ORIGINAL ARTICLE

The association between paternal childcare involvement and postpartum depression and anxiety among Chinese women—a path model analysis

Xiaoying Zhang[1] · Ping Ma[2] · Ming Li[3]

Abstract

Depression and anxiety are among the most common morbidities during the perinatal period. Very few studies have been conducted to examine the association between paternal childcare involvement and postpartum depression (PPD) and anxiety (PPA) in East Asian cultures. This study aims to examine the association between fathers' involvement in childcare and mothers' mental health and explores the potential mediating effects of the mother and child's health among a national sample of Chinese women. This is a cross-sectional, self-administered online survey of maternal women ($N = 778$) within 1 year after childbirth in China. The questionnaire comprised of sociodemographics, fathers' childcare involvement, child and mother's physical health, and mothers' postpartum mental health status. A path analysis model was constructed to examine the correlation between paternal childcare involvement and maternal depression and anxiety within 1-year postpartum. The mediating effect of the mother and child's physical health was also explored in the model. Paternal involvement in childcare was significantly associated with lower PPD ($\beta = -.36$, $p < 0.001$) and PPA ($\beta = -.29$, $p < 0.001$) levels of mothers after covariates were adjusted. Furthermore, women's physical health partially mediated the association between paternal involvement and PPD, and child's health partially mediated the association between paternal involvement and PPA and PPD. Our findings emphasize the essential role of father's childcare involvement and the need to promote culturally tailored intervention programs, which may improve the mental health status among Chinese postpartum mothers.

Keywords Paternal childcare involvement · Postpartum depression · Postpartum anxiety · Path analysis · Physical health

Introduction

The postpartum period increases the vulnerability of women to develop mental disorders such as depression and anxiety. Postpartum depression (PPD), a common morbidity during the postpartum period, is one of the most debilitating complications of childbearing. The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) defines

PPD as major depressive disorder with depressive symptoms onset within 4 weeks after delivery, and it may extend into 1-year postpartum (Castillo et al. 2007). In developed countries, one in seven women suffer from PPD, and the prevalence is even higher at one in five women in low- and middle-income countries (Fisher et al. 2012; Gelaye et al. 2016). Postpartum anxiety (PPA) is another common mental disorder affecting postpartum women. A recent narrative review indicated that the prevalence of PPA ranged from 13% to 40% (Field 2018). Previous studies have shown that untreated maternal mental disorders have far-reaching negative consequences on women's daily functioning and quality of life. For instance, perinatal depression may develop into chronic and recurrent depression, potentially resulting in more severe consequences of mental disorders (e.g., psychosis) and suicide (Gressier et al. 2017; Slomian et al. 2019). Additionally, PPD and PPA caused mothers to be less responsive to a child's needs, which adversely affects

✉ Xiaoying Zhang
   zhangxy_21@sumhs.edu.cn

1 College of Public Health, Shanghai University of Medicine and Health Sciences, Shanghai 200124, China

2 Department of Health Promotion and Community Health Sciences, School of Public Health, Texas A&M University, College Station, TX 77843, USA

3 Department of Health Sciences, Towson University, Towson, MD 21252, USA

their intellectual and emotional development (Drury et al. 2016; Evans et al. 2012; Madigan et al. 2018).

Women with PPD and/or PPA have experienced complicated barriers to professional mental healthcare service access and utilization, for example, busy schedule for the transition to motherhood, stigma attached to mental diseases, lack of social support, and inaccessibility to healthcare sources. Therefore, the development of culturally tailored PPD and PPA screening and prevention programs for maternal women at higher risk is an effective strategy to reduce the onset of mental disorders among maternal women. Identifying risk factors associated with PPD and PPA will be the key first step to strengthen our understanding and provide a foundation for mental health care professionals to develop such programs.

Risk factors for PPD have been explored in Western and Eastern countries (Klainin & Arthur 2009; Qi et al. 2021; Robertson et al. 2003; Robertson et al. 2004; Stewart et al. 2003; Vigod et al. 2010). Previous studies indicated that social support is a critical buffer for maternal mental health problems. However, the role of the father's involvement in childcare on maternal mental health is greatly understudied. The current literature mainly focuses on special groups such as adolescent mothers, minorities, and low-income families (de Mendonça et al. 2012; Fagan & Lee 2010). In addition, among the limited number of studies, most focused on the association between paternal involvement and PPD, and few studies have been conducted to examine the impact of fathers' childcare involvement on PPA. It is also noted that previous studies merely examined the association between paternal involvement and maternal mental health, and not the mechanism behind the association.

