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The Role of Digital Doulas: An Integrative Review of Interventions for Maternal Neuropsychiatric Health in the Perinatal Period

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Abstract

Emerging evidence underscores the potential of digital technologies in improving perinatal mental health by offering continuous and person-centered support. This integrative review synthesizes findings across disciplines-including obstetrics, psychiatry, digital health, and human–computer interaction-to examine the role of digital doula interventions. Such technologies reimagine the traditional doula model through mobile applications, tele-support systems, and AI-based companions. Results indicate that digital doula support is consistently linked to reduced perinatal anxiety and depressive symptoms, improved emotional regulation, and greater satisfaction with childbirth experiences. Moreover, these interventions enhance accessibility and continuity of care, particularly for marginalized groups, thereby advancing digital health equity. Nevertheless, challenges such as limited standardization, data privacy issues, and insufficient reimbursement models remain. Digital doula care stands at the intersection of neuropsychiatry, digital therapeutics, and maternal health, offering innovative pathways to alleviate perinatal psychological distress and promote precision mental healthcare. Future research should focus on developing digital biomarkers for perinatal mental health and assessing long-term neurobehavioral outcomes of technology-facilitated support.

Keywords

Digital Doula, Neuropsychiatry, Perinatal Mental Health, Digital Therapeutics, Tele-Neuropsychiatry, AI in Maternal Care, Digital Health Equity

1. Introduction

Maternal mental health is increasingly recognized as a critical determinant of neuropsychiatric well-being across the lifespan [1]. The perinatal period-encompassing pregnancy through the first postpartum year-is a time of profound neurobiological and psychosocial change, during which up to 20–25% of women experience perinatal mood and anxiety disorders (PMADs) [2]. These conditions are not only associated with significant emotional distress but also with alterations in maternal–infant bonding, child neurodevelopment, and long-term cognitive outcomes [3]. Despite growing awareness, barriers such as stigma, cost, and limited access to specialized mental health care perpetuate inequities in perinatal neuropsychiatric outcomes, particularly among low-income and racially marginalized populations [4].

Traditional doula care-continuous, non-clinical emotional and informational support during childbirth-has demonstrated measurable benefits for both maternal health outcomes and psychological well-being [5]. Doulas can buffer stress responses, enhance a sense of agency, and facilitate early identification of perinatal mood disturbances [5]. However, the reach of this support model is limited by geographic, financial, and workforce constraints. The COVID-19 pandemic accelerated the adoption of telehealth and digital communication tools, catalyzing the transformation of doula care from in-person to digital or hybrid “tele-doula” models [6].

Emerging evidence demonstrates that virtual doula interventions can replicate many of the emotional and cognitive benefits of traditional doula care while expanding access to underrepresented populations [7]. A recent cohort study found that participation in a digital doula program via a comprehensive health platform was associated with reduced odds of cesarean birth, greater emotional support, and improved mental health management during pregnancy [8]. These findings suggest that digital doula care may serve as a scalable psychosocial and neuropsychiatric intervention-leveraging mobile applications, AI-enabled chat support, and telepresence technologies to address the emotional and cognitive dimensions of childbirth. Parallel developments in digital mental health tools-including digital cognitive behavioral therapy, mindfulness platforms, and mobile phenotyping-have also shown efficacy in reducing perinatal depression and anxiety [9]. Integrating these approaches within a digital doula framework represents an innovative avenue for advancing precision neuropsychiatric care in the perinatal period.

From a systems perspective, the digital doula model also addresses dimensions of digital health equity by extending culturally congruent, linguistically appropriate, and low-cost psychosocial support to marginalized communities [10]. As Medicaid coverage for doula services expands in several U.S. states, the integration of digital platforms offers new opportunities to bridge inequities in access to perinatal mental health care [10].

Therefore, this review aims to synthesize current evidence on the intersection of digital doula interventions and maternal neuropsychiatric health. Specifically, it evaluates how digital and hybrid doula models influence perinatal mood, anxiety, and stress outcomes, explores their role in advancing digital mental health equity, and identifies the implementation challenges in integrating these interventions into tele-neuropsychiatric and obstetric systems. By bridging insights from psychiatry, obstetrics, and digital health, this paper seeks to position the digital doula model as an emergent paradigm in precision maternal neuropsychiatry.

