Construction of a Stepped Care Intervention Program for Postpartum Depression in Maternal and Child Health Institutions Based on Mobile Platforms: A Postprint Study

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Abstract

Abstract

Background: The prevention and treatment of postpartum depression (PPD) is a critical public health issue. However, the psychological intervention rate among women screening positive for depression in China remains generally low, which has become a key bottleneck in prevention and control efforts. In 2022, the WHO pointed out that the stepped-care model provides a theoretical framework for integrating maternal mental health services into the maternal and child health (MCH) service system. Nevertheless, empirical research on this model in China remains limited, and its applicability and effectiveness require further validation.

Objective: Based on the Shenzhen Postpartum Depression Screening and Intervention Project platform, this study aims to construct a stepped-care intervention program for postpartum depression that is suitable for Chinese MCH institutions and fully utilizes mobile platforms.

Methods: Using a community-based participatory research approach, multi-stakeholder qualitative interviews, focus group discussions, and supplementary literature reviews were conducted from February to October 2024. Qualitative evidence from multiple sources was synthesized to draft the preliminary intervention program. From October 2024 to January 2025, two rounds of Delphi consultations were conducted with 15 experts to evaluate expert engagement (represented by questionnaire recovery rates and the proportion of experts providing specific comments). The expert authority coefficient (Cr) and the coefficient of variation (CV) for the scientific rigor and feasibility of items at all

levels were calculated. The intervention program was adjusted and optimized based on item screening criteria and expert feedback.

Results: Qualitative data included in the comprehensive analysis consisted of 25 multi-stakeholder interview records, 1 focus group discussion transcript, 5 policy documents, 5 clinical guidelines, 3 systematic reviews, 5 randomized controlled trials, and 1 mixed-methods study. The preliminary program included 4 intervention stages (Level 1 items), 10 intervention contents (Level 2 items), and 12 intervention measures (Level 3 items). The effective recovery rate for both rounds of expert consultation questionnaires was 100.0%, with 14 (93.3%) and 11 (73.3%) experts providing specific suggestions, respectively; the Cr values were 0.86 and 0.87. In the first round, the CV for importance ranged from 0 to 0.16, and the CV for feasibility ranged from 0.05 to 0.27. In the second round, the CV for importance ranged from 0 to 0.13, and the CV for feasibility ranged from 0 to 0.21. The final intervention program comprised 4 intervention stages, 14 intervention contents, and 35 specific intervention measures.

Conclusion: This study constructed a mobile platform-based stepped-care intervention program for postpartum depression, which demonstrates scientific rigor and feasibility. It provides a theoretical basis and methodological guidance for MCH institutions to optimize the prevention and treatment of postpartum depression.

Full Text

Preamble

Methodology Research: A Stepped-Care Intervention Program for Postpartum Depression in Maternal and Child Health Institutions Based on Mobile Platforms

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Abstract

Background

The prevention and treatment of postpartum depression (PPD) is a critical public health issue. However, the rate of psychological intervention among postpartum women who screen positive for depression in China remains generally low, representing a key bottleneck in prevention and control efforts. In 2022, the

World Health Organization (WHO) noted that the stepped-care model provides a theoretical framework for integrating perinatal mental health services into maternal and child healthcare systems. Nevertheless, empirical research on this model in China remains limited, and its applicability and effectiveness require further validation.

Objective
Based on the Shenzhen Postpartum Depression Screening and Intervention Project platform, this study aims to construct a stepped-care intervention program for postpartum depression that is suitable for Chinese maternal and child healthcare institutions and fully utilizes mobile platforms.