Furthermore, the role of paternal involvement in maternal mental health is especially under studied in Eastern countries as most previous studies on the relationship between fathers' involvement and maternal mental health are in Western cultural backgrounds (Kim et al. 2020; Sejourne et al. 2012). Actually, the role of paternal childcare involvement in maternal mental health warrants special attention in Eastern culture because Chinese father's role in childcare was traditionally absent for a large part of history. Several factors contributed to this phenomenon. First, East Asian countries, including Japan, China, and Korea, were influenced by the Confucian culture, under which men are expected to develop careers and women are expected to take care of household chores (Chen & He 2004; Lin et al. 2017). Therefore, childcare, especially caring for an infant, is considered a responsibility primarily placed on women. In addition, the extended family's intensive involvement in postpartum care and childcare further attenuated the father's role. Childcare responsibilities were shared between the mother and the grandmothers, rather than with the father. A qualitative study once reported that Chinese women mainly expect emotional support from their husbands and instrumental support (tangible assistance) from their extended family (Tang et al. 2016). However, as the times change, China is transitioning from an extended family culture to a nuclear family culture. Also, as women's employment rates rise, men are increasingly participating in childcare. Considering fathers are the most important family members, paternal childcare involvement's role in maternal mental health calls for more research. We are interested in the association between paternal childcare involvement and women's PPD and PPA in East Asian cultural backgrounds.

This study aims to examine the association between fathers' childcare involvement and maternal mental health in the Chinese context and explore possible mediating roles of women's physical health and child health. A deeper understanding of the father's role in maternal mental health during the postpartum period will help health professionals and researchers develop effective intervention programs to reduce the onset of PPD (Dennis at al. 2017).

Methods

Study design and participants

The cross-sectional, self-administered online survey study was conducted among Chinese maternal women from October 2021 to April 2022 via Wenjuanxing (Changsha Ranxing Information Technology Co., Ltd., Hunan, China). Wenjuanxing is the largest commercial survey design platform and survey sampling and administration company in China, which recruits individuals who sign up on the website to take paid surveys across multiple sites nationally. The eligibility criteria for the online survey were Chinese women who (1) are mothers of children under 1-year-old; (2) aged between 18 and 45 years old; and (3) live on the Chinese mainland. As women with a history of mental disorders before pregnancy are at an increased risk for developing mental health problems during pregnancy and after childbirth again (Biaggi et al. 2016; Ghaedrahmati et al. 2017), we excluded women with a history of mental disorders to control for confounding effect. Wenjuanxing sent emails to eligible women who had previously signed up to receive online survey invitations. The email offered compensation that is worth six Chinese yuan (about 1 US dollar) for each respondent. Ethical approval was obtained from the ethical review board of Shanghai University of Medicine and Health Sciences. Informed consent was recorded electronically before answering the questions.

Survey development procedure

All survey questions were initially adopted from national surveys and PPD-related literature by our research team.

The survey questions were then reviewed and revised by an expert review panel that includes psychiatrists, maternal and child health physicians and nurses, and public health researchers.

The updated survey was pilot tested among 30 eligible women living in both urban and rural areas in China to collect comments on the appropriateness of the content, language use, literacy level, and online logic settings. The final survey consists of five main sections including demographics and social-economic status, women's self-reported health, child's health status, fathers' involvement in childcare, and measurement of women's PPD and PPA. Furthermore, we used additional strategies to improve the quality of survey data. First, a forced answering option was applied to all questions to reduce the missing data rate on key variables of interest. Second, a trap question (e.g., "Where is Mountain Tai?," please select C regardless of the correct answer) was inserted in the questionnaire, and respondents who provided a wrong answer were removed from the follow-up analyses. We also excluded questionnaires if the total answering time was less than 3 min, as a shorter answering time negatively affects the quality of the responses based on the length of the questionnaire and the average reading speed of Chinese. Furthermore, two reviewers checked each questionnaire independently for the answers to two highly correlated survey questions (e.g., "mental health status after childbirth" and "ever experienced mental health concerns postpartum"). The questionnaires with inconsistent answers to these two questions were marked with a star, and the entire questionnaire responses were discussed and assessed to determine the overall quality of responses. Questionnaires were excluded if a poor-quality consensus was reached among reviewers and all authors. Ultimately, a total of 19 questionnaires were removed from the study.

