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The influence of postpartum depression literacy on health promoting behaviors among postpartum women

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This study aimed to investigate the influence of postpartum depression literacy on health promoting behaviors among postpartum women, focusing on the mediating role of self-efficacy and the moderating effect of family functioning in this dynamic relationship. A cross-sectional survey was conducted with 622 postpartum women recruited during routine prenatal visits. Data were collected using validated instruments, including the Postpartum Depression Literacy Scale, Health-Promoting Lifestyle Profile II, General Self-Efficacy Scale, and Family Adaptability and Cohesion Scale. A moderated mediation model was adopted to examine direct, indirect, and interaction effects among the variables. Higher levels of postpartum depression literacy were significantly associated with increased engagement in health promoting behaviors. Self-efficacy partially mediated this relationship, with an indirect effect size of 0.35, indicating its central role in translating mental health literacy into positive behavioral outcomes. Family functioning moderated the association between postpartum depression literacy and self-efficacy, with stronger family support amplifying the beneficial effect (interaction effect, $p < 0.05$). These findings indicate that postpartum depression literacy significantly contributes to the adoption of health promoting behaviors among postpartum women, primarily by enhancing self-efficacy, a mechanism that is further reinforced in the context of high family functioning. This underscores the necessity of incorporating both mental health literacy enhancement and family-centered support strategies into comprehensive maternal health promotion programs to maximize behavioral engagement and improve overall maternal well being.

Keywords Postpartum depression, Mental health literacy, Self-efficacy, Health promoting behavior

Pregnancy constitutes a pivotal developmental period in a woman's life, marked not only by profound physiological transformation but also by heightened psychological vulnerability[1]. Women undergoing this transition often become increasingly aware of bodily changes, actively consult healthcare professionals, and adopt targeted lifestyle adjustments with the goal of safeguarding maternal and fetal well-being[2]. Healthcare systems, in parallel, have recognized the far-reaching impact of prenatal behaviors and have accordingly prioritized maternal health services as a critical component of public health strategy. Behaviors adopted during pregnancy have been shown to exert long-term influences on both maternal and offspring health outcomes, reinforcing the importance of early behavioral modifications. According to the World Health Organization, approximately 60% of an individual's health status is determined by behavioral and lifestyle factors[3], which underscores the central role of health behaviors in improving pregnancy outcomes and enhancing intergenerational health trajectories[3].

Health-promoting behavior refers to the process by which individuals actively seek and enhance beneficial health potentials to achieve or maintain optimal physical and mental conditions[4]. Among postpartum women, the adoption of such behaviors serves multiple critical functions by mitigating psychological distress[5], lowering the risk of adverse obstetric outcomes such as preterm birth, maternal obesity, and gestational diabetes, and contributing to reductions in cesarean section rates and hospitalization frequencies. Health-promoting behaviors foster a favorable intrauterine environment that is essential for optimal fetal development and significantly decrease the incidence of low birth weight and neonatal mortality[6–9]. The evidence demonstrates that promoting health behaviors during pregnancy represents a cost-effective and evidence-based strategy to

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improve the health of both mothers and their offspring. This approach plays a crucial role in reducing adverse pregnancy outcomes and supporting long-term intergenerational well-being. Postpartum depression (PPD) is a prevalent and severe mood disorder that typically manifests within six weeks postpartum, characterized by enduring affective disturbances, reduced self-esteem, cognitive deficits such as impaired executive function and creativity, pervasive feelings of hopelessness, and a spectrum of somatic symptoms including anorexia, sleep dysregulation, and fatigue[11]. As one of the most debilitating psychiatric conditions during a woman's reproductive lifespan, PPD exerts profound adverse effects on maternal psychosocial functioning and quality of life[12]. The clinical sequelae of PPD encompass maladaptive emotional regulation, diminished coping capacity, disrupted interpersonal relationships, and an elevated risk for self-injurious behaviors and suicidal ideation, underscoring its critical public health implications[13]. The construct of mental health literacy (MHL), first operationalized by Jorm in 1997, denotes a multidimensional framework comprising knowledge, attitudes, and beliefs that facilitate the recognition, management, and prevention of mental disorders[14]. In the context of PPD, MHL specifically entails the ability to identify symptoms, comprehend risk factors, and implement or seek evidence-based interventions, thereby functioning as a determinant of timely help-seeking and effective self-management[15]. Extant literature consistently evidences the significant influence of psychological constructs, including MHL, on health behaviors and outcomes[16]. For instance, insufficient MHL among perinatal women is linked to maladaptive coping strategies and engagement in risk behaviors such as substance use, which exacerbate clinical prognoses[17]. Conversely, enhancement of MHL has demonstrated efficacy in fostering adaptive health behaviors and improving psychological resilience[18,19]. Notwithstanding these advances, the mechanistic pathways linking postpartum depression-specific MHL to health-promoting behaviors remain inadequately delineated, particularly within Chinese populations where cultural and systemic factors may modulate these associations. The paucity of empirical research investigating these relationships hampers the development of targeted, culturally appropriate interventions designed to optimize maternal mental health literacy and consequent health behavior adherence. Addressing this critical gap represents a pressing imperative for advancing maternal and child health outcomes.