Methods
Using a community-based participatory research (CBPR) approach, we conducted multi-stakeholder qualitative interviews, focus group discussions, and supplementary literature reviews from February to October 2024. Qualitative evidence from multiple sources was synthesized to draft the preliminary intervention program. From October 2024 to January 2025, two rounds of expert consultations were conducted using the Delphi method with 15 experts. We evaluated expert engagement (indicated by questionnaire recovery rates and the proportion of experts providing specific feedback), calculated the expert authority coefficient (Cr), and determined the coefficient of variation (CV) for the importance and feasibility of items at all levels. The intervention program was adjusted and optimized based on item screening criteria and expert feedback.

Results
The qualitative data included in the comprehensive analysis consisted of 25 multi-stakeholder interview transcripts, one focus group discussion record, five policy documents, five clinical guidelines, three systematic reviews, five randomized controlled trials, and one mixed-methods study. The preliminary program included 4 intervention stages (primary items), 10 intervention components (secondary items), and 12 specific measures (tertiary items). The effective recovery rate for both rounds of expert consultation questionnaires was 100.0%. Specifically, 14 experts (93.3%) in the first round and 11 experts (73.3%) in the second round provided specific recommendations. The expert authority coefficient (Cr) was 0.86 and 0.87 for the two rounds, respectively. In the first round of consultation, the CV for item importance ranged from 0 to 0.16, while the CV for feasibility ranged from 0.05 to 0.27. In the second round, the CV for importance ranged from 0 to 0.13, and the CV for feasibility ranged from 0 to 0.21. The final intervention program comprises 4 intervention stages, 14 intervention components, and 35 specific intervention measures.

Conclusion
This study developed a mobile platform-based stepped-care intervention program for postpartum depression. The program is scientifically grounded and feasible, providing a theoretical basis and methodological guidance for maternal and child health institutions to optimize the prevention and treatment of postpartum depression.

Keywords: Postpartum depression; Stepped care model; Psychological intervention; Maternal and child health services; Mobile health; Delphi method

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Introduction

Approximately 15% of women in China experience varying degrees of depressive symptoms or episodes during the postpartum period [**?**]. If left untreated, these symptoms can progress into postpartum depression (PPD), severely impacting the physical and mental health of the mother [**?**]. Furthermore, PPD has adverse effects on the short-term and long-term development of infants and young children [**?**], and in extreme cases, increases the risk of self-harm, suicide, or infanticide [**?**], posing a grave threat to maternal and child safety [**?**]. Research indicates that systematic postpartum depression screening combined with targeted psychological interventions for screen-positive women can effectively alleviate depressive symptoms and reduce the likelihood of progression to clinical depression [**?**].

The "Work Plan for Strengthening the Prevention and Treatment of Depression" [**?**] published in August 2020 emphasizes the need to enhance health education regarding prevention and treatment for the maternal population, conduct depression screening and assessment, and improve capabilities for early diagnosis and standardized treatment. However, treatment adherence for psychological interventions among pregnant and postpartum women in China remains generally low following depression screening [**?**]. Taking Shenzhen as an example, although postpartum depression screening and intervention programs have been implemented for a long time—with mobile platforms significantly improving implementation efficiency—the proportion of women who screen positive and actually seek treatment at psychological clinics is still less than 20% [**?**].

Overall, China' s maternal mental health service system faces two major challenges: first, the total volume of mental health resources is insufficient and unevenly distributed. In 2019, there were only 2.9 practicing psychiatrists and 9.5 nurses per 100,000 people nationwide, and the service capacity of primary healthcare institutions remains particularly weak [**?**]. Second, there is a mismatch between the intensity of psychological intervention services and the severity of maternal symptoms. Some patients with mild symptoms over-rely on specialized resources, while those with severe symptoms struggle to obtain intensive treatment in a timely manner [**?**].

In 2022, the WHO proposed that the stepped care model provides a theoretical framework for integrating maternal mental health into maternal and child health (MCH) services [Figure 1: see original paper] [**?**]. By organizing interventions in stages and gradually increasing intervention intensity based on the severity of

the patient's symptoms, this model not only improves adherence to psychological interventions in environments with limited mental health resources but also enhances the accessibility and sustainability of interventions by training non-mental health professionals to provide mental health services [**?**]. Numerous international studies have confirmed that the stepped care model has achieved significant results in the prevention and treatment of postpartum depression [**?**].

