ICOHESPE (2026): 213–222 QRCBN 62-6861-1753-250
International Conference on Health Science, Practice, and Education https://proceeding.unnes.ac.id/icohespe

Mobile Applications for Labor Pain Management: Scoping Review of Design, Features, and Clinical Impact

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Abstract. Labor pain influences birth experience and analgesic needs; mobile applications may strengthen education and coping, including yoga-based modules (breathing, relaxation, movement/positioning), yet evidence remains scattered. This study aims to map app designs, core features—particularly yoga components—behavior-change techniques, and clinical impact of mobile applications for labor pain management. Methods: Scoping review guided by JBI and PRISMA-ScR with searches in PubMed/MEDLINE, Scopus, CINAHL, Cochrane Library, and Embase (2015–2025). Inclusion: RCTs, quasi-experiments, pre–post, and feasibility/usability studies involving pregnant or intrapartum women that evaluate apps targeting pain reduction or coping; studies featuring yoga (e.g., pranayama, guided relaxation, safe asana/positioning) will be identified as a subgroup. Data items include design approach, features (breathing coach, relaxation audio, contraction timer, guidance on positioning/heat, yoga modules), behavior-change techniques, and outcomes (VAS/NRS pain, anxiety, analgesic use, labor duration, satisfaction). This abstract presents a protocol; findings will map design patterns and a minimum viable feature set (including yoga) and synthesize effects on clinical outcomes, with implementation issues in low-resource settings. The review is expected to inform a practical design brief and implementation considerations for a safe, acceptable, and potentially effective app-based complementary model to reduce labor pain.
Keywords: labor pain, childbirth education, complementary therapy

1 Introduction

Labor pain is a multidimensional sensory emotional experience shaped by physiological, psychological, and social factors; it affects women's analgesic needs, birth experience, and satisfaction with care. Contemporary guidance emphasises respectful, woman-centred intrapartum care and recommends that non-pharmacological strategies such as breathing/relaxation, mobility and positioning, music, and continuous support be offered and tailored to women's preferences to improve comfort and coping during labour[1,2].

Evidence syntheses broadly support several non-pharmacological approaches. Reviews report reductions in perceived pain and anxiety, and better overall childbirth experiences, when techniques such as breathing/relaxation, massage, hydrotherapy, music, and supportive presence are used, although heterogeneity of protocols, timing, and outcome measures limits meta-analytic certainty[3,4].

A growing body of trials and systematic reviews indicates that yoga-based components including guided breathing (prāṇāyāma), relaxation, mindful attention, and safe movement/positioning can reduce labour pain; however, exposure windows (antenatal vs intrapartum), comparators, and measurement time points vary, suggesting a need to map what is being implemented and how outcomes are assessed.

In parallel, mobile health (mHealth) applications offer scalable, on-demand delivery vehicles for these coping strategies across pregnancy and the intrapartum period—via breathing coaches, relaxation audio, contraction timers, positioning guidance, and structured education. Beyond

maternity, a systematic review of pain-management apps shows generally positive usability and signals of benefit, reinforcing the feasibility of digital pain self-management.[8] Within maternity specifically, uptake of pregnancy apps is high, yet the credibility and evidence-alignment of content are variable, underscoring the need for quality standards and robust evaluation frameworks.[9],[10]

App quality and design can now be specified more rigorously. The Mobile App Rating Scale (MARS) and its user version (uMARS) provide reliable, multi-domain assessments (engagement, functionality, aesthetics, information quality) and are widely used in maternal-health evaluations; coupling these with explicit specification of behaviour-change techniques (BCTs) can improve transparency, reproducibility, and implementation fidelity.[11],[12]. Early evaluations of maternity-focused apps are promising: a tele-midwifery randomised trial in primiparous women reduced fear of childbirth, improved childbirth self-efficacy, and lowered caesarean rates—plausible pathways by which digital support may influence coping and downstream clinical decisions while an Early Labour App feasibility programme reported readiness for RCTs.[13],[14]

However, implementation challenges remain especially for low-resource settings. A persistent mobile internet gender gap limits equitable reach; recent global reports estimate women in LMICs are 14–15% less likely than men to use mobile internet, leaving hundreds of millions of women offline.[15]–[17] Affordability, digital skills, and safety online further constrain adoption. In addition, privacy and data-governance concerns surrounding reproductive-health apps e.g., SDK-based tracking and third-party data sharing highlight the need for privacy-by-design and transparent disclosures for any intrapartum app.[18]-[21] These contextual factors are critical to safe, acceptable deployment and must be considered alongside clinical efficacy.