Self-efficacy refers to an individual's confidence in their ability to complete tasks and achieve goals within a specific domain[20]. A robust body of literature, both domestic and international, has elucidated the bidirectional and dynamic interplay between self-efficacy and health-promoting behaviors. From a social cognitive perspective, beliefs and behaviors are reciprocally influential: enhanced self-efficacy bolsters motivation and persistence in adopting health-promoting actions, while successful behavioral enactment reinforces and elevates self-efficacy beliefs. Empirical investigations across diverse populations consistently demonstrate that higher self-efficacy predicts increased frequency and adherence to health-promoting behaviors at varying life stages[21–23]. Moreover, self-efficacy itself is modulated by mental health literacy; individuals with elevated mental health literacy exhibit superior recognition of mental health challenges and demonstrate greater propensity to seek professional psychological support, thereby augmenting their confidence in coping effectively with psychological stressors[24]. Supporting this, a systematic review underscored that targeted improvements in women's health literacy significantly enhance both self-efficacy and self-care behaviors[25,26]. For example, Li Sihui et al. identified a strong positive correlation between adolescents' mental health literacy and self-efficacy, indicating that self-efficacy increases proportionally with improvements in mental health literacy[27]. Collectively, these findings implicate self-efficacy as a potential mediating mechanism through which postpartum depression-related mental health literacy influences the adoption and maintenance of health-promoting behaviors. Elucidating this mediation pathway is essential for designing effective psychosocial interventions aimed at optimizing maternal health outcomes.

Family systems theory conceptualizes the family as the primary social unit, wherein optimal family functioning fosters individual psychological well-being and adaptive health behaviors by enhancing self-esteem, emotional security, and perceived social support[28]. Given that the home environment constitutes the principal context for postpartum women 's daily experiences, the quality of family functioning critically shapes their capacity to engage in and sustain health-promoting behaviors[29]. Empirical evidence suggests that well-functioning families provide abundant emotional support, thereby reinforcing postpartum women 's self-efficacy, facilitating positive health behaviors, and promoting effective self-management[30,31]. Conversely, dysfunctional family dynamics may undermine maternal psychological resilience and hinder health behavior adherence. Despite its theoretical and practical significance, the moderating role of family functioning in the nexus between mental health literacy, self-efficacy, and health-promoting behaviors during pregnancy remains underexplored. Systematic investigation of these interrelationships is warranted to inform family-centered intervention strategies that holistically address the psychosocial determinants of maternal health.

Pender's health promotion model provides a comprehensive theoretical framework for understanding the multifaceted determinants of health behaviors, distinguishing primarily between cognitive-perceptual factors and modifying factors[32]. Cognitive-perceptual factors, encompassing constructs such as perceived health importance, self-efficacy, subjective health status, and anticipated benefits of health-promoting behaviors, function as the proximal motivational drivers that directly influence individuals' adoption and maintenance of health-promoting actions. In contrast, modifying factors, which include demographic variables, social support networks, and environmental or situational contexts, exert an indirect influence by shaping the cognitive-perceptual processes. Within this conceptualization, family functioning emerges as a salient modifying factor that may moderate the strength and direction of the relationship between postpartum depression mental health literacy and self-efficacy. This theoretical insight informs the hypothesis that family functioning modulates how mental health literacy translates into enhanced self-efficacy, thereby impacting subsequent health behavior engagement.

Building upon this framework, the present study seeks to delineate the intricate interrelationships among postpartum depression mental health literacy, self-efficacy, family functioning, and health-promoting behaviors

in postpartum women. We propose a moderated mediation model in which self-efficacy mediates the association between postpartum depression mental health literacy and health-promoting behaviors, while family functioning serves as a moderator of the initial mediation pathway, specifically the link between mental health literacy and self-efficacy (as shown in Fig. 1). This model integrates psychological and socio-environmental dimensions and aims to elucidate the underlying mechanisms that govern behavioral adaptation during the perinatal period. The empirical validation of this model holds significant implications for the development of multifaceted, culturally sensitive interventions designed to enhance maternal mental health literacy, reinforce self-efficacy, and leverage family dynamics to optimize health outcomes for both mothers and offspring.