However, directly applying established international stepped care models to the Chinese context still presents numerous challenges. On one hand, there are significant differences between Chinese pregnant and postpartum women and those in Western countries regarding mental health concepts, family support, and service accessibility, which affect the acceptance and applicability of intervention strategies. On the other hand, the distribution of mental health resources within China' s MCH service system is uneven, and a standardized, reproducible intervention pathway has not yet been established. Current domestic research on stepped interventions for postpartum depression remains scarce; most consist of graded intervention plans constructed based on evidence-based data and maternal interviews [**?**]. These have not yet entered the clinical trial stage and generally lack a systemic pathway design that is oriented toward multi-stakeholder needs and embedded within the MCH service system.

To effectively apply the stepped care model in a local context, it is urgent to gain a deep understanding of the actual needs of mothers and their families regarding the content and delivery formats of psychological interventions. Simultaneously, it is necessary to collect feedback from various service providers regarding resource conditions, service workflows, and implementation feasibility. This study utilizes Community-Based Participatory Research (CBPR) to explore: (1) preferences and needs of postpartum women regarding intervention content and delivery formats; (2) suggestions and feasibility assessments from various service providers regarding intervention content at each stage; (3) the operational status and experiences of the postpartum depression screening and intervention project in Shenzhen; and (4) the integration of staged intervention measures into routine project operations.

Methodology

1.1 Qualitative Research and Program Drafting

1.1.1 Qualitative Interviews From February to July 2024, using a purposive sampling method, we recruited 25 stakeholders from five municipal or district-level maternal and child health hospitals, one municipal psychiatric hospital, and three community health service centers in Shenzhen to participate in semi-structured interviews. The participants included seven postpartum women who screened positive for depression, six psychiatric or psychological healthcare professionals, six maternal and child health staff members, five community postpartum visit personnel, and one full-time researcher. The interview guide was developed based on the WHO stepped-care model for maternal mental health

[Figure 1: see original paper]. The interviews focused on the potential interventions and implementation pathways of the stepped-care model within China' s maternal and child health service system. After completing the data analysis for the 22nd participant, no new themes emerged, indicating theoretical saturation [**?**].

1.1.2 Focus Group Discussion In April 2024, the research team organized a focus group discussion involving seven municipal and district-level project leaders from the Shenzhen Postpartum Depression Screening and Intervention Project. The discussion primarily focused on the applicability and feasibility of the intervention measures proposed during the qualitative interviews within real-world clinical and community settings.

1.1.3 Literature Review Following the initial findings, the research team conducted a literature review and policy analysis between September and October 2024 to provide theoretical and contextual support. Literature searches were performed across Chinese and English databases (CNKI, Wanfang, PubMed, Web of Science) from 2001 to 2024. A total of 14 publications were included: 3 systematic reviews [**?**, **?**], 5 randomized controlled trials [**?**], 1 mixed-methods study [**?**], and 5 clinical guidelines [**?**, **?**].

1.1.4 Formation of the Preliminary Program The research group conducted a comprehensive analysis of the results derived from interviews, focus group discussions, and the literature review. Following the principle of triangulation, the group drafted a preliminary stepped-care intervention program for postpartum depression. This program included 4 intervention stages (primary items), 10 intervention contents (secondary items), and 12 specific measures (tertiary items).

1.2 Delphi Expert Consultation

1.2.1 Expert Selection The research team selected 15 experts from 11 medical institutions and universities in cities such as Shenzhen, Guangzhou, Shanghai, and Changsha. Inclusion criteria included: (1) Expertise in mental health, maternal and child health, public health, or related fields; (2) Master' s degree or higher, and associate senior level title or above; (3) More than 5 years of experience in relevant professional work.