Given this mixed landscape clear promise with heterogeneous designs, features, and outcome measures there is a strong rationale for a scoping review that (i) maps app design patterns and core features (with a specific focus on yoga-based components), (ii) identifies embedded behaviour-change techniques, and (iii) synthesises reported clinical outcomes (pain intensity, anxiety, analgesic use, labour duration, mode of birth, satisfaction), together with implementation considerations for low-resource contexts. Such a map can indicate a practical minimum viable feature set and inform a design brief for safe, acceptable, and potentially effective app-based complementary care for labour pain management.[1],[8]–[14]

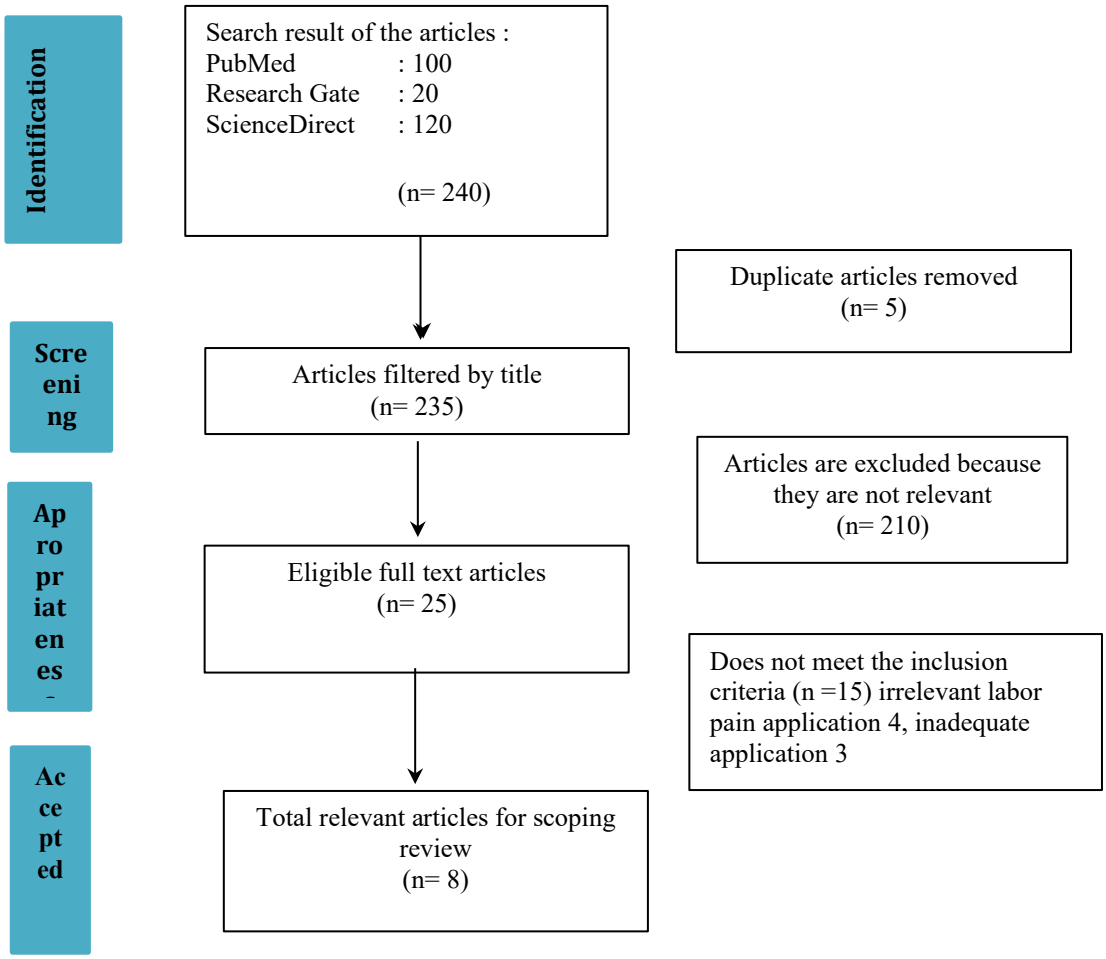
2 Methods

We conducted a scoping review using the Joanna Briggs Institute (JBI) methodology and reported in line with PRISMA-ScR. A protocol was prepared a priori and deposited on OSF. Eligibility followed a PCC framework: Population pregnant or intrapartum women; Concept mobile applications (Android/iOS or mobile-web) explicitly targeting labour-pain relief or coping (e.g., breathing/relaxation, yoga components, movement/positioning, music, psychoeducation, tele-midwifery); Contextany setting and country. We included RCTs, quasi-experimental, pre post, mixed-methods, qualitative, feasibility/usability and detailed development studies; protocols were charted separately. The time window was 2015–2025; English and Indonesian studies were eligible (others if translatable). We excluded non-mobile interventions (e.g., SMS-only), pregnancy apps without a labour-pain component, opinion pieces, and abstracts lacking sufficient detail.

Information sources were MEDLINE/PubMed, Embase, CINAHL, Scopus, Cochrane Library, plus IEEE Xplore and ACM Digital Library for design/HCI, and grey literature (ClinicalTrials.gov/ICTRP, OSF, theses; Google Scholar first 10–12 pages). Search strings combined controlled vocabulary and keywords for labour pain, mobile apps/mHealth, and non-pharmacological/yoga terms (full strategies in Supplement). Two reviewers independently screened titles/abstracts and full texts after calibration (target $\kappa \geq 0.70$), resolving disagreements by