2. Methods

2.1 Study Design

This study employed a digital integrative review design, synthesizing interdisciplinary evidence on digital doula interventions and their impact on maternal neuropsychiatric outcomes. The integrative review approach was selected to include a wide range of empirical and theoretical sources-quantitative, qualitative, and mixed-methods studies-enabling a comprehensive understanding of how digital support models influence perinatal mental health and neuropsychiatric well-being. Methodological guidance was drawn from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) and the Cochrane Synthesis Without Meta-Analysis (SWiM) frameworks [9,11].

2.2 Search Strategy

A systematic search was conducted in six electronic databases-PubMed, PsycINFO, Embase, Scopus, Web of Science, and CINAHL-covering publications between January 2015 and May 2025. The search combined controlled vocabulary and free-text terms related to *digital doula*, *tele-doula*, *digital maternal support*, *AI in perinatal care*, *perinatal depression*, *anxiety*, *neuropsychiatry*, and *digital mental health*.

The search strategy was adapted from recent reviews on digital perinatal interventions [12]. and mental health technology reviews [13]. Grey literature (e.g., dissertations, conference proceedings, and reports) was excluded to maintain methodological rigor and peer-reviewed validity.

2.3 Inclusion and Exclusion Criteria

Studies were included if they met the following criteria:

a. Population: Pregnant or postpartum individuals (within one year after birth).

b. Intervention: Digital or hybrid doula models providing emotional, cognitive, or informational support via digital platforms (e.g., mobile apps, telehealth, AI chatbots, or virtual reality).

c. Outcomes: Measures of *neuropsychiatric* or *psychological* well-being (e.g., depression, anxiety, stress regulation, emotional bonding).

d. Study Design: Quantitative, qualitative, or mixed-methods studies published in English.

e. Context: Health systems or community settings with a focus on digital maternal or mental health care.

Studies were excluded if they (i) focused solely on traditional, in-person doula care without a digital component, (ii) lacked measurable mental health outcomes, or (iii) were commentaries or non-peer-reviewed materials.

2.4 Data Extraction and Synthesis

Two independent reviewers extracted data using a structured form aligned with the Template for Intervention Description and Replication (TIDieR) checklist and CAPE engagement model (Connect–Attend–Participate–Enact) to assess participant engagement with digital platforms [11]. Extracted data included:

a. Study characteristics (authors, year, country, design);

b. Digital modality (mobile app, telehealth, AI-based chatbot, VR environment);

c. Population demographics;

d. Neuropsychiatric and psychosocial outcomes;

e. Implementation or ethical considerations (e.g., privacy, access, cultural tailoring).

Thematic synthesis was used to integrate findings across quantitative and qualitative data, emphasizing both *clinical outcomes* (e.g., depressive symptom reduction) and *implementation mechanisms* (e.g., engagement, digital equity, and scalability).

2.5 Quality Appraisal

Study quality was assessed using the Mixed Methods Appraisal Tool (MMAT 2018) for methodological diversity [14]. Inter-rater reliability between reviewers was >0.85. Discrepancies were resolved through discussion and consensus.

The overall confidence in evidence was evaluated through the GRADE-CERQual framework, assessing coherence, methodological limitations, and relevance to neuropsychiatric outcomes.

2.6 Data Visualization and Digital Mapping

In line with DN's emphasis on digital integration, data were synthesized using a digital mapping workflow via NVivo and Python-based visualization tools to generate:

a. a network map of intervention types and neuropsychiatric outcomes,

b. a heat map of global implementation sites, and

c. a digital equity index based on socioeconomic and accessibility variables.

This digital-enhanced synthesis method enables transparent and reproducible visualization of trends across diverse digital doula and perinatal neuropsychiatric studies [15].

2.7 Ethical Considerations

This review was conducted using secondary published data and therefore did not require institutional ethical approval. All procedures followed standard research ethics for digital data synthesis and transparency in reporting [16].

3. Results

3.1 Overview of Included Studies

A total of 37 studies (2019–2025) met the inclusion criteria, encompassing randomized controlled trials (RCTs), qualitative studies, and mixed-method evaluations across 13 countries. Most interventions (62%) utilized telehealth videoconferencing or mobile applications, while 25% incorporated AI-enhanced chat support or digital behavioral activation (BA) components. Nearly half of all studies explicitly addressed perinatal depression or anxiety as primary outcomes, and 30% examined broader neuropsychiatric indicators such as stress regulation, mood variability, and affective bonding.

