non-pharmacological interventions and evaluates their effectiveness in reducing labor pain, improving maternal labor experience (satisfaction and fear), and optimizing clinical outcomes, including labor duration and use of epidural analgesia. ***Methods***: This review followed the PRISMA 2020 guidelines. A systematic search was conducted in Scopus, PubMed, ProQuest, ScienceDirect, and EBSCO databases for studies published between 2021 and 2026. Study quality was assessed using the JBI critical appraisal tool, and findings were synthesized using thematic and narrative analysis. ***Results***: The search identified 2,042 articles, of which eight studies met the inclusion criteria. Overall, digital-based non-pharmacological interventions demonstrated consistent effectiveness in reducing labor pain, improving maternal labor experiences, and supporting better clinical outcomes. ***Conclusions***: Digital interventions have the potential to be evidence-based, mother-centered labor pain management strategies. Future research should evaluate long-term outcomes, objective clinical measures, and scalability of implementation to support broader integration into maternity health care systems globally.

Keywords: Clinical labor outcomes; Digital intervention; Labor pain; Maternal labor experience; Non-pharmacological pain management.

أنواع وفعالية التدخلات الرقمية لإدارة ألم الولادة وتجارب الأمهات في خدمات الولادة: مراجعة منهجية

الخلاصة

الخلفية: ألم الولادة هو تجربة فسيولوجية ونفسية معقدة تحدث على مستوى العالم وتؤثر على نتائج الأم ورضا العمل، مما يؤكد أهمية استراتيجيات الإدارة غير الدوائية الفعالة. **الهدف**: تقوم هذه المراجعة المنهجية بدمج التدخلات غير الدوائية القائمة على التكنولوجيا الرقمية وتقيم فعاليتها في تقليل ألم المخاض، وتحسين تجربة الأمهات في الولادة (الرضا والخوف)، وتحسين النتائج السريرية، بما في ذلك مدة المخاض واستخدام مسكنات الألم فوق الجافية. **الطرائق**: اتبعت هذه المراجعة إرشادات PRISMA 2020. تم إجراء بحث منهجي في قواعد بيانات Scopus وPubMed وProQuest وScienceDirect وEBSCO عن دراسات نشرت بين عامي 2021 و2026. تم تقييم جودة الدراسة باستخدام أداة التقييم النقدي JBI، وتم تلخيص النتائج باستخدام تحليل موضوعي وسردي. **النتائج**: حدد البحث 2,042 مقالة، منها ثماني دراسات استوفت معايير الإدراج. بشكل عام، أظهرت التدخلات الرقمية غير الدوائية فعالية مستمرة في تقليل آلام المخاض، وتحسين تجارب الأمهات، ودعم نتائج سريرية أفضل. **الاستنتاجات**: التدخلات الرقمية لديها القدرة على أن تكون استراتيجيات إدارة ألم الولادة مبنية على الأدلة وتركز على الأم. يجب أن تقيم الأبحاث المستقبلية النتائج طويلة المدى، والمقاييس السريرية الموضوعية، وقابلية التوسع في التنفيذ لدعم التكامل الأوسع في أنظمة رعاية رعاية الأمومة على مستوى العالم.

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INTRODUCTION

Childbirth is a universal biological event that has profound implications for women's physical, psychological, and social health [1,2]. Labor pain is one of the major clinical challenges in global maternity care, especially in the context of the need for effective, safe, and mother-centered pain management strategies [3,4]. The World Health Organization reports that approximately 140 million deliveries occur each year worldwide, with complications during childbirth often related to intense pain and inadequate care, contributing to maternal and perinatal morbidity and mortality [5]. In Indonesia, the 2018 Riskesdas data shows that 28% of women experience childbirth complications, reflecting the high burden of labor pain and the need for effective and contextual pain management strategies [6]. One of the obstacles in managing labor pain includes limited access to non-pharmacological interventions, lack of education for mothers, and limited capacity of health workers to provide comprehensive pain management support [7–9]. Numerous studies indicate that women in labor frequently possess limited knowledge regarding pain management alternatives, receive insufficient

information during labor, and are minimally engaged in decision-making processes, thereby affecting their pain experience and sense of control during labor [10–12]. Suboptimal labor pain management is associated with increased pain intensity, longer labor, maternal anxiety, less satisfying labor experiences, and postpartum psychological symptoms [13–15]. Pharmacological approaches, including inhaled analgesics, opioids, non-opioids, and epidural anesthesia, have been shown to be effective in reducing pain but have the potential to cause side effects for both mother and baby [16–18]. Integrating non-pharmacological pain management with digital health technology is an innovative approach to improving accessibility, personalization, and maternal engagement in childbirth care [18,19]. Alternatively, non-pharmacological methods combined with advances in digital technology have opened up new opportunities for accessible, safe, interactive, and woman-centered labor pain management [20–22]. Increasing evidence indicates that digital interventions markedly diminish the intensity of labor pain and enhance the maternal birth experience [23–30]. Digital approaches include transcutaneous electrical nerve stimulation TENS [23], interferential electrical stimulation [24], virtual reality headsets [25], infrared belts [31], mechanical massage pillows [27], music therapy [28], hypnosis audio [29], and digital visuals and animation [30]. However, the available evidence remains fragmented, methodologically heterogeneous, and limited in comprehensive synthesis, particularly in developing country contexts [20,32]. Therefore, this systematic review aims to identify types of digital interventions in labor pain management, evaluate their effectiveness in reducing pain and improving the labor experience, and identify research gaps to support implementation in evidence-based maternity services.

METHODS

Study design

This systematic review was structured following the PRISMA 2020 guidelines [33]. A comprehensive literature search strategy was conducted on studies that assessed non-pharmacological interventions based on digital technology and examined their effectiveness in reducing labor pain, improving maternal labor experience (satisfaction and fear), and optimizing clinical outcomes, including labor duration and use of epidural analgesia.

Search strategy

A systematic literature search was conducted across five databases [34–36], including Scopus, PubMed, ProQuest, ScienceDirect, and EBSCO, for articles published between 2021 and 2026. The search strategy was developed using the Population, Intervention, Comparison, Outcome (PICO) framework [37]. Population (P): Mothers giving birth in the active phase of labor (intrapartum care) Intervention (I): Non-pharmacological interventions based on digital technology Comparator (C): Conventional care or without technology-based interventions Output (O): Labor pain intensity, maternal labor experience (satisfaction and fear), and clinical outcomes. Keywords were used in combination with Boolean operators. The database search strategy included the terms "labor pain," "childbirth pain," "labor pain management," "digital intervention," "digital health," "virtual reality," "TENS," "technology-assisted therapy," "childbirth," and "intrapartum care," using Boolean operators to combine them.