Measures

Fathers' involvement in childcare

A survey was designed to assess paternal involvement in childcare. This scale is a five-item self-reported questionnaire covering five aspects of childcare: feeding and hygiene-related work; purchasing diapers, formula, and other food or toys for the child; playing with the child; caring for the child during nighttime; and taking care of the child when they are sick. The five items are assessed on a 5-point Likert scale from 1 (seldom or never) to 5 (usually). These five dimensions covered the main concepts developed by previous literature on the measurement of father involvement in infant care (Garfield et al. 2019; Lin et al. 2017; Singley et al. 2018), and we modified it with consideration of the Chinese context based on interviews of postpartum mothers after the pilot test.

Postpartum depression (PPD)

The validated Chinese version of the Edinburgh Postpartum Depression Scale (EPDS) was used to assess women's PPD symptoms (Cox et al. 1987; Lee et al. 1998). The EPDS consists of a set of 10 screening questions to assess a woman's depressive symptoms in the past seven days during the postpartum period. Each question was scored on a four-point Likert scale from 0 (not at all) to 3 (most of the time) to assess the frequency of symptoms, yielding a total theoretical score of 0 to 30, with a higher score indicating more severe PPD symptoms. The total score of EPDS higher than 12 indicates a medium or severe level of PPD. The Cronbach's alpha for EPDS in this study sample was 0.80, indicating high reliability in our sample. Notably, we used EPDS as a continuous variable in the current study to assess the level of PPD symptoms.

Postpartum anxiety (PPA)

PPA symptom was assessed using the Generalized Anxiety Disorder 7-item (GAD-7) scale (Spitzer et al. 2006). The GAD-7 has demonstrated good validity and reliability among the Chinese population in previous studies (Zhou et al. 2018). Each item was scored on a four-point scale from 0 (not at all) to 3 (most of the time) to assess the frequency of symptoms. The summed score of the seven questions, ranging from 0 to 21, was used to measure the anxiety level. A total score of GAD-7 larger than 9 indicates a medium or severe level of PPA. The Cronbach's alpha for GAD-7 was 0.80 in our sample. We used GAD-7 as a continuous variable to assess the level of PPA symptoms in this current study.

Potential mediators

Women's physical health was measured by a self-reported question, "How would you rate your health?" and answers ranged from 1 (very bad) to 5 (very good). The child's health status was determined from a five-point Likert question reported by the mother, "How is your child's health?" and answers ranged from 1 (very bad) to 5 (very good).

Covariates

Sociodemographic covariates were adjusted in the analyses including maternal age (18–25 years, 26–30 years, 31–35 years, 36–40 years, or 41–45 years), mother's education level (high school and lower, bachelor's degree or above), and annual household income (< 80,000; 80,000–150,000, 150,000–300,000, > 300,000). Additionally, whether the father lives at home during the postpartum period was included in the model.

Data analysis

All statistical analyses were performed using Stata 16.0 (Stata Corp, College Station, TX, USA). Descriptive analyses (e.g., percentages, mean with standard deviation [std. dev]) were conducted to describe the participants' sociodemographic characteristics, mothers' self-reported health status, child's health status, whether the father lives at home during the postpartum period, fathers' involvement in childcare, and maternal PPD and PPA scores. Cronbach's alpha was conducted to examine the reliability of each construct. A confirmatory analysis was also constructed to examine the validity of the instrument assessing fathers' childcare involvement. A path analysis model was construed to examine the association between fathers' childcare involvement and maternal PPD and PPA level. Only variables that are significant in the bivariate analysis were included in the path analysis model. Additionally, we assessed the potential mediating effects of women's health and child's health between the fathers' involvement and maternal mental health (e.g., PPD and PPA respectively). In the current study, model fit was assessed based on the root mean square error of approximation (RMSEA), comparative fit index (CFI), and standardized root mean residual (SRMR). A RMSEA < 0.08, a CFI > 0.90, and a SRMR < 0.06, were used as the cut-off points for an adequate model fit (Hu & Bentler 1999).

Results

Characteristics of the study sample

The study included 778 women (18–45 years) who met the eligibility criteria. Table 1 shows the sample characteristics of the participants. The majority of the mothers were between 18 and 35 years old (96.65%), with a bachelor's degree or above (89.46%), had only one child (85.73%), and lived in urban areas (82.26%). And 83.55% of fathers live at home during the postpartum period. More than two-thirds (67.74%) of the participants had an annual household income between 80,000 and 300,000 Chinese yuan.