3.2 Reduction in Perinatal Depression

Digital doula and tele-mental interventions consistently demonstrated clinically meaningful reductions in depressive symptoms among perinatal women.

a. A systematic review of 25 RCTs found that digital psychotherapeutic interventions (e.g., CBT- or mindfulness-based mobile platforms) produced significant decreases in depression scores (Hedges's $g=0.49$, $p<0.001$) compared with control groups [17].

b. Similarly, digital behavioral activation (BA) interventions showed robust short- to mid-term efficacy, with significant improvements in depressive symptoms at 2–6 months post-treatment ($p < .001$) across 17 RCTs [18].

c. Tele-doula and telehealth-integrated programs embedded within obstetric clinics demonstrated reductions of 47% in depressive symptom severity within 3–4 months of engagement [19].

Across these studies, women who received continuous digital social-emotional support (e.g., from doulas or mental health coaches via apps) experienced more pronounced mood stabilization than those receiving standard care.

3.3 Reduction in Perinatal Anxiety and Stress

Perinatal anxiety-a key neuropsychiatric marker-was also significantly improved in digital and telehealth models.

a. Digital psychotherapeutic platforms achieved moderate reductions in anxiety symptoms (Hedges's $g=0.25$, $p<0.01$) and stress symptoms ($g=0.47$) [17].

b. A telehealth mindfulness-based cognitive behavioral group intervention reported sustained decreases in anxiety levels over an 8-week period among both pregnant and postpartum women [20].

c. A 2025 scoping review confirmed that telehealth models for perinatal disease management consistently led to improved anxiety and depression outcomes across 10 studies [21].

These improvements were partly mediated by increased accessibility, self-monitoring, and real-time feedback, which enhanced perceived control and emotional regulation-key factors in neuropsychiatric resilience.

3.4 Emotional Regulation and Neuropsychiatric Engagement

Several qualitative studies highlighted that digital doula and telehealth platforms promoted emotional self-regulation and empowerment through empathic communication and continuous presence.

a. Women reported increased emotional connectedness and self-efficacy during childbirth when supported through virtual doula systems, particularly among low-income populations [4].

b. Participatory design studies identified four user "personas"-Resilient, Lonely, Overwhelmed, and Aware-representing diverse cognitive-emotional profiles requiring tailored digital engagement strategies [22].

c. Women participating in digital group videoconference programs described increased feelings of safety, empathy, and shared emotional regulation-critical factors for mitigating neuropsychiatric stress load [23].

These findings align with neurobehavioral theories emphasizing that digital social connectedness can buffer stress-related dysregulation in perinatal mood circuits.

3.5 Equity and Accessibility Outcomes

Digital doula interventions demonstrated a pronounced impact on reducing neuropsychiatric health disparities.

a. Studies in Medicaid-covered populations showed that community-based digital doula programs improved postpartum mental well-being and mitigated mood disorders among low-income women [4].

b. A 2024 study emphasized that equitable digital access and culturally adapted interfaces were critical for reducing anxiety and depression among marginalized perinatal individuals [24].

c. Digital platforms that incorporated language accessibility, peer engagement, and doula-informed design reported the highest engagement rates and most substantial improvements in psychological outcomes.

3.6 Mechanistic Insights and Sustainability

The integration of digital behavioral activation and mindfulness modules was associated with measurable neuropsychiatric benefits. Mechanistic studies revealed short-term reductions in stress biomarkers and cognitive reactivity, suggesting potential neurobiological correlates of intervention success [25]. However, meta-analytic findings indicated that treatment effects often declined beyond six months, underscoring the need for longitudinal digital follow-up and integration with hybrid in-person neuropsychiatric care [18].

4. Discussion

4.1 Principal Findings

This digital integrative review underscores the growing evidence that digital doula interventions-spanning telehealth platforms, mobile apps, and AI-assisted behavioral tools-are associated with substantial improvements in neuropsychiatric outcomes, particularly perinatal depression, anxiety, and emotional regulation. The convergence of digital health technologies with maternal neuropsychiatry represents a paradigm shift from episodic care to continuous, precision-based psychological support. Consistent reductions in depressive and anxiety symptoms across diverse populations indicate that digital doulas not only extend access to support but also facilitate real-time emotional buffering through empathic, interactive systems.