Inclusion criteria

Inclusion criteria include: 1) Population: Mothers giving birth in the active phase of the first stage of labor, 2) Intervention: involving digital-based non-pharmacological interventions during labor or the intrapartum period, 3) Outcomes: Measurement of labor pain and/or maternal labor experience (satisfaction, fear, and anxiety), 4) Study design: Randomized controlled trial (RCT), quasi-experimental study, and 5) Language and year of publication: English-language articles published between 2021 and 2026.

Exclusion criteria

Studies were excluded if they met any of the following criteria: 1) Non-interventional observational studies (e.g., cross-sectional studies without intervention), 2) Studies with pharmacological intervention as a main component, and 3) Studies involving pregnant women without intervention during labor, and 4) Research protocols, editorials, narrative reviews, or articles without empirical data.

Study selection process

The study selection process is carried out in stages according to the PRISMA guidelines [38] and identified 2,042 records obtained from various electronic databases, namely PubMed (n= 708), ProQuest (n= 131), ScienceDirect (n= 791), and EBSCO (n= 397). Before the screening stage, 1,644 records were removed, consisting of 610 irrelevant articles, 820 duplicate records, and 214 records removed for other reasons. After this process, 398 records were screened based on title and abstract. At this stage, 215 records were excluded as they did not meet the objectives. Next, 183 reports were assessed for full-text retrieval, but 136 were not successfully retrieved. A total of 47 full-text articles were then assessed for eligibility. Of these, 39 articles were excluded on the grounds that they were not in English (n= 16), did not include digital interventions (n= 10), and were not available in open access (n= 13). Ultimately, eight studies met all inclusion criteria and were included in the systematic review analysis. The study selection process is presented in a PRISMA

flowchart. Next, the methodological quality of the selected studies was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Tools for experimental studies, randomized controlled trials, and quasi-experimental studies [39,40].

Data analysis

Data were systematically extracted using a standardized form that included study characteristics, type of digital intervention, and primary outcomes [41]. Data synthesis was conducted using a narrative and thematic approach, with results grouped by type of digital technology and key outcomes, including labor pain, maternal labor experience, and clinical outcomes of labor.

RESULTS

In Figure 1, the PRISMA 2020 flowchart shows the identification, screening, eligibility assessment, and inclusion of studies evaluating digital technology-based non-pharmacological interventions and examining their effectiveness in reducing labor pain, improving maternal labor experience (satisfaction and fear), and optimizing clinical outcomes including labor duration and use of epidural analgesia.

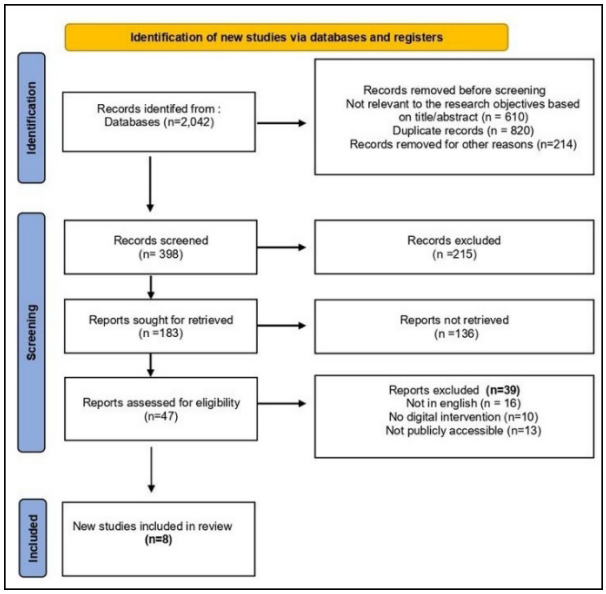

Figure 1: PRISMA analysis chart.

Table 1 shows the characteristics, study design, type of digital intervention, and main findings of the 8 studies included in the systematic review of digital technology-based non-pharmacological digital interventions in labor pain management (2021–2026).

Table 1: Characteristics of literature included in the systematic review (n=8)

Author (Year)	Title	Design	Method	Sample	Digital Intervention	Key Findings
Njogu *et al.* (2021) [23]	Effects of transcutaneous electrical nerve stimulation during the first stage of labor	RCT	TENS and control (routine care) groups.	326 primipara mothers	Biofeedback-based Transcutaneous Electrical Nerve Stimulation (TENS).	TENS significantly reduces the intensity of labor pain and shortens the labor phase.
Sahar *et al.* (2023) [24]	The effect of interferential electrical stimulation current on labor pain and duration of the active phase of labor in primiparous women	RCT	IFC group and IFC sham.	60 primipara mothers	Interferential Electrical Stimulation (IFC) (medium frequency current, quadripolar)	IFC significantly reduces the intensity of labor pain and shortens the duration of the active phase.
Halimeh *et al.* (2023) [25]	The effect of virtual reality on labor pain and anxiety during the first stage of labor	RCT	VR and control groups.	130 mothers giving birth	Virtual Reality (VR) based on visual and audio distractions	The use of VR significantly reduces pain intensity and fear of childbirth.
Dastjerd *et al.* (2023) [31]	The effect of infrared belt and hot water bag on labor pain intensity	RCT	Three groups: infrared belt hot water bag control.	136 primipara mothers	Infrared Belt (Infrared-based Thermotherapy)	Infrared belt significantly reduces pain intensity during the first stage of labor
Sade & Ozkan (2025) [27]	The effect of mechanical massage on labor pain, duration and maternal satisfaction	RCT	Three groups: Control Mechanical massage controlled by the midwife, mechanical massage controlled by the mother	154 primipara mothers	Electric cushion-based mechanical massage	Mechanical massage significantly reduces pain, increases satisfaction and shortens the duration of labor.
Pongrojpaw & Suwannarurk *et al.* (2023) [28]	The Benefits of Music Therapy and Aromatherapy Zingiber officinale Roscoe for Reducing Pain During the First Stage of Labor	RCT	Three groups: Control music therapy ginger aromatherapy	300 nulliparous mothers	Music therapy using headphones	Music therapy significantly reduces labor pain and shortens labor duration.
Huang *et al.* (2026) [29]	The effect of a brief audio-guided self-hypnosis intervention on fear of childbirth during normal delivery	Non-Randomized Prospective Controlled Trial	Two groups: audio hypnosis control	346 primiparous mothers	Audio-Guided Self-Hypnosis Brief	Self-hypnosis significantly reduces pain intensity, fear of labor and use of epidural analgesics

Yu *et al*. (2026) [30]	The effects of visual and animation-based non-pharmacological pain relief approaches on labor	RCT	Two groups: Digital intervention (visual brochures and digital animations) Control (text-based materials).	84 primiparous mothers	Digital visuals and animations that provide antenatal education about non-pharmacological strategies to relieve labor pain	Digital animation significantly reduces pain, fear of labor and epidural use. .