1.2.2 Consultation Process From October 2024 to January 2025, two rounds of Delphi consultation were conducted. Experts rated the importance and feasibility of each item using a Likert 5-point scale. A mean score of ≥ 3.50 and a coefficient of variation (CV) ≤ 0.25 were established as the primary screening criteria.

1.3 Statistical Methods

Data were analyzed using Microsoft Excel and SPSS 23.0. Evaluation indicators included expert enthusiasm (recovery rate), expert authority coefficient (Cr), and coordination degree (CV and Kendall' s W).

Results

2.1 Expert Demographics

The 15 experts had an average age of (45.0 ± 7.4) years and an average professional experience of (21.1 ± 9.2) years. 60.0% were from specialized hospitals and 60.0% held doctoral degrees.

2.2 Delphi Results

The recovery rate for both rounds was 100.0%. The expert authority coefficient (Cr) was 0.86 and 0.87 for the two rounds. In the first round, the CV for importance was 0–0.16 and for feasibility was 0.05–0.27. In the second round, the CV for importance was 0–0.13 and for feasibility was 0–0.21.

2.3 Final Intervention Program

The final program comprises 4 intervention stages, 14 intervention components, and 35 specific intervention measures.

Table 1: Stepped-care intervention program for postpartum depression in maternal and child health institutions utilizing a mobile platform

Stage	Intervention Content	Specific Measures	Importance (Mean±SD)	Feasibility (Mean±SD)
Stage 1: Promotion of good mental health (All postpartum women)	1.1 Public science education	1.1.1 Formulate educational content	4.933 ± 0.258	4.867 ± 0.352
		1.1.2 Online education (Hospital social media)	4.733 ± 0.594	4.800 ± 0.414
		1.1.3 Offline education (Posters/leaflets)	4.733 ± 0.458	4.867 ± 0.352
	1.2 Education for caregivers	1.2.1 Inpatient education	4.867 ± 0.352	4.800 ± 0.414

Stage	Intervention Content	Specific Measures	Importance (Mean±SD)	Feasibility (Mean±SD)
		1.2.2 Targeted post-discharge push	4.867 ± 0.352	4.800 ± 0.414
		1.2.3 Online Q&A module	4.867 ± 0.352	4.667 ± 0.488
	1.3 Screening and evaluation	1.3.1 6-week postpartum screening (EPDS/GAD-7)	5.000 ± 0.000	4.933 ± 0.258
		1.3.2 Automatic EMR entry	4.933 ± 0.258	4.733 ± 0.594
		1.3.3 Convenient self-assessment entry	4.933 ± 0.258	4.733 ± 0.594
		1.3.4 Instant screening feedback	4.933 ± 0.258	4.800 ± 0.414
Stage 2: Preventive interventions (EPDS 10-12)	2.1 Mental health education	2.1.1 Develop specialized materials	4.933 ± 0.258	4.867 ± 0.352
		2.1.2 Weekly online education push	5.000 ± 0.000	4.867 ± 0.352
		2.1.3 Interactive learning/check-ins	4.933 ± 0.258	4.333 ± 0.617
	2.2 Clinic reminders	2.2.1 Weekly outpatient visit reminders	4.933 ± 0.258	4.667 ± 0.617
		2.2.2 Visit record management	4.867 ± 0.352	4.800 ± 0.414