Table 1 Sample characteristics, women within 1-year postpartum ($n = 778$)

Characteristics	N (%)	Mean (std. dev)
Postpartum depression (EPDS > = 13)	227 (29.18%)	
Postpartum depressive symptoms (continuous)		10.08 (4.95)
Anxiety (GAD-7 > = 10)	143 (18.38%)	
Anxiety symptoms (continuous)		5.48 (3.63)
Age (years)		
18–25	72 (9.25%)	
26–30	512 (65.81%)	
31–35	168 (21.59%)	
36–45	26 (3.35%)	
Women's education level		
< College degree	82 (10.54%)	
> = College degree	696 (89.46%)	
Yearly household income (Chinese Yuan)		
Less than 80,000	131 (16.84%)	
80,000 to 150,000	234 (30.08%)	
150,000–300,000	293 (37.66%)	
> 30,0000	120 (15.42%)	
Number of children		
One	667 (85.73%)	
Two or more	111 (14.27%)	
Areas of living		
Urban	648 (82.26%)	
Non-urban	140 (17.74%)	
Father lives at home		
Yes	650 (83.55%)	
No	128 (16.45%)	
Mother's health status		3.87 (0.65)
Children's health status		4.28 (0.66)

Table 2 Fathers' childcare involvement ($n = 778$)

Characteristics	N (%)
Father's feeding and hygiene involvement	
Seldom	20 (2.57%)
Occasionally	124 (15.94%)
Sometimes	162 (20.82%)
Often	400 (51.41%)
Usually	72 (9.25%)
Father's purchasing involvement	
Seldom	45 (5.78%)
Occasionally	126 (16.20%)
Sometimes	192 (24.68%)
Often	304 (39.07%)
Usually	111 (14.27%)
Father's play and reading involvement	
Seldom	13 (1.67%)
Occasionally	85 (10.93%)
Sometimes	188 (24.16%)
Often	372 (47.18%)
Usually	120 (15.42%)
Father's night childcare involvement	
Seldom	51 (6.56%)
Occasionally	135 (17.35%)
Sometimes	245 (31.49%)
Often	290 (37.28%)
Usually	57 (7.33%)
Father's childcare involvement when child is sick	
Seldom	8 (1.03%)
Occasionally	28 (3.60%)
Sometimes	82 (10.54%)
Often	358 (46.02%)
Usually	302 (38.82%)

The mean score of EPDS was 10.08 (std. dev = 4.95), and more than 29% of the women had a medium or severe level of PPD with an EPDS score > 12. The mean score of GAD-7 was 5.48 (std. dev = 3.63), and 18.38% of women demonstrated medium to severe levels of PPA with a GAD-7 score > 9.

Table 2 shows the percentages of fathers' childcare involvement in five specific domains. More than half of participating fathers (59.66%) reported they often or usually involved in feeding and hygiene-related work, 53.34% often or usually purchased items for the child, and 62.60% often/usually played with the child. Additionally, we found that 44.61% and 84.84% of fathers often or usually took care of the child during the nighttime and when the child was sick, respectively.

Confirmatory analysis

For paternal involvement in childcare, confirmatory factor analysis (CFA) showed that all the items were significantly related to the construct ($p < 0.001$), and the scale had an adequate construct validity (RMSEA = 0.078; CFI = 0.978; SRMR = 0.029) and reliability (Cronbach's $\alpha = 0.82$). For the five aspects of fathers' childcare involvement, the factor loadings for feeding and hygiene-related work and night care for the child were over 0.70, and that of play with the child, purchasing child items, and involvement when the child is sick were lower than 0.70 (as demonstrated in Fig. 1).

Path analysis model

The goodness of fit of the model was desirable (RMSEA = 0.069; CFI = 0.917; SRMR = 0.049). As