Figure 2 represents the methodological quality assessment of included studies based on the JBI Critical Appraisal Tool. Most studies demonstrated moderate to high methodological quality.

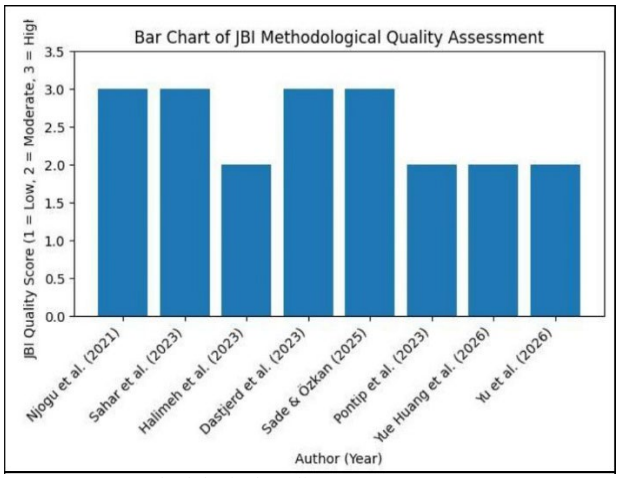

Figure 2: JBI methodological quality assessment.

DISCUSSION

This systematic review assesses the various types and efficacy of digital-based non-pharmacological interventions in alleviating labor pain, enhancing maternal labor experiences (satisfaction and fear), and optimizing clinical outcomes, such as labor duration and the utilization of epidural analgesia. Based on evidence from randomized controlled trials and clustered randomized controlled trials published between 2021 and 2026, technology-based interventions have demonstrated significant effectiveness, particularly in reducing labor pain and improving maternal outcomes. However, the magnitude and consistency of effects vary depending on the type of intervention, implementation method, and population characteristics.

Digital Intervention and Reducing Labor Pain Intensity

One of the most consistent findings across the included studies was the effectiveness of digital technology-based non-pharmacological interventions in reducing the intensity of labor pain [23–25,27–31] through cognitive and sensory distraction mechanisms and increased self-control during the labor process [42–44]. Controlled trials have demonstrated that technology-based interventions, such as virtual reality, transcutaneous electrical nerve stimulation (TENS), interferential electrical stimulation, and infrared heat therapy, significantly diminish labor pain scores in comparison to conventional care. For example, a virtual reality-based intervention demonstrated significant differences in reducing labor pain and fear through immersive visual-auditory stimulation that distracts the mother from nociceptive stimuli [45–47]. Similarly, neuromodulation-based interventions such as TENS and interferential electrical stimulation have shown analgesic effects through modulation of pain transmission at the spinal level and increased release of endogenous opioids [48]. This study reported that TENS used during labor resulted in reduced pain scores compared to controls, and its analgesic mechanisms included reduced pain transmission through spinal effects (gate-control) and increased analgesic neurotransmitters such as β-endorphin (49). These findings suggest that TENS affects the limbic area, thereby reducing the emotional aspect of pain [23,24]. In addition, heat-based interventions such as infrared therapy have been shown to have additional analgesic effects through increased tissue perfusion and muscle relaxation, which indirectly reduces pain perception during the active phase of labor [31,50,51]. These findings reinforce the concept that labor pain management is most effective when digital interventions are able to simultaneously integrate sensory, cognitive, and emotional stimulation [52–55]. Immersive and interactive digital interventions seem to have more consistent pain-relieving effects than passive ones because they change how the brain and body perceive pain and how stressed the mother is [56–59]. Furthermore, combining digital interventions with adequate clinical support and antenatal education appears to enhance their effectiveness. In contrast, digital interventions that focus solely on information delivery without an interactive component tend to show more limited effectiveness in reducing clinical pain [60–63]. This suggests that digital approaches to labor pain management depend not only on the type of technology, but also on how the intervention is integrated within the context of labor care [42,64,65]. Factors such as the timing of the intervention, the mother's level of anxiety, childbirth support, and previous childbirth experiences have the potential to influence the effectiveness of digital interventions [66–68]. In addition, contextual and cultural adaptation are also important factors in determining the success of implementing digital interventions in diverse maternity populations [69–71]. Furthermore, the effectiveness of digital interventions appears to be enhanced when combined with adequate clinical support and antenatal education. Interventions that combine digital stimulation with active maternal involvement [72–74], such as guided relaxation,

biofeedback, or support from a healthcare professional, can result in sustained pain reduction and improve the overall birth experience [75–77]. This suggests that digital-based labor pain management should be combined as a biopsychosocial approach that dynamically integrates sensory, cognitive, and emotional regulation [78–80].

Maternal Childbirth Experience: Satisfaction and Fear

Increased positive childbirth experiences, particularly satisfaction and decreased fear of childbirth, were consistent findings in this systematic review [25,27,29,30]. Interventions that combine psychological preparation with ongoing clinical interactions, such as two-way communication with health workers and structured digital mentoring, show a stronger influence than one-way educational approaches [72,81,82]. For example, some integrated digital platforms not only improve birth preparedness but also increase the perception of maternal involvement in clinical decision-making and increase satisfaction with birth care. It is noteworthy that some perinatal digital programs have shown that improvements in maternal psychological preparedness, fear, and confidence can be maintained into the early postpartum period [83,84]. Digital antenatal education based on visual booklets and animated videos, for example, significantly increased mothers' internal control, satisfaction with their partners and themselves, satisfaction with the overall birth experience, and satisfaction with the support of nursing staff during labor [29]. In addition, findings from audio-guided self-hypnosis interventions effectively reduced levels of fear of losing control during labor [30]. These findings are in line with the conceptual model of healthcare experience that places perceived control, interpersonal support, and continuity of care as the primary determinants of patient experience [85,86]. Although many digital interventions improve knowledge, preparedness, and perceptions of support, only a subset of studies demonstrate consistent changes in postpartum psychological well-being [87,88]. These gaps reflect structural barriers to antenatal, intrapartum, and postpartum services, as well as variations in the quality of clinical communication in routine practice. This approach ensures that increasing maternal preparedness and engagement fully translates89], which can hinder the effectiveness of digital interventions in improving overall maternal health outcomes. These findings suggest that maternal digital interventions need to be developed alongside system-level strategies that facilitate continuity of care and coordination across perinatal phases; without such integration, digital interventions risk merely enhancing individual preparedness without producing clinically and emotionally meaningful changes in the birth experience [90]. In the context of low- and middle-income countries, strengthening the integration of digital innovation and maternal care systems is increasingly crucial. Varied access to services, limited healthcare resources, and diverse sociocultural contexts demand a digital approach that focuses not only on technological innovation but also on systemic and contextual adaptation [91]. This approach ensures that increasing maternal preparedness and engagement fully translates into a safe, meaningful, and sustainable birth experience in maternal health care practices.