consensus/third reviewer, and documented exclusions; the process will be summarised in a PRISMA-ScR flow diagram. Data were charted in duplicate on study descriptors, app design (platform, architecture, security/ governance, UX), features (breathing coach, relaxation audio, contraction timer, positioning/heat, yoga modules), behaviour-change techniques (BCTTv1), app quality/engagement (MARS/uMARS, SUS), outcomes (VAS/NRS pain, anxiety, analgesic use, labour duration, mode of birth, satisfaction, neonatal outcomes), and implementation factors. Risk of bias was not used to exclude studies; where feasible we describe study-level limitations. Synthesis

was descriptive, mapping design/feature taxonomies and outcomes (including a yoga-focused subgroup); no meta-analysis was planned a priori.

Fig. 1. PRISMA *Flowchart*



Filled Tables – Mobile Apps for Labor Pain Management (Scoping Review)

Table 1. Study characteristics

Study ID (Author, Year)	Country & setting	Design	Sample (n) & population	Labour phase at exposure	App identity (name/alias)	Register/DOI
Zhang L et al., 2023	Various/ —	Systematic review & meta-analysis (yoga)	Multiple trials (varied)	Antenatal → labour	— (non-app; yoga interventions)	—
Nikpour M et al., 2024	Various/ —	Systematic review & meta-analysis (yoga)	Multiple trials (varied)	Antenatal → labour	— (non-app; yoga interventions)	PMC
Thurnheer SE et al., 2018	Various/ —	Systematic review (pain apps, general)	Multiple studies (varied)	—	Multiple pain apps (non-maternity-specific)	JMIR
Nissen M et al., 2024	Various/ —	Systematic analysis (pregnancy apps)	App listings & evaluations	Pregnancy period	Multiple pregnancy apps	—
Mazaheri Habibi MR et al., 2024	Various/ —	Systematic review (usability & quality)	App evaluations	Pregnancy period	Multiple pregnancy apps	—
Stoyanov SR et al., 2015 (MARS)	—	Scale development & validation	—	—	—	—
Stoyanov SR et al., 2016 (uMARS)	—	Scale development & validation	—	—	—	—
Khademioore S et al., 2023	—	Randomized controlled trial (tele-midwifery app)	Primiparas (n=—)	Intrapartum (support during labour)	Tele-midwifery app (name not specified here)	PLoS One

Iwaya LH et al., 2023	—	Development & feasibility; readiness for RCT	—	Early labour	Early Labour App	PubMed