Method

Study participants

This cross-sectional study employed convenience sampling to recruit postpartum women attending routine antenatal care at Changsha Maternal and Child Health Hospital.

Inclusion criteria were as follows: women aged 18 years or older; within six weeks postpartum; cognitively and physically capable of independently completing the questionnaires; and having provided informed consent for participation.

Exclusion criteria included postpartum women with severe obstetric complications or diagnosed mental disorders. Severe obstetric complications defined as conditions posing substantial risk to maternal or fetal health, including but not limited to preeclampsia, insulin-dependent gestational diabetes mellitus, placenta previa, abruptio placentae, or other acute obstetric emergencies necessitating hospitalization. Diagnosed mental disorders referred to clinically documented psychiatric conditions, incldluing major depressive disorder, bipolar disorder, schizophrenia spectrum disorders, or severe anxiety disorders with functional impairment, as confirmed by medical records or licensed mental health professionals.

Study instruments

1. Demographic questionnaire.

A self-designed demographic questionnaire was used to collect participants' background and obstetric information. Items included age, ethnicity, educational attainment, employment status, monthly household income, gestational age, gravidity and parity history, miscarriage experience, and prior adverse pregnancy outcomes.

2. Postpartum depression literacy scale.

Mental health literacy related to postpartum depression was assessed using the Chinese version of the Postpartum Depression Literacy Scale (PDLS), adapted and psychometrically validated by Huang et al.[33]. The instrument comprises 31 items across six theoretically grounded domains: recognition of postpartum depression symptoms (6 items), knowledge of etiological factors and risk profiles (5 items), beliefs and knowledge regarding self-care practices (5 items), awareness of professional help-seeking options (4 items), attitudes toward advocacy and help-seeking behavior (6 items), and familiarity with informational resources related to postpartum depression (5 items). Each item is rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree),

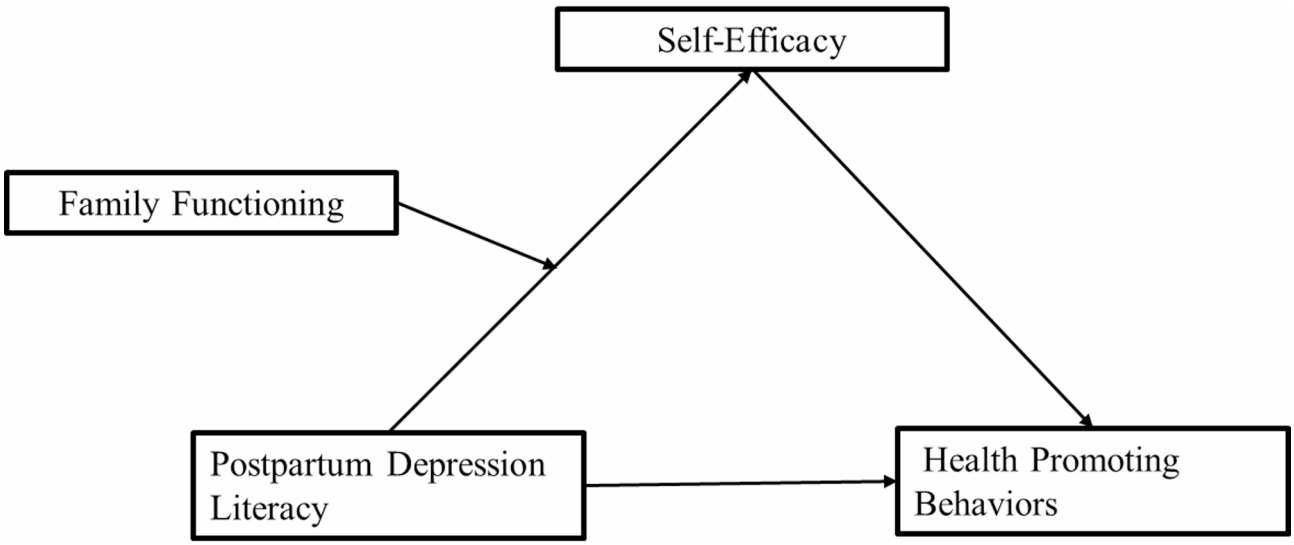

Fig. 1. Hypothetical model illustrating the mediating role of self-efficacy and the moderating role of family functioning in the association between postpartum depression literacy and health-promoting behaviors.

with higher scores reflecting greater literacy regarding postpartum mental health. The overall Cronbach's α coefficient was 0.896, with dimension-specific coefficients ranging from 0.770 to 0.872.