Stage	Intervention Content	Specific Measures	Importance (Mean±SD)	Feasibility (Mean±SD)
	2.3 Follow-up management	2.3.1 Weekly telephone follow-up (4 weeks)	4.933 ± 0.258	4.667 ± 0.488
Stage 3: Treatment of mild symptoms (EPDS 13-14)	3.1 Evidence-based brief CBT	3.1.1 Online CBT modules	4.867 ± 0.352	4.733 ± 0.458
		3.1.2 Interactive video/case analysis	5.000 ± 0.000	4.667 ± 0.488
		3.1.3 Staged module push (8-12 stages)	4.867 ± 0.352	4.733 ± 0.458
		3.1.4 Intervention reminders	4.867 ± 0.352	4.733 ± 0.458
		3.1.5 Caregiver support involvement	4.867 ± 0.352	4.267 ± 0.884
		3.1.6 Feedback collection	4.867 ± 0.352	4.733 ± 0.458
	3.2 Phone/Video counseling	3.2.1 Proactive professional counseling	4.933 ± 0.258	4.600 ± 0.632
		3.2.2 Dynamic adjustment of support	4.933 ± 0.258	4.733 ± 0.458
	3.3 Mental health education	3.3.1 Specialized content design	4.933 ± 0.258	4.800 ± 0.414
		3.3.2 Weekly education push	5.000 ± 0.000	4.733 ± 0.458

Stage	Intervention Content	Specific Measures	Importance (Mean±SD)	Feasibility (Mean±SD)
		3.3.3 Interactive learning/check-ins	4.867 ± 0.352	4.467 ± 0.516
	3.4 Follow-up management	3.4.1 Weekly telephone follow-up (4 weeks)	4.933 ± 0.258	4.733 ± 0.458
	3.5 Referral recommendations	3.5.1 Referral for unimproved symptoms	4.933 ± 0.258	4.733 ± 0.458
		3.5.2 Two-way information sharing	5.000 ± 0.000	4.733 ± 0.458
Stage 4: Treatment of mod-severe symptoms (EPDS $ $15 or self-harm ideation)	4.1 Referral recommendations	4.1.1 Proactive referral for high-risk	4.933 ± 0.258	4.800 ± 0.414
		4.1.2 Information exchange mechanism	5.000 ± 0.000	4.667 ± 0.617
	4.2 Follow-up management	4.2.1 Weekly telephone follow-up (4 weeks)	4.933 ± 0.258	4.733 ± 0.458
	4.3 Crisis hotline connection	4.3.1 Integration of 12356/local hotlines	4.933 ± 0.258	4.933 ± 0.258
		4.3.2 Hotline usage reminders	4.933 ± 0.258	4.933 ± 0.258

Note: EPDS = Edinburgh Postnatal Depression Scale; GAD-7 = Generalized Anxiety Disorder-7; CBT = Cognitive Behavioral Therapy.

Discussion

3.1 Significance of the Mobile Platform-Based Stepped-Care Program

The stepped-care model allows for remote follow-up, treatment, and precise referral via digital platforms. International studies have shown that 95% of women can improve their mental health through low-intensity interventions, with only 5% requiring professional treatment [**?**]. In China, where mental health resources are limited, this model improves service coverage and accessibility. The mobile platform automates data collection and optimizes workflows like screening entry and appointment reminders, aligning with the "Internet + Medical Health" policy [**?**].

3.2 Scientific Rigor of the Program

The program was developed using a mixed-methods approach, synthesizing qualitative data from 25 stakeholders and a focus group of project leaders. This ensured the program addressed the actual needs of mothers and the practical constraints of service providers. The Delphi process with 15 multidisciplinary experts further validated the scientific grounding and clinical operability of the measures.

3.3 Feasibility and Challenges

The integration of education, screening, CBT, and referral services into a unified mobile platform provides a systematic solution for MCH institutions. However, challenges remain. Adherence to online CBT may be affected by maternal schedules and family support. Future implementation should include incentive mechanisms like "learning check-ins." Additionally, the information exchange mechanism for referrals requires strict privacy protection systems and clear data-sharing protocols.

Conclusion

This study developed a scientifically robust and feasible stepped-care intervention program for postpartum depression, supported by a mobile health platform. The program offers theoretical and methodological guidance for maternal and child health institutions to optimize prevention and intervention efforts. Future research should involve small-scale pilot trials to evaluate clinical effectiveness and implementation outcomes in real-world settings.

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