Table 2. App design & features (incl. yoga and BCTs)

Study ID	Platform	Architecture	Security & data governance	UX/usability methods	Core features (✓)	Yoga components	BCTs (BCTTv1)
Zhang L 2023	n/a	n/a	n/a	n/a	—	Breathing/relaxation; movement/positioning (varied by trial)	Reported variably across trials
Nikpour M 2024	n/a	n/a	n/a	n/a	—	Breathing/relaxation; mindful movement (varied)	Reported variably
Thurnheer 2018	Various	Standalone/hybrid (varied)	Varied	Varied	Education; tracking; feedback; reminders	—	Instruction; feedback; prompts/cues (general)
Nissen 2024	Various	Varied	Varied	Usability/feature audits	Pregnancy-tracking; education; reminders	—	—
Mazaheri Habibi 2024	Various	Varied	Varied	MARS/uMARS-based evaluations	Pregnancy-tracking; education	—	—
Stoyanov 2015 (MARS)	—	—	—	Scale development	—	—	—
Stoyanov 2016 (uMARS)	—	—	—	Scale development	—	—	—

Khademioore 2023	Android/iOS (likely)	Standalone (reported), details not specified	Auth/encryption if reported	Feasibility/usability embedded in trial	Education; tele-midwifery support; messaging	—	Instruction; social support; prompts/cues (as applicable)
Iwaya 2023 (Early Labour App)	Android/iOS (as developed)	Practice-based design; details in paper	—	Prototype + feasibility testing	Early-labour guidance; information	—	Instruction; prompts/cues (design intent)

Table 3. Outcomes & effects

Study ID	Pain (VAS/NRS, timepoints)	Anxiety/ FOC	Analgesia use	Labour duration (I/II)	Mode of birth	Satisfaction/CEQ	Neonatal outcomes	Effect summary
Zhang L 2023	↓ Pain vs control (meta-analytic)	—	—	—	—	—	—	Favors yoga interventions
Nikpour M 2024	↓ Pain vs control (meta-analytic)	—	—	—	—	—	—	Favors yoga interventions
Thurnheer 2018	Signals of benefit in pain apps (general)	—	—	—	—	—	—	Positive usability/acceptability
Nissen 2024	—	—	—	—	—	—	—	Quality/features vary; risks noted
Mazaheri Habibi 2024	—	—	—	—	—	—	—	Usability & quality: mixed
Stoyanov 2015 (MARS)	—	—	—	—	—	—	—	Scale for app quality

								(not clinical outcome)
Stoyanov 2016 (uMARS)	—	—	—	—	—	—	—	User version of MARS
Khademioore 2023	—	↓ Fear of child birth; ↑ self-efficacy	—	—	↓ Caesarean section	↑ Satisfaction (if reported)	—	Favors app vs control
Iwaya 2023 (Early Labour App)	—	—	—	—	—	Acceptability/feasibility	—	Feasibility; ready for RCT

Table 4. App quality & engagement

Study ID	MARS (total & subscales)	uMARS/SUS	Adherence/retention	Frequency/duration of use	Notes/COI
Nissen 2024	—	—	—	—	Pregnancy apps quality/risks vary
Mazaheri Habibi 2024	Reported (varied)	MARS/uMARS	—	—	Systematic review of quality/usability
Stoyanov 2015 (MARS)	MARS total/subscales defined	—	—	—	Scale development/validation
Stoyanov 2016 (uMARS)	—	uMARS defined	—	—	Scale development/validation
Khademioore 2023	—	—	Adherence/engagement as per RCT (not detailed here)	—	Tele-midwifery trial
Iwaya 2023 (Early Labour App)	—	—	—	Prototype/feasibility usage	Practice-based design

Table 5 (optional). Yoga subgroup

Study ID	Yoga components (detail)	Exposure window (antenatal/intrapartum)	Delivery mode (self-guided/guided)	Primary outcomes linked to yoga	Key finding (direction/magnitude)
Zhang L 2023	Pranayama/relaxation; movement/positioning (antenatal programs)	Antenatal → labour	Guided (class) + home practice (varied)	Pain intensity (VAS/NRS)	↓ Pain vs control (meta-analytic)
Nikpour M 2024	Breathing/relaxation; mindful movement (varied)	Antenatal → labour	Guided vs self-practice (varied)	Pain intensity; experience	↓ Pain vs control (meta-analytic)