3. Health promoting lifestyle profile II.

Health-promoting behaviors were measured using the Health-Promoting Lifestyle Profile II (HPLP-II), a widely applied instrument originally developed by Walker et al.[34]. The scale consists of 52 items encompassing six behavioral domains: interpersonal relations (9 items), physical activity (8 items), health responsibility (9 items), nutritional practices (9 items), self-actualization (9 items), and stress management (8 items). Responses are recorded on a 4-point Likert scale (1 = never, 4 = routinely), with total scores ranging from 52 to 208. Elevated scores indicate more frequent engagement in health-promoting practices. The overall scale demonstrated excellent internal consistency (Cronbach's α = 0.922), with subscale reliability coefficients ranging from 0.702 to 0.904.

4. General Self-Efficacy Scale.

General self-efficacy was assessed using the General Self-Efficacy Scale (GSES), originally developed by Schwarzer et al.[35] and subsequently translated and validated in Chinese by Wang et al.[36]. The instrument contains 10 unidimensional items that capture individuals' global confidence in their capacity to manage challenging situations and execute goal-directed behaviors. Each item is scored on a 4-point Likert scale ranging from 1 (not at all true) to 4 (completely true), yielding a total score between 10 and 40, with higher scores indicating stronger perceived self-efficacy. The GSES demonstrated high internal consistency, with a Cronbach's α coefficient of 0.870.

5. Chinese Version of the Family Adaptability and Cohesion Evaluation Scales.

Family functioning was evaluated using the Chinese version of the Family Adaptability and Cohesion Evaluation Scales (FACES II-CV), originally developed by Olson et al.[37] and adapted for Chinese populations by Fei et al.[38]. The scale comprises 30 items assessing two key structural components of family systems: cohesion (16 items), which reflects emotional bonding and connectedness among family members, and adaptability (14 items), which reflects the family's flexibility in response to situational stress or change. Items are scored on a 5-point Likert scale (1 = not at all, 5 = always), with higher scores indicating greater levels of cohesion and adaptability. Internal consistency reliability for the current study was acceptable to strong, with Cronbach's α values of 0.850 for the cohesion subscale and 0.730 for the adaptability subscale.

Data collection

Data were collected from the Obstetrics and Neonatology Departments of Changsha Maternal and Child Health Hospital between from July 1, 2024, to October 31, 2024. A digital recruitment poster was developed by the research team, outlining the study objectives, procedures, inclusion and exclusion criteria, and contact information for the investigators. This material was disseminated through official department-managed WeChat follow-up groups by obstetric and neonatal nursing staff. Postpartum women who expressed interest in the study were instructed to contact the research team directly via the details provided in the poster.

At the time of their scheduled postnatal or neonatal outpatient visits, interested participants received a face-to-face explanation of the study protocol from trained research personnel, including the study's purpose, confidentiality provisions, and the voluntary nature of participation. Once participants confirmed eligibility and demonstrated full comprehension, they were invited to complete the questionnaire via a secure Quick Response (QR) code.

The electronic questionnaire was administered using Wenjuanxing, a widely utilized and secure online data collection platform in China. The survey comprised three sequential components: (1) eligibility screening items, used to confirm the participant's alignment with inclusion and exclusion criteria; (2) an electronic informed consent section, which provided a participant information sheet and required a digital informed consent via "I agree" confirmation; and (3) the main survey, consisting of validated psychometric instruments.

Participants completed the survey independently at their convenience, using mobile devices. Real-time support was available to address technical or content-related queries. A total of 628 questionnaires were distributed electronically, with 622 valid responses returned, resulting in a high effective response rate of 99.04%.

Statistical analysis

Data were analyzed using SPSS 26.0. Measurement data were described using means ± standard deviations, while categorical data were described using frequencies and proportions. Pearson correlation analysis was used to examine the relationships among postpartum depression literacy, health-promoting behaviors, self-efficacy, and family functioning. The PROCESS 4.1 macro in SPSS 26.0 was utilized to establish mediation and moderation models, analyzing the mediating effect of self-efficacy between postpartum depression literacy and health-promoting behaviors, as well as the moderating effect of family functioning. A p-value of < 0.05 was considered statistically significant.

Results

Impact of demographic factors on health-promoting behaviors among postpartum women

Univariate analyses identified several sociodemographic factors, including maternal and paternal education levels, occupational status of both parents, residential setting, type of medical insurance coverage, monthly per capita household income, quality of family relationships, and pregnancy intentionality, as significantly associated

with the engagement in health-promoting behaviors among postpartum women (refer to Table 1 for detailed statistics).