4.2 Integration with Neuropsychiatric Frameworks

Digital doula models mirror core principles of neuropsychiatry by targeting emotional regulation, cognitive appraisal, and affective bonding through virtual engagement [26]. Continuous digital presence and AI-driven communication emulate therapeutic alliance mechanisms traditionally observed in face-to-face psychotherapy, thus influencing the same neural substrates implicated in mood regulation [22]. Furthermore, recent findings in digital mental health suggest that sensor-based monitoring and AI-supported adaptive feedback can modulate affective circuits involved in perinatal mood disorders [27].

From a neuropsychiatric perspective, this suggests that digital doula care is not merely a psychosocial adjunct but potentially a neurobiologically active intervention, capable of influencing stress-response systems and cognitive-emotional integration through consistent virtual support and biofeedback mechanisms.

4.3 AI and Predictive Modeling in Perinatal Neuropsychiatry

The rapid integration of AI into perinatal care holds promise for the early detection and prediction of mood dysregulation [28]. AI algorithms can analyze multimodal inputs-voice tone, language sentiment, wearable biosensor data-to predict emerging depressive or anxious states with high sensitivity [29]. Future doula systems may leverage such models to offer personalized emotional interventions, alerting human doulas or clinicians to subclinical warning signs before crisis onset.

Moreover, AI-driven conversational agents integrated into doula platforms can deliver evidence-based coping strategies and psychoeducation, enhancing accessibility for underserved populations. However, as highlighted by Torous and Blease (2024), generative AI in psychiatry still faces challenges in clinical accuracy, ethical deployment, and bias mitigation, emphasizing the need for hybrid human-AI collaboration rather than automation [30].

4.4 Ethical, Equity, and Accessibility Considerations

The digital divide remains a major determinant of neuropsychiatric health equity. Access to telehealth and AI-enabled interventions continues to be stratified by socioeconomic and racial disparities [31]. For example, in Medicaid populations, digital doula programs significantly reduced perinatal mood disorder rates, suggesting that digitally mediated care can close equity gaps when combined with community engagement and culturally sensitive design [4].

Ethical deployment of AI-enhanced doula systems must prioritize privacy, transparency, and user agency, aligning with frameworks proposed for trustworthy AI in mental health [32]. Furthermore, integration into clinical workflows should avoid algorithmic paternalism, ensuring that digital predictions augment rather than replace empathic human decision-making [33].

4.5 Toward Hybrid Human–AI Doula Ecosystems

Emerging research suggests that hybrid systems-combining human doulas, AI companions, and digital biomarkers-could represent the next frontier in precision perinatal neuropsychiatry [34]. These systems could dynamically tailor interventions by tracking real-time indicators such as sleep, heart rate variability, or affective speech markers, integrating them into adaptive mental health protocols. The integration of machine learning-based digital phenotyping and human empathic engagement aligns with broader calls for "humanized AI" in psychiatry [27]. Such frameworks could ultimately transform doula care into a neuropsychiatric intervention platform-where emotion regulation, stress biomarkers, and mental health trajectories are continuously monitored and optimized through digital precision feedback loops.

4.6 Limitations and Future Directions

While the current evidence base demonstrates clear benefits of digital doula care, several gaps remain. Few studies employ neuroimaging, electrophysiological, or biomarker outcomes, limiting understanding of the neural mechanisms underlying digital support effects. Additionally, long-term follow-up data are scarce, leaving uncertainty about sustainability beyond six months [35]. Future research should pursue multimodal longitudinal designs, integrating neurobiological, behavioral, and digital phenotyping data.

Moreover, as perinatal psychiatry embraces AI, new frameworks must be developed to evaluate algorithmic validity, interpretability, and fairness [30]. Cross-sector partnerships among clinicians, engineers, and policymakers are critical to ensure that AI-enabled doula models remain ethical, inclusive, and clinically meaningful.

5. Conclusion

Digital doula interventions embody the convergence of neuropsychiatry and digital therapeutics, providing scalable, personalized, and human-centered solutions for perinatal mental health. Integrating AI-driven analytics, equitable telehealth access, and continuous emotional support can advance the field toward precision maternal neuropsychiatric care. Ultimately, the goal is not to replace human empathy with technology but to amplify it through intelligent, ethical, and inclusive digital ecosystems.

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