Clinical Outcomes of Labor: Duration of Labor and Use of Epidural Analgesia

The effects of non-pharmacological interventions on clinical outcomes of labor, particularly labor duration and the use of epidural analgesia, have shown more heterogeneity than outcomes related to labor satisfaction. This reflects the clinical complexity of labor, which is influenced not only by physiological responses but also by clinical practices, policies, and maternal preferences [92,93]. In line with previous findings regarding the role of supportive and integrated interventions in improving the quality of the birth experience [25,27], some evidence suggests that non-invasive neuromodulation interventions and structured non-pharmacological support have the potential to influence the labor process and analgesia requirements [28]. Clinical trial results reported that the use of electrical stimulation during labor was associated with a reduction in labor duration compared to routine care, accompanied by a reduction in the need for additional analgesia [23,24]. Synthesis of audio-guided self-hypnosis approaches has the potential to shorten the early phase of labor and may be an alternative for mothers who wish to minimize the use of epidural analgesia, although the level of certainty of the evidence still varies between studies [29]. Conceptually, these findings are consistent with the neurophysiological model of labor that posits stability of the maternal stress response, neuroendocrine balance, and autonomic regulation as critical factors in coordinating uterine activity and cervical progression [94,95]. Within this framework, non-pharmacological interventions have the potential to reduce excessive stress that can hinder the labor process, thereby indirectly reducing the need for epidural analgesia [96,97].

Methodological Considerations and Quality of Evidence

Methodologically, the quality of evidence in this review was moderate to high, as assessed using the Joanna Briggs Institute Critical Appraisal Tool [39,40] influenced by study design, variations in intervention types, measuring instruments, sample size, and limited follow-up duration (23,25,28–30). This limits the generalizability of the findings and confirms that the effectiveness of technology-based non-pharmacological interventions is highly contextual and dependent on the design and implementation within the maternity care

system [72,74]. Despite these limitations, the convergence of findings across diverse populations and service contexts supports the conclusion that technology-based non-pharmacological interventions are a credible and potentially scalable approach to improving the quality of care and the birth experience.

Implications for Indonesia and Other Low- and Middle-Income Countries

The findings of this review have important implications for Indonesia and low- and middle-income countries, where the quality of childbirth experiences and access to pain management still vary [99]. Meanwhile, the number of cesarean sections without medical indications remains high and is often related to fear of normal delivery and pain that is not optimally managed [100,101]. In the context of limited resources and unequal distribution of obstetric services, digital-based non-pharmacological interventions offer a relatively cost-effective approach and have the potential for widespread implementation, especially when integrated sustainably into antenatal, intrapartum, and postpartum services [72,102-104]. However, its effectiveness is highly influenced by the intervention design and implementation context, with the potential for greatest impact in approaches that are theory-based, culturally sensitive, and integrated within existing service systems [39,71,90,91]. In Indonesia, successful implementation also depends on family involvement, antenatal education, infrastructure readiness, health worker capacity, and integration with clear service pathways and shared decision-making. Future intervention development must align with the national maternal health strategy and cross-sectoral policies to ensure sustainability and impact on maternal health..

Future Research Directions

Future research needs to strengthen the quality of evidence on the effectiveness of non-pharmacological interventions through more robust designs, longer-term follow-up, and an emphasis on objective clinical outcomes, not just maternal perceptions. Furthermore, it is crucial to conduct multilevel evaluations of interventions integrated throughout antenatal, intrapartum, and postpartum care that are sensitive to cultural contexts, particularly in Southeast Asia, including Indonesia, to ensure the relevance, scalability, and sustainability of implementation within maternity care systems.

Study Limitations

This review has several limitations, including the potential for participant blinding to increase bias, the predominance of subjective outcomes, and the relatively short follow-up duration. Furthermore, the heterogeneity of interventions and outcome measures limits comparisons between studies, while the predominance of research from high-income countries requires caution in generalizing findings to low- and middle-income countries, including Indonesia.

Conclusion

This systematic review shows that non-drug treatments that use digital technology can make childbirth better and improve clinical outcomes, but their effectiveness depends on the situation. These findings emphasize the necessity of theory-based, culturally sensitive, and integrated interventions within maternity care systems to support evidence-based for labor pain management, particularly in resource-constrained settings.

Conflict of interests

The author declares no conflict of interest.

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Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

REFERENCES

1. Zaman A, Fadlalmola HA, Ibrahem SE, Ismail FH, Abedelwahed HH, Ali AM. The role of antenatal education on maternal self-efficacy , fear of childbirth , and birth outcomes : A systematic review and meta-analysis. *Eur J Midwifery*. 2025;1–16. doi: 10.18332/ejm/200747.
2. Nahaee J, Rezaie M, Abdoli E, Mirghafourvand M, Homaie SG. Association of childbirth experience with long – term psychological outcomes : a prospective cohort study. *Reprod Health*. 2024;1–9. doi: 10.1186/s12978-024-01819-9.
3. Silva-fernández CS, Garrosa E. Qualitative study of maternity healthcare vulnerability based on women's experiences in different sociocultural context. *Nurse Reprod*. 2025;18;15(3):105. doi: 10.3390/nursrep15030105.
4. El-salahi S, Bevis RK, Hogg L. The relationship between traumatic childbirth and first-time mothers ' social identity and wellbeing : a cross-sectional observational study. *BMC Pregnancy Childbirth*. 2024;3:1–11. doi: 10.1186/s12884-024-06288-3.
5. Organization WH. Intrapartum care for a positive childbirth experience [Internet]. 2018. Available from: https://www.who.int/publications/i/item/WHO-RHR-18.12
6. Indonesia KKR. Laporan Nasional Riskesdas 2018 [Internet]. Jakarta; 2018. Available from: https://www.litbang.kemkes.go.id/laporan-riset-kesehatan-dasar-riskesdas/
7. Loza W, Miressa B, Kenay TA, Tamirat G. Perception, practice and associated factors of labour pain management among obstetric care providers in public health facilities in Harari Region, Ethiopia: a multicentre cross-sectional study. *Int Health*. 2025;17(481–488). doi: 10.1093/inthealth/ihae084.
8. Parkies LE, Murray D, Okafor UB. The Benefits and barriers of providing non-pharmacological pain relief to women in labour during COVID-19: A qualitative study of midwives in South Africa. *MDPI Women*. 2024;105–115. doi: 10.3390/women4010008.
9. Mwakawanga DL, Sirili N, Chikwala VZ, Mselle LT. A qualitative study on perceived barriers on use of non-