Interrelationships among postpartum depression mental health literacy, self-efficacy, family functioning, and health-promoting behaviors

Pearson correlation coefficients revealed statistically significant positive associations between postpartum depression-specific mental health literacy, self-efficacy, family functioning, and health-promoting behaviors ($p < 0.01$). Furthermore, postpartum depression mental health literacy was significantly correlated with both self-efficacy and family functioning ($p < 0.01$), while self-efficacy demonstrated a robust positive correlation with family functioning ($p < 0.01$) (as shown in Table 2).

Hierarchical multiple regression analyses of determinants of health-promoting behaviors

Hierarchical multiple regression analysis was employed to elucidate the predictors of health-promoting behaviors. Initially, variables found significant in univariate analyses were entered; however, these demographic factors did not retain statistical significance and were thus excluded from the final model. Subsequently, psychosocial variables including postpartum depression mental health literacy, self-efficacy, and family functioning (cohesion and adaptability) were incorporated. The final regression model demonstrated that family relationship quality (β = -0.07, $p = 0.03$), pregnancy planning status (β = -0.07, $p = 0.02$), postpartum depression mental health literacy ($\beta = 0.16$, $p < 0.001$), self-efficacy ($\beta = 0.23$, $p < 0.001$), and family functioning ($\beta = 0.38$, $p < 0.001$) were significant independent predictors of postpartum health-promoting behaviors. These findings justified inclusion of family relationship quality and pregnancy planning status as covariates in subsequent mediation and moderated mediation analyses (as shown in Table 3).

Moderated mediation effect

Common method variance was evaluated via Harman's single-factor test, which extracted 20 factors with eigenvalues greater than 1. The first factor accounted for 25.39% of total variance, below the critical threshold of 40%, indicating negligible common method bias. Using Hayes' PROCESS macro (Model 7), all continuous predictors were mean-centered to mitigate multicollinearity. Controlling for family relationships and pregnancy planning, postpartum depression mental health literacy exerted significant positive effects on self-efficacy ($\beta = 2.21$, $p < 0.001$) and health-promoting behaviors ($\beta = 11.79$, $p < 0.001$). Self-efficacy was a significant positive predictor of health-promoting behaviors ($\beta = 1.61$, $p < 0.001$). Importantly, the interaction term between postpartum depression mental health literacy and family functioning significantly predicted self-efficacy ($\beta = 0.04$, $p < 0.001$) (as shown in Table 4).

Simple slope analyses further clarified the moderating effect of family functioning on the relationship between mental health literacy and self-efficacy. This association was strongest under conditions of high family functioning (mean plus one standard deviation; $\beta = 3.05$, $p < 0.001$), moderate at average family functioning (mean; $\beta = 2.21$, $p < 0.001$), and attenuated yet statistically significant under low family functioning (mean minus one standard deviation; $\beta = 1.36$, $p < 0.001$), indicating a dose-response moderation effect.

Mediation analyses confirmed both direct and indirect pathways through which postpartum depression mental health literacy influences health-promoting behaviors via self-efficacy, with family functioning serving as a significant moderator of the initial mediation path (Table 5).

Discussion

This study provides a nuanced examination of the pathways linking postpartum depression mental health literacy to health-promoting behaviors among postpartum women, employing a moderated mediation model to elucidate the underlying mechanisms. Our findings reveal that self-efficacy partially mediates this relationship, while family functioning significantly moderates the effect of mental health literacy on self-efficacy, thereby influencing subsequent health behaviors. These results underscore the interplay between individual cognitive factors and the socio-environmental context in shaping postpartum health outcomes.

Relationship between postpartum depression mental health literacy and health-promoting behaviors

Our results demonstrate a robust positive association between postpartum depression mental health literacy and engagement in health-promoting behaviors. Maternal health literacy represents a crucial determinant of behavioral choices related to maintaining health during the postpartum period[39]. Specifically, higher levels of mental health literacy enable mothers to accurately recognize symptoms and risk factors associated with postpartum depression, thereby fostering proactive health management and help-seeking behaviors[40]. Empirical evidence supports that postpartum women with elevated mental health literacy are more likely to participate in counseling services, adhere to routine health assessments, comply with nutritional supplementation protocols such as folic acid intake, and maintain regular physical activity[41]. This increased awareness facilitates conscious adoption of health-promoting practices, including establishing balanced daily routines, adhering to scientifically grounded dietary regimens, engaging in appropriate exercise, and cultivating positive social interactions, all of which contribute to emotional stability and mitigate adverse postpartum psychological outcomes[40].