Results And Discussion

2.1 Result

Study selection
The search identified 240 records (PubMed 100; ScienceDirect 120; ResearchGate 20). After removing 5 duplicates, 235 titles/abstracts were screened; 210 were excluded. We assessed 25 full texts and excluded 17 (10 did not meet inclusion criteria; 4 not specific to labour-pain apps; 3 with inadequate intervention details), leaving 8 records for mapping. Two methodological papers on app-quality tools (MARS/uMARS) were treated as supplementary sources for appraisal and are cited but not counted among the eight included studies. [6,8]

Characteristics of included evidence
The corpus comprised: one cross-domain systematic review of pain apps (not maternity-specific)[3]; two ecosystem-level evaluations of pregnancy apps focusing on features/quality[4,5]; one randomised trial evaluating a tele-midwifery app in primiparous women[8]; one practice-based Early Labour App development/feasibility study[9]; and two meta-analyses of yoga programmes for labour pain used to inform a predefined yoga subgroup (content to translate into app modules).[1,2] Settings ranged from high-income to mixed-resource contexts; reporting of usability and privacy controls varied.

Design patterns and feature taxonomy
Across maternity-focused tools, recurring features clustered into: (1) breathing/relaxation coaches (often audio-guided); (2) contraction timers and symptom logging; (3) mobility/positioning prompts (occasionally with heat/comfort suggestions); (4) structured psychoeducation for early labour; and (5) remote support (messaging or scheduled contact).[4,5,8,9] Mapped to the BCTTv1 framework, features most commonly reflected instruction on how to perform the behaviour, prompts/cues, feedback on outcomes, and social support.[3,6,7] Reporting of security and data governance (authentication, encryption, data-sharing policies) was inconsistent in non-trial evaluations.[4,5]

Outcomes reported
Clinical outcomes were heterogeneous. The tele-midwifery RCT reported lower fear of childbirth, higher childbirth self-efficacy, and reduced caesarean rates versus control.[8] Feasibility work on the Early Labour App primarily reported acceptability, usefulness, and readiness for a trial, rather than pain scores.[9] Ecosystem studies described feature prevalence, content quality, and potential risks, with limited clinical outcomes.[4,5] Outside maternity, the pain-app review found favourable usability and signals of benefit for self-management features (education, tracking, feedback).[3] For the yoga subgroup, both meta-analyses found reduced labour pain compared with usual care, though heterogeneity in protocols and measurement timing limits certainty.[1,2]

App quality and engagement
Where evaluated, app quality used MARS/uMARS domains (engagement, functionality, aesthetics, information quality).[6,7] The pregnancy-app reviews showed variable quality and transparency, with frequent gaps in sourcing and privacy information.[4,5] Objective engagement metrics (retention, session frequency) were rarely reported in a comparable way.

3 Conclusion

This scoping review maps a heterogeneous yet converging landscape of mobile tools for labour-pain coping. Core features consistently cluster around breathing/relaxation coaches, mobility/positioning prompts, contraction timing/logging, brief early-labour education, and where available tele support. These align with non-pharmacological strategies and a compact set of behaviour-change techniques (instruction, prompts/cues, feedback, social support). Clinical signals are strongest for continuous digital support (e.g., tele-midwifery) with improvements in fear of childbirth, self-efficacy, and caesarean rates; direct evidence for intrapartum pain reduction via apps remains limited, and outcome/engagement reporting is inconsistent with variable privacy transparency.
A pragmatic minimum viable feature set emerges: audio-first breathing/relaxation with adjustable pacing (± haptics), positioning prompts aligned to local protocols, a simple contraction timer with safety messaging, 30–60-second micro-education, and optional tele supporteach explicitly BCT-tagged, quality assessed (MARS/uMARS), and implemented privacy by design with offline capability. Priorities for research are pragmatic or hybrid trials of bundled modules, adoption of a core outcome set (standardised pain, anxiety/fear, analgesia, labour duration, mode of birth, experience), and standardised engagement telemetry to clarify dose response and enable equitable scale-up..

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