pharmacological methods in management of labour pain by nurse- midwives in eastern Tanzania. *BMC Nurs*. 2024;1–9. doi: 10.1186/s12912-024-02187-2.
10. Tandon A, Gujral K, Gupta V. Labour pain: A comprehensive review of perceptions, experiences, and sociocultural influences on pain and its management practices. *Cureus*. 2025;17(6):e86540. doi: 10.7759/cureus.86540.
11. Rantala A, Hakala M, Pölkki T. Women's perceptions of the pain assessment and non- pharmacological pain relief methods used during labor: A cross-sectional survey. *Eur J Midwifery*. 13:6:21. doi: 10.18332/ejm/146136.
12. Thorgaard-Rasmussen K, Alvesson HM, Pembe AB, Mselle LT, Unkels R, Metta E, et al. Women's and maternity care providers' perceptions of pain management during childbirth in hospitals in Southern Tanzania. *BMC Pregnancy Childbirth*. 2024;24(1):417. doi: 10.1186/s12884-024-06606-9.
13. Mahalan N, Smitha MV. Effect of audio-visual therapy on pain and anxiety in labor: A randomized controlled trial. *Eur J Obstet Gynecol Reprod Biol X*. 2023;20:100240. doi: 10.1016/j.eurox.2023.100240.
14. Mehrabi E, Nourizadeh R, Pourfathi H. The comparison of the effect of non-pharmacological pain relief and pharmacological analgesia with remifentanil on fear of childbirth and postpartum depression: A randomized controlled clinical trial. *BMC Pregnancy Childbirth*. 2024;24(1):305. doi: 10.1186/s12884-024-06270-z.
15. Nori W, Kassim MA, Helmi ZR, Pantazi AC, Brezeanu D, Brezeanu AM, et al. Non-Pharmacological pain management in labor: A systematic review. *J Clin Med*. 2023;12(23):7203. doi: 10.3390/jcm12237203.
16. Whitburn LY, Jones LE, Davey MA, Small R. The meaning of labour pain: How the social environment and other contextual factors shape women's experiences. *BMC Pregnancy Childbirth*. 2017;17(1). doi: 10.1186/s12884-017-1343-3
17. Czech I, Fuchs P, Fuchs A, Lorek M, Tobolska-Lorek D, Drosdzol-Cop A, et al. Pharmacological and non-pharmacological methods of labour pain relief—establishment of effectiveness and comparison. *Int J Environ Res Public Health*. 2018.9;15(12):2792. doi: 10.3390/ijerph15122792.
18. Pardo MR, (Ed.), Basics of Anesthesia, (7th edition), New York Elsevier. 2017.
19. Wang M, Song Q, Xu J, Hu Z, Gong Y, Lee AC, et al. Continuous support during labour in childbirth: a Cross-sectional study in a university teaching hospital in Shanghai, China. *BMC Pregnancy Childbirth*. 2018;6;18(1):480. doi: 10.1186/s12884-018-2119-0.20.
20. Elsayed N, Radwan M, Morsy H, Metwally S, Mostafa M, Desoky A. Immersive virtual reality application on labor pain, anxiety and satisfaction among laboring women. *Assiut Sci Nurs J*. 2024;(136–149). doi: 10.21608/asnj.2024.279948.1805.
21. Kassa ZY, Dadi AF, Bizuayehu HM, Hassen TA, Ahmed KY. Person-centred maternity care during childbirth : a systematic review in low and middle-income countries. *BMC Pregnancy Childbirth*. 2025;25(1):147. doi: 10.1186/s12884-024-07133-3.
22. Carus EG, Albayrak N, Bildirici HM, Ozmen SG. Immersive virtual reality on childbirth experience for women : a randomized controlled trial. *BMC Pregnancy Childbirth*. 2022;(1–8). doi : 10.1186/s12884-022-04598-y.
23. Njogu A, Qin S, Chen Y, Hu L, Luo Y. The effects of transcutaneous electrical nerve stimulation during the first stage of labor : a randomized controlled trial. *BMC Pregnancy Childbirth*. 2021;21(1):164. doi: 10.1186/s12884-021-03625-8.
24. Pak S, Ghaderi F, Somee AS, Mirghafourvand M. The effects of interferential electrical stimulation current on labor pain and duration of active phase of labor in primiparous women : A randomized controlled trial. *Physiother Theory Pract*. 2023;39(6):1133-1140. doi: 10.1080/09593985.2022.2035035.
25. Mohammadi H, Rasti J, Ebrahimi E. Virtual reality, fear of pain and labor pain intensity: A randomized controlled trial. *Anesth Pain Med*. 2023;13(1):e130387. doi: 10.5812/aapm-130387.
26. Najaf Najafi M, Najaf Najafi N, Rashidi Fakari F, Moeindarbary S, Abdi F, Sadat Hoseini Z, et al. The effect of aromatherapy alone or in combination with massage on dysmenorrhea: A systematic review and meta-analysis. *Rev Bras Ginecol Obstet*. 2021;43(12):968-979. doi: 10.1055/s-0041-1740210.
27. Sade G, Özkan H. The effect of mechanical massage on labor pain, duration and maternal satisfaction: a randomized controlled trial. *BMC Pregnancy Childbirth*. 2025;25(1):823. doi: 10.1186/s12884-025-07977-3.
28. Pongrojpaw D, Suwannarurk K. Efficacy of music therapy and Zingiber officinale Roscoe aromatherapy for reducing pain during the first stage of labor: A randomized controlled trial. *Siriraj Med J*. 2023;75(10):707–712. doi: 10.33192/smj.v75i10.263860.
29. Huang Y, Cui L, Chen Q, Pan Y, Tang G, Di X, et al. The effect of a brief audio-guided self-hypnosis intervention on fear of childbirth during normal delivery: A non-randomised controlled trial. *Midwifery*. 2026;156:104720. doi: 10.1016/j.midw.2026.104720.
30. Yu PJ, Wang LK, Tsai JM. Effects of a visual and animation-based non-pharmacological pain relief approach on childbirth: A quasi-experimental study. *Women Birth*. 2026;39(1):102163. doi: 10.1016/j.wombi.2026.102163.
31. Dastjerd F, Erfanian Arghavanian F, Sazegarnia A, Akhlaghi F, Esmaily H, Kordi M. Effect of infrared belt and hot water bag on labor pain intensity among primiparous: a randomized controlled trial. *BMC Pregnancy Childbirth*. 2023;23(1):1–11. doi: 10.1186/s12884-023-05689-0.
32. Tiranda Y, Panngam N. Virtual reality usage in managing pain labor: A scoping review. *Dis Prevent Public Health J*. 2023;17(2):194-199. doi: 10.12928/dpphj.v17i2.8056.
33. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Int J Surg*. 2021;88:105906. doi: 10.1016/j.ijsu.2021.105906.
34. Kok G, Gottlieb NH, Peters GJ, Mullen PD, Parcel GS, Ruiter RA, et al. A taxonomy of behaviour change methods: An intervention mapping approach. *Health Psychol Rev*. 2016;10(3):297-312. doi: 10.1080/17437199.2015.1077155.
35. Yasmin AN, Fadilah IN, Mutia F. Reference services in the library: Literature review. *Pedagogi*. 2024;(2):150–158. doi: 10.24036/pedagogi.v24i2.2051.
36. Patel M, Patel N. Exploring Research Methodology : Review Article. *Int J Res Rev*. 2019;6(3):48-55.
37. Eriksen MB, Frandsen TF. The impact of patient , intervention , comparison , outcome (PICO) as a search strategy tool on literature search quality : a systematic review. *J Med Libr Assoc*. 2018;106(4):420-431. doi: 10.5195/jmla.2018.345.
38. Page MJ, Mckenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement : an updated guideline for reporting systematic reviews. *BMJ*. 2021;372. doi: 10.1136/bmj.n71.
39. Barker TH, Stone JC, Sears K, Klugar M, Tufanaru C, Leonardi-Bee J, et al. The revised JBI critical appraisal tool for the assessment of risk of bias for randomized controlled trials. *JBI Evid Synth*. 2023;21(3):494-506. doi: 10.11124/JBIES-22-00430.
40. Joanna Briggs Institute. JBI levels of evidence FAME. 2014; Available from: https://jbi.global/sites/default/files/2019-05/JBI-Levels-of-evidence_2014_0.pdf
41. Kallio H, Pietilä AM, Johnson M, Kangasniemi M. Systematic methodological review: Developing a framework for a qualitative semi-structured interview guide. *J Adv Nurs*. 2016;72:2954–2965. doi: 10.1111/jan.13031.
42. Wong MS, Gregory KD, Spiegel BMR, Khalil C. Patient perceptions of virtual reality for pain relief in labor: A qualitative study. *Front Pain Res*. 2022;1(12). doi: 10.3389/fpain.2022.1063751.
43. Najjariasl P, Dalvandi K, Shabani F, Hadi Z, Ramezani A. The effectiveness of virtual reality in managing labor pain: A systematic review and meta-analysis. *Res Square*. 2024. doi: 10.21203/rs.3.rs-4724968/v1.
44. Xu N, Chen S, Liu Y, Jing Y, Gu P. The effects of virtual reality in maternal delivery: Systematic review and meta-analysis. *JMIR Serious Games*. 2022;10(4):e36695. doi: 10.2196/36695.
45. Carus EG, Albayrak N, Bildirici HM, Ozmen SG. Immersive virtual reality on childbirth experience for women: a randomized