Mediating role of self-efficacy in the relationship between postpartum depression mental health literacy and health-promoting behaviors

The mediation analysis indicates that self-efficacy serves as a partial mediator in the association between postpartum depression mental health literacy and health-promoting behaviors. This finding aligns with extant literature emphasizing the central role of self-efficacy in facilitating health behavior change[42,43]. Enhanced

Variable	*n*	Score	t/F	*P*
Age (years)			1.971	0.140
18 ~ 30	329	150.95 ± 21.86		
31 ~ 40	279	153.33 ± 26.20		
≥ 41	14	141.71 ± 33.94		
Ethnicity			0.068	0.946
Han	581	151.83 ± 24.07		
Others	41	151.56 ± 26.83		
Residence			2.076	0.038
Urban	556	152.50 ± 24.48		
Rural	66	145.97 ± 21.42		
Education level of pregnant woman			7.002	0.000
Junior High School or Below	24	137.83 ± 20.38		
High School or Vocational School	81	146.89 ± 27.48		
Associate Degree or Bachelor's Degree	445	152.07 ± 23.04		
Master's Degree or Above	72	160.40 ± 25.82		
Education level of husband			7.395	0.000
Junior High School or Below	33	142.18 ± 24.16		
High School or Vocational School	97	144.04 ± 25.39		
Associate Degree or Bachelor's Degree	406	153.21 ± 22.88		
Master's Degree or Above	86	157.65 ± 26.50		
Occupation of pregnant woman			6.125	0.002
Unemployed	118	145.74 ± 23.41		
Farmer	470	153.73 ± 24.34		
Worker	34	146.38 ± 21.91		
Occupation of husband			5.671	0.004
Unemployed	28	140.39 ± 27.40		
Farmer	565	152.84 ± 24.14		
Worker	29	142.86 ± 18.23		
Medical payment method			12.782	0.000
Out-of-Pocket	132	144.21 ± 23.42		
Maternity Insurance	368	155.66 ± 24.22		
Health Insurance	122	148.43 ± 22.87		
Monthly per capita family income (Yuan)			4.829	0.008
≤ 2000	24	140.71 ± 29.57		
2001 ~ 3000	145	148.62 ± 25.24		
3001 ~ 4000	453	153.42 ± 23.40		
Family relationship			9.739	0.000
Harmonious	578	152.80 ± 24.09		
Average	40	136.13 ± 20.56		
Unsatisfactory	4	165.25 ± 28.50		
Gestational age (weeks)			-1.756	0.080
≤ 12	156	148.87 ± 25.29		
13 ~ 27	466	152.80 ± 23.83		
Hospitalization for pregnancy maintenance			0.407	0.684
Yes	116	152.64 ± 25.38		
No	506	151.62 ± 24.00		
Adverse pregnancy history			-0.425	0.671
Yes	81	150.74 ± 26.41		
No	541	151.97 ± 23.92		
History of miscarriage			-1.698	0.090
Yes	168	149.10 ± 23.59		

Continued

Variable	*n*	Score	t/F	*P*
No	454	152.81 ± 24.43		
Planned pregnancy			2.584	0.010
Yes	447	153.51 ± 22.65		
No	175	147.47 ± 27.50		
Birth order			0.890	0.374
First child	402	152.45 ± 24.27		
Second child and above	220	150.64 ± 24.19		
Expectation of fetal gender			0.787	0.432
Yes	299	152.61 ± 25.04		
No	323	151.07 ± 23.50		
Presence of pregnancy complications or comorbidities			0.001	1.000
Yes	85	151.81 ± 26.14		
No	537	151.81 ± 23.95		

Table 1. Influence of different demographic factors on health-promoting behaviors of postpartum women.

Variable	$\bar{x} \pm s$	HPLPII	PoDLis	GSES	FACES II-CV
Health-promoting behaviors	151.81 ± 24.24	1			
Postpartum depression literacy	3.42 ± 0.54	0.44**	1		
Self-efficacy	26.02 ± 6.33	0.53**	0.41**	1	
Family functioning	104.87 ± 21.27	0.60**	0.42**	0.57**	1

Table 2. Correlation among maternal postpartum depression mental health literacy, self-efficacy, family function, and health promotion behavior. ** $P < 0.01$.

mental health literacy augments individuals' understanding and acceptance of mental health challenges, reduces internalized stigma, alleviates feelings of helplessness, and promotes resilience. These psychological processes collectively strengthen self-efficacy[44]. Postpartum women possessing higher mental health literacy develop greater confidence in managing postpartum stressors through the acquisition of psychological knowledge and cultivation of positive attitudes. This enhanced self-efficacy propels them to effectively translate knowledge into actionable health behaviors by perceiving stressors as manageable and comprehensible. Consequently, these women demonstrate greater motivation and capacity to sustain health-promoting behaviors, underscoring the critical importance of fostering self-efficacy within postpartum mental health interventions.