controlled trial. *BMC Pregnancy Childbirth*. 2022;22(1):354. doi: 10.1186/s12884-022-04598-y.
46. Mohammed AA, Hazazi ZH, Alhumaidi BN, Alanezi S, Alshammari F, Alobaidly A, et al. Efficacy of non-pharmacological interventions for labor pain reduction: A systematic review and meta-analysis. *Afr J Reprod Health*. 2025;29(10):207-228. doi: 10.29063/ajrh2025/v29i10.21.
47. Baradwan S, Khadawardi K, Badghish E, Alkhamis WH, Dahi AA, Abdallah KM, et al. The impact of virtual reality on pain management during normal labor: A systematic review and meta-analysis of randomized controlled trials. *Sex Reprod Healthc*. 2022;32:100720. doi: 10.1016/j.srhc.2022.100720.
48. Rampazo ÉP, Liebano RE. Analgesic effects of interferential current therapy: A narrative review. *Medicina (Kaunas)*. 2022;58(1):141. doi: 10.3390/medicina58010141.
49. Mane SV, Bhatbolan S. Effect of OBG - TENS (transcutaneous electrical nerve stimulation) on labor outcome: A randomized controlled trial. *Bull Fac Phys Ther*. 2025;30:32. doi : 10.1186/s43161-025-00291-1.
50. Tsagkaris C, Papazoglou AS, Eleftheriades A, Tsakopoulos S, Alexiou A, Găman MA, et al. Infrared radiation in the management of musculoskeletal conditions and chronic pain: A systematic review. *Eur J Investig Health Psychol Educ*. 2022;12(3):334-343. doi: 10.3390/ejihpe12030024.
51. Thahir M, Hasbiah H, Tang A. Effect of infra-red and muscle energy technique on pain and range of motion on low back pain. *Int J Sci Basic Appl Res*. 2025;76(1):66-72. 4531:66–72.
52. Özer E, Çetinkaya Şen Y, Canlı S, Güvenç G. Effects of virtual reality interventions on the parameters of normal labor: A systematic review and meta-analysis of randomized controlled trials. *Pain Manag Nurs*. 2024;25(1):93-99. doi: 10.1016/j.pmn.2023.09.012.
53. Anesth J, Crit A, Coviello A, Iacovazzo C, Frigo MG, Ianniello M, et al. Technical aspects of neuraxial analgesia during labor and maternity care : an updated overview. J *Anesth Analg Crit Care*. 2025. doi: 10.1186/s44158-025-00224-3.
54. Kibibi Wairimu H, Nyambura Achieng M. Using virtual reality for pain management and therapy. *Newport Int J Res Med Sci*. 2025;6(2):103–111. doi :10.59298/NIJRMS/2025/6.2.103111.
55. Tapinova K, Dossov M. Virtual reality for pain management : an umbrella review. *Front Med*. 2023;14(10):1203670. doi: 10.3389/fmed.2023.1203670.
56. Saquib J, AlMohaimeed HA, AlOlayan SA, AlRebdi NA, AlBulaihi JI, AlMugbel RA, et al. Effect of interactive vs. passive virtual reality on pain threshold and tolerance. *Scand J Pain*. 2021;22(1):167-172. doi: 10.1515/sjpain-2021-0046.
57. Deng X, Jian C, Yang Q, Jiang N. The analgesic effect of different interactive modes of virtual reality: A prospective functional near-infrared spectroscopy (fNIRS) study. *Front Neurosci*. 2022;15:16:1033155. doi: 10.3389/fnins.2022.1033155.
58. Li J, Lu X, Hu L. The analgesic effects and neural oscillatory mechanisms of virtual reality scenes based on distraction and mindfulness strategies in human volunteers. *Br J Anaesth*. 2023;131:1082–1092. doi: 10.1016/j.bja.2023.09.001.
59. Yang QH, Du SH, Tang L, Zhang YH, Wang XQ. Analgesic effects and neural oscillatory mechanisms of music-synchronized virtual reality intervention. *J Neuroeng Rehabil*. 2025;22(1):202. doi: 10.1186/s12984-025-01740-7.
60. Luo Z, Zhou R, Nong K, Peng X, Chen L, Li P, et al. Digital health interventions in pediatric perioperative care: A network meta-analysis. *JAMA Pediatr*. 2025;179(11):1153-1161. doi: 10.1001/jamapediatrics.2025.3099.
61. Moe-Byrne T, Knapp P, Lidster A. How effective are video animations as information tools for patients and the general public? An updated systematic review. Front Digit Health. 2026;7(I). doi: 10.3389/fdgth.2025.1717044.
62. Suzart LC, Ferreira SC. Virtual reality and digital technologies for pain management : scope review. *Brazilian J Pain*. 2025;8:e20250028. doi :10.63231/2595-0118.20250028-en.
63. Main A, McCartney H, Ibrar M, Muirhead F, Mavroeidi A, Rai HK, et al. Patients' experiences of digital health interventions for the self-management of chronic pain: Systematic review and thematic synthesis. *J Med Internet Res*. 2025;27:e69100. doi: 10.2196/69100.
64. Kyei GK, Kyei EF, Ansong R. The efficacy and patient experience of virtual reality in labor: An integrative review of pain and anxiety management. *Pain Manag Nurs*. 2025;26(1):65-74. doi: 10.1016/j.pmn.2024.08.007.
65. Baradwan S, Khadawardi K, Badghish E, Alkhamis WH, Dahi AA, Abdallah KM, et al. The impact of virtual reality on pain management during normal labor: A systematic review and meta-analysis of randomized controlled trials. *Sex Reprod Healthc*. 2022;32:100720. doi: 10.1016/j.srhc.2022.100720.
66. Xu D, Xu M, Fang L, Chen H, Ye J, Huang C. Exploring the experience of birth trauma from the midwife's perspective. *BMC Pregnancy Childbirth*. 2025;25:1031. doi: 10.1186/s12884-025-08205-8.
67. Gudeta TG, Terefe AB, Muhamed AN, Mengistu T, Sori SA. Perceived childbirth self-efficacy and its associated factors among pregnant women in South-Central Ethiopia. *Int J Woman Health*. 2023;1411. doi: 10.2147/IJWH.S423784.
68. Aryani HR. Literature review of the relationship between pain perception and coping in mothers during childbirth. *Health Med Sci*. 2025;3(1):11. doi: 10.47134/phms.v3i1.520.
69. Naderbagi A, Loblay V, Zahed IUM, Ekambareshwar M, Poulsen A, Song YJC, et al. Cultural and contextual adaptation of digital health interventions: Narrative review. *J Med Internet Res*. 2024;26:e55130. doi: 10.2196/55130.
70. Xu J, Akezhuoli H, Zhou M, Yao T, Lu J, Wang X, et al. Development and evaluation of a culturally adapted digital-platform integrated multifaceted intervention to promote the utilization of maternal healthcare services : a single-arm pilot study. *Int J Equity Health*. 2023;22(1):217. doi : 10.1186/s12939-023-02033-y.
71. Asadollahi F, Zagami SE, Eslami S, Roudsari RL. Barriers and facilitators for mHealth utilization in pregnancy care: a qualitative analysis of pregnant women and stakeholder's perspectives. *BMC Pregnancy Childbirth*. 2025;25:141. doi: 10.1186/s12884-025-07244-5.
72. Mohamed H, Ismail A, Sutan R, Rahman RA, Juval K. A scoping review of digital technologies in antenatal care : recent progress and applications of digital technologies. *BMC Pregnancy Childbirth*. 2025. doi: 10.1186/s12884-025-07209-8
73. Kim JI, Lee JY, Park SH. Evaluating the effectiveness of digital interventions for stress management in pregnant women: Systematic review and meta-analysis. *JMIR Mhealth Uhealth*. 2026;14:e66267. doi: 10.2196/66267.
74. Wang J, Tang N, Congcong D. Association of digital health interventions with maternal and neonatal outcomes: Systematic review and meta-Analysis. *J Med Internet Res*. 2025;27. doi: 10.2196/66580.
75. Chang CY, Gau ML, Huang CJ, Cheng HM. Effects of non-pharmacological coping strategies for reducing labor pain: A systematic review and network meta-analysis. *PLoS One*. 2022;17(1):e0261493. doi: 10.1371/journal.pone.0261493.
76. Colak MB, Akin B, Kalkan SC. Effects of labor support on pregnant women' s childbirth comfort , satisfaction and postpartum comfort levels: A randomized controlled trial. *BMC Pregnancy Childbirth*. 2025;25(1):789. doi: 10.1186/s12884-025-07904-6.77.
77. Adjie JMS, Priscilla J, Safira FN. The childbirth experience: A systematic review on prenatal and intrapartum supportive interventions. *Curr Women Health Rev*. 2025;1(1). doi : 10.2174/0115734048285845240313085858.
78. Ängeby K, Johansson M, Børøsund E, Varsi C, Iwaya LH, Nordin A. Testing the ELSA birth App during pregnancy and labor for primiparous women: Randomized controlled trial. *J Med Internet Res*. 2025;27:e72807. doi: 10.2196/72807.
79. Duangiad T, Chunuan S, Chatchawet W. Effectiveness of enhancing childbirth self-efficacy support program via LINE official account among pregnant adolescents: A randomized controlled trial. *Pacific Rim Int J Nurs Res*. 2025;29(3). doi: 10.60099/prijnr.2025.272780.
80. Azza A, Sasarari ZA, Nurafriani N, Irmawati S. Effect of implementing childbirth preparation classes on women's self-