Moderating role of family functioning in the pathway from postpartum depression mental health literacy to self-efficacy and health-promoting behaviors

Our study also revealed a significant positive correlation between family functioning and health-promoting behaviors, consistent with prior research emphasizing the family as a fundamental living environment for postpartum women[45,46]. Family members provide essential emotional, informational, and instrumental support that influences postpartum women's physical activity, dietary habits, and psychological well-being[47,48]. Support from family helps reduce maternal workload and psychological stress, enabling better rest and recovery. Studies have highlighted that support from partners and family is a strong protective factor against mental health issues during pregnancy and postpartum, and women with high family functioning report better psychological health[49]. Importantly, our results confirmed that family functioning moderates the relationship between postpartum depression mental health literacy and self-efficacy. Women with high family functioning are more likely to exhibit greater self-efficacy when they possess good mental health literacy, which subsequently promotes higher levels of health-promoting behaviors. Functional families support self-efficacy development primarily through social support mechanisms[50]. Emotional support and care from family members help regulate postpartum psychological stress, facilitating the conversion of mental health knowledge into self-efficacious beliefs. This process increases women's confidence and motivation to engage in health-promoting activities[10]. In contrast, family conflicts or lack of communication may result in self-doubt and helplessness, hindering the application of mental health knowledge in daily life. Therefore, healthcare providers should focus on mobilizing family resources and delivering postpartum education to families. Enhancing family support can improve the psychosocial environment, thereby promoting health behaviors and psychological well-being among postpartum women.

Variables2	Model1				Model2			
	B (95%CI0	SE	β	*P*	B (95%CI)	SE	β	*P*
Step 1								
Residence	-1.96 (-8.57,4.66)	3.37	-0.02	0.56	-1.60 (-6.64,3.43)	2.56	-0.02	0.53
Education level of pregnant woman	3.51 (-0.55,7.56)	2.07	0.09	0.09	0.45 (-2.67, 3.58)	1.59	0.01	0.78
Education level of husband	2.37 (-1.34,6.09)	1.89	0.07	0.21	1.86 (-0.97, 4.69)	1.44	0.05	0.20
Occupation of pregnant woman	2.63 (-1.50,6.76)	2.10	0.05	0.21	0.65 (-2.50, 3.80)	1.6	0.01	0.68
Occupation of husband	0.71 (-5.67,7.08)	3.25	0.01	0.83	2.86 (-2.00, 7.72)	2.48	0.04	0.25
Medical payment method	0.68 (-2.36,3.72)	1.55	0.02	0.66	0.89 (-1.43,3.20)	1.18	0.02	0.45
Monthly per capita family income (Yuan)	1.96 (-1.90,5.82)	1.97	0.04	0.32	0.49 (-2.47,3.44)	1.51	0.01	0.75
Family relationship	-6.64 (-13.29,0.01)	3.39	-0.08	0.05	-5.60 (-10.67,-0.52)	2.58	-0.07	0.03
Planned pregnancy	-4.14 (-8.40,0.13)	2.17	-0.08	0.06	-3.94 (-7.21,-0.67)	1.67	-0.07	0.02
Step2								
Postpartum depression literacy					0.24 (0.14,0.34)	0.05	0.16	<0.001
Self-efficacy					0.90 (0.62,1.18)	0.14	0.23	<0.001
Family functioning					0.43 (0.35,0.52	0.04	0.38	<0.001
R^2	0.06				0.46			
Adjusted R^2	0.05				0.45			
R2 variable	0.06				0.40			
F	4.27^{***}				42.77^{***}			

Table 3. Multilevel hierarchical regression analysis of factors influencing health-promoting behaviors in postpartum women. ***P<0.001.

Variable	Self-efficacy			Health-promoting behaviors		
	coeff	SE	t	coeff	SE	t
Family relationship	0.76	0.71	1.08	-8.23	2.74	-3.01^{***}
Planned pregnancy	-0.13	0.46	-0.28	-3.28	1.77	-1.85
Postpartum depression literacy	2.21	0.42	5.20^{***}	11.79	1.62	7.30^{***}
Self-efficacy				1.61	0.14	11.87^{***}
Family functioning	0.15	0.01	14.18^{***}			
Postpartum depression literacy * Family functioning	0.04	0.01	3.57^{***}			
R^2	0.38			0.36		
F	74.46^{***}			85.53^{***}		

Table 4. Examination of the moderated mediation effect of postpartum depression literacy on health-promoting behaviors. *** P<0.001.