efficacy and pregnancy outcomes. *J Ilmiah Kesehatan Sandi Husada*. 2025;14(1):36-44. doi: 10.35816/jiskh.v14i1.1245.
81. Agbi FA, Lulin Z, Asamoah EO. Quality of communication between healthcare providers and pregnant women: Impact on maternal satisfaction, health outcomes, and shared decision-making. *J Obstet Gynecol*. 2023;2:784. doi: 10.31586/ujog.2023.784.
82. Jeong G, Kim HK, Bang U. Effect of a continuity of midwifery care model that used a respectful maternal care framework in Korea: a non-randomized study. *Front Public Health*. 2025;13:1578158. doi: 10.3389/fpubh.2025.1578158.
83. Abdelaziz EM, Alshammari AM, Elsharkawy NB, Oraby FA, Ramadan OME. Digital intervention for tokophobia: a randomized controlled trial of internet-based cognitive behavioral therapy on fear of childbirth and self-efficacy among Egyptian pregnant women. *BMC Pregnancy Childbirth*. 2025;25(1):233. doi: 10.1186/s12884-025-07341-5.
84. Goddard L, Tucker K, Astbury NM, Roman C, Chi Y, Morgan K, et al. A digital lifestyle App for hypertension during pregnancy: Mixed methods intervention development study using the person-based approach. *JMIR Form Res*. 2025;9:e68927. doi: 10.2196/68927.
85. Wang Z, Wang X, Chiu HC, Kong X, Li Q, Ran X, et al. The people-centered care and inpatients' perceived experience in China: A nationwide cross-sectional study. *Int J Equity Health*. 2025;24:48. doi: 10.1186/s12939-025-02409-2.
86. Guan T, Chen X, Li J, Zhang Y. Factors influencing patient experience in hospital wards: A systematic review. *BMC Nurs*. 2024;23:527. doi: 10.1186/s12912-024-02054-0.
87. Arifin SRM, Kamaruddin A, Muhammad NA, Nurumal MS, Mohadis HM, Hussain NHN, et al. An evaluation of digital intervention for perinatal depression and anxiety: A systematic review. *AIMS Public Health*. 2024;11(2):499-525. doi: 10.3934/publichealth.2024025.
88. Mohammed HH, Hamed AAAE, Afefy NAE, Sherif NA, Ibrahim SM. The effectiveness of nurse-led antenatal education on maternal self-efficacy: an evidence-based approach. *BMC Nurs*. 2025;24(1):895. doi: 10.1186/s12912-025-03471-5.
89. Harsono AAH, Bond CL, Enah C, Ngong MG, Kyeng RM, Wallace E, et al. Structural barriers to maternity care in Cameroon: A qualitative study. *Reprod Health*. 2024;21(1):108. doi: 10.1186/s12978-024-01834-w.
90. Shaochuan C, Lianci H, Qiongyue Z, Xin W, Huiqiong X, Ying T, et al. Development and implementation of an "Internet " integrated service model for antepartum, intrapartum, and postpartum care in maternal and child specialty hospitals: A randomized controlled trial. *Digit Health*. 2025;11:20552076251357657. doi: 10.1177/20552076251357657.
91. Shartyanie NP, Hanifa IN, Khan N. Digital health interventions in emergency obstetric and newborn care services in low- and middle-income countries: Scoping review. *J Med Internet Res*. 2025;27:e75738. doi: 10.2196/75738.
92. McKelvin G, Thomson G, Downe S. The childbirth experience: A systematic review of predictors and outcomes. *Women Birth*. 2021;34(5):407-416. doi: 10.1016/j.wombi.2020.09.021.
93. Aji RS, Efendi F, Kurnia ID, Tonapa SI, Chan CM. Determinants of maternal healthcare service utilisation among Indonesian mothers: A population-based study. *F1000Res*. 2021;10:1124. doi: 10.12688/f1000research.73847.2.
94. Buckley S, Uvnäs-Moberg K, Pajalic Z, Luegmair K, Ekström-Bergström A, Dencker A, et al. Maternal and newborn plasma oxytocin levels in response to maternal synthetic oxytocin administration during labour, birth and postpartum - A systematic review with implications for the function of the oxytocinergic system. *BMC Pregnancy Childbirth*. 2023;23(1):137. doi: 10.1186/s12884-022-05221-w.
95. Wong CA. Advances in labor analgesia. *Int J Womens Health*. 2010;1:139-154. doi: 10.2147/ijwh.s4553.
96. Olza I, Uvnas-Moberg K, Ekström-Bergström A, Leahy-Warren P, Karlsdottir SI, Nieuwenhuijze M, et al. Birth as a neuro-psycho-social event: An integrative model of maternal experiences and their relation to neurohormonal events during childbirth. *PLoS One*. 2020;15(7):e0230992. doi: 10.1371/journal.pone.0230992.
97. Benfield RD, Hortobágyi T, Tanner CJ, Swanson M, Heitkemper MM, Newton ER. The effects of hydrotherapy on anxiety, pain, neuroendocrine responses, and contraction dynamics during labor. *Biol Res Nurs*. 2010;12(1):28-36. doi: 10.1177/1099800410361535.
98. Abdolalipour S, Abbasalizadeh S, Mohammad-Alizadeh-Charandabi S, Abbasalizadeh F, Jahanfar S, Raphi F, et al. Effect of implementation of the WHO intrapartum care model on maternal and neonatal outcomes: a randomized control trial. *BMC Pregnancy Childbirth*. 2024;24(1):283. doi: 10.1186/s12884-024-06449-4.
99. Kawish AB, Umer MF, Arshed M, Khan SA, Hafeez A, Waqar S. Respectful maternal care experience in low- and middle-income countries: A systematic review. *Medicina (Kaunas)*. 2023;59(10):1842. doi: 10.3390/medicina59101842.
100. Zewudu L, Keshaun F, Silesh M, Id MT, Ketema E, Demis A, et al. Preference of cesarean delivery and its associated factors among pregnant women attending ante natal care at public health facilities of Debrebrehan City, Ethiopia: Cross-sectional study. *PLoS One*. 2024;19(1). doi: 10.1371/journal.pone.0296990.
101. Elgzar WT, Alshahrani MS, Ibrahim HA. Mode of delivery preferences: the role of childbirth fear among nulliparous women. *Front Psychol*. 2023;14:1221133. doi: 10.3389/fpsyg.2023.1221133.
102. Carrandi A, Hu Y, Karger S, Eddy KE, Vogel JP, Harrison CL, et al. Systematic review on the cost and cost-effectiveness of mHealth interventions supporting women during pregnancy. *Women Birth*. 2023;36(1):3-10. doi: 10.1016/j.wombi.2022.03.007.
103. Medani IE, Hakami AM, Chourasia UH, Rahamtalla B, Adawi NM, Fadailu M, et al. Telemedicine in obstetrics and gynecology: A scoping review of enhancing access and outcomes in modern healthcare. *Healthcare (Basel)*. 2025;13(16):2036. doi: 10.3390/healthcare13162036.
104. Cipta DA, Andoko D, Theja A, Utama AVE, Hendrik H, William DG, et al. Culturally sensitive patient-centered healthcare: a focus on health behavior modification in low and middle-income nations-insights from Indonesia. *Front Med (Lausanne)*. 2024;11:1353037. doi: 10.3389/fmed.2024.1353037.