Practical implications

This study, grounded in Pender's Health Promotion Model and Bandura's social cognitive theory, reveals that postpartum depression mental health literacy influences health-promoting behaviors through self-efficacy, with family functioning serving as a critical socio-environmental moderator. By integrating these factors within a moderated mediation framework, our findings underscore the interdependence of individual cognitive resources and social support systems in shaping postpartum health behaviors. This highlights the necessity of multidimensional interventions that concurrently enhance mental health literacy, bolster self-efficacy, and optimize family dynamics. Implementing culturally sensitive, family-inclusive programs based on this integrative

The mediating role of self-efficacy			
Effect	**BootSE**	**BootLLCI**	**BootULCI**
2.20	1.01	-0.17	3.85
3.55	0.85	1.78	5.19
4.91	0.92	3.16	6.8
The direct impact of postpartum depression literacy			
SE	***P***	**LLCI**	**ULCI**
1.62	<0.001	8.62	14.96
Moderated mediation index			
Index	**BootSE**	**BootLLCI**	**BootULCI**
0.06	0.02	0.03	0.12

Table 5. Direct and indirect effects of postpartum depression literacy on health-promoting behaviors.

perspective may foster sustained behavioral improvements and ultimately benefit maternal and infant health outcomes.

Limitation

Notwithstanding the significant contributions of this study, several methodological and contextual limitations warrant consideration.

Firstly, the cross-sectional nature of the study precludes any definitive causal inferences regarding the directional relationships among postpartum depression literacy, self-efficacy, family functioning, and health-promoting behaviors. Prospective longitudinal designs are imperative to elucidate the temporal dynamics and causality within this complex interplay. Secondly, the sample was drawn exclusively from a single healthcare institution and predominantly comprised women within six weeks postpartum, which may constrain the external validity and limit the generalizability of the findings to broader postpartum populations, diverse geographic regions, or varying postpartum stages. Multisite studies with larger, more heterogeneous cohorts are recommended to enhance representativeness and applicability. Thirdly, reliance on self-report measures introduces potential biases, including social desirability and recall biases, which may compromise the precision and objectivity of the data related to health behaviors and psychosocial constructs. Future investigations would benefit from integrating multimodal assessment strategies, such as clinician evaluations, objective behavioral measures, or collateral informant reports, to augment measurement robustness. Furthermore, the disproportionately small sample size of participants aged 41 years and older represents a significant limitation. This demographic distribution aligns with contemporary obstetric trends, wherein pregnancies beyond 40 years are categorized as high-risk and thus occur less frequently. The underrepresentation of this advanced maternal age cohort potentially diminishes the statistical power to detect age-specific associations and limits the external validity of the findings for this subgroup. To comprehensively elucidate the influence of postpartum depression literacy and its psychosocial correlates across the full maternal age spectrum, future research should prioritize the recruitment of larger, more representative samples of older postpartum women.

Conclusion

This study demonstrates that postpartum depression mental health literacy significantly influences health-promoting behaviors among postpartum women. Self-efficacy functions as a partial mediator in this relationship, while family functioning moderates the association between mental health literacy and self-efficacy. These findings provide robust evidence elucidating the internal mechanisms through which mental health literacy affects postpartum health behaviors, offering critical insights to guide the development of targeted intervention programs.

Nevertheless, several limitations warrant consideration. The sample was recruited from a single tertiary hospital, which may limit the generalizability of the findings. The reliance on self-reported data introduces the potential for recall bias. Moreover, the cross-sectional study design restricts causal inferences regarding the relationships among variables. Future research should address these limitations by employing larger, multicenter, and longitudinal designs to more comprehensively explore determinants of health-promoting behaviors in postpartum populations.

Data availability

Data supporting the findings of this study are available from the corresponding author upon reasonable request.

Received: 28 December 2024; Accepted: 16 July 2025
Published online: 24 July 2025

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Acknowledgements
The authors extend their sincere gratitude to all participants and researchers who contributed to this study.

Author contributions
All authors have read and approved the final manuscript.Zhuihui Chen conceptualized the proposal, designed the questionnaire, collected data, and wrote and edited the draft.Chuntao Liu collected data, performed the analysis, and reviewed the draft.Xiaojing Tan collected data and reviewed the draft.Xiaoli Liao conceptualized the proposal, designed the questionnaire, performed the analysis, and reviewed the draft.All authors reviewed the manuscript.

Funding
The authors received no financial support for the research, authorship, or publication of this article.

Competing interests
The authors declare no competing interests.

Ethical approval
The study protocol received ethical approval from the Changsha Hospital for Maternal and Child Health Care (NO.: EC-20240625-21). All procedures were conducted in accordance with the 1964 Declaration of Helsinki and its subsequent amendments or comparable ethical standards.

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