Fig. 1 Path analysis model for father's childcare involvement and postpartum depression and anxiety levels. The figure only presents the statistically significant associations (solid lines) and standardized coefficients
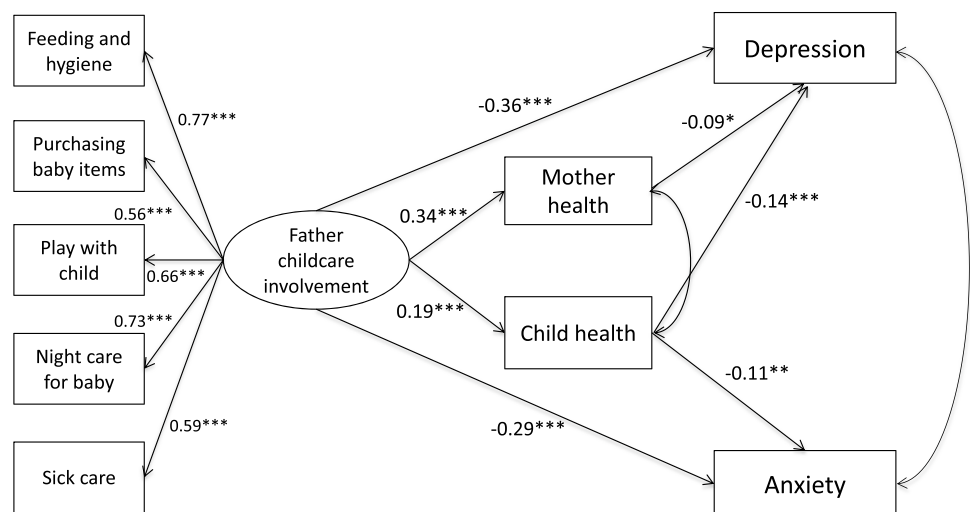
CFI: 0.917; RMSEA:0.069 ; SRMR:0.049
*P<0.05; **P<0.01; ***P<0.001

demonstrated in Fig. 1, we found that fathers' childcare involvement was significantly associated with lower levels of PPD ($\beta = -0.36$, $p < 0.001$) and PPA symptoms ($\beta = -0.29$, $p < 0.001$). Mothers' physical health partially mediated the association between paternal involvement and PPD as the paths from paternal involvement to the mother's health ($\beta = .34$, $p < 0.001$) and from mothers' health status to PPD ($\beta = -0.09$, $p < 0.05$) were both significant. In addition, the child's health status partially mediated the association between paternal childcare and PPA, as the paths from paternal childcare involvement to the child's health ($\beta = .19$, $p < 0.001$) and from child's health status to PPA ($\beta = -0.11$, $p < 0.01$) were both significant. Child's health also mediated the association between fathers' childcare involvement and PPD ($\beta = .19$, $p < 0.001$; $\beta = -0.14$, $p < 0.001$).

In addition, maternal age was negatively associated with PPD ($\beta = -0.11$, $p < 0.01$) and PPA ($\beta = -0.12$, $p < 0.01$) levels. Mothers' education level ($\beta = 0.12$, $p < 0.01$), household income ($\beta = 0.11$, $p < 0.01$), and father living at home ($\beta = 0.27$, $p < 0.001$) were positively associated with fathers' childcare involvement.

Discussions

Discussion of the major findings

This study examined the association between fathers' childcare involvement and maternal mental health, and found that higher levels of paternal involvement were associated with lower PPD and PPA levels among a group of Chinese postpartum mothers. To the author's knowledge, this study is the first to explore the possible influence of paternal childcare involvement on maternal mental health in the Chinese context.

Our finding that fathers' childcare involvement is associated with lower levels of PPD is consistent with previous research conducted in Western and Asian countries (de Mendonça et al. 2012; Kasamatsu et al. 2021; Lin et al. 2017; Sejourne et al. 2012; Yakupova & Liutsko 2021). Maselko and colleagues found that greater paternal involvement predicted lower levels of maternal depression in rural Pakistan (Maselko et al. 2019). Kasamatsu et al. (2021) reported that paternal childcare behaviors were associated with less maternal psychological distress in Japan (Kasamatsu et al. 2021). We also found significant association between paternal involvement and PPA level among the new mothers. Lin and colleagues echo our finding by reporting that paternal involvement was associated with lower levels of PPD and PPA among families in Taiwan (Lin et al. 2017). Compared to studies on PPD, PPA is far less studied, but is also a concerning mental health issue among postpartum mothers. More studies are warranted to explore the association between paternal instrumental support, such as active

childcare involvement, and a woman's postpartum anxiety symptoms. There are several explanations for the findings. One possible explanation is that the father's positive engagement in parenting tasks may alleviate the mother's childcare burden and stress, which was indicated as the mechanism between paternal involvement and maternal mental health in previous literature (Fagan & Lee 2010; Lin et al. 2017). It might also be attributed that fathers' active participation in childcare and domestic tasks contributes to gender equality, and provides women a source of instrumental and emotional support and a sense of stable romance relationship, which nurtures women's mental health.

This current study further added to the literature by exploring the mechanism between paternal involvement and PPD and PPA. An interesting finding is that women's physical health partially mediated the relationship between paternal involvement and PPD, and that the child's health partially mediated the relationship between paternal involvement and PPA and PPD. For the first path, it yielded that paternal childcare involvement might mitigate PPD by improving women's physical health. It is reasonable to ascertain that paternal support can improve women's physical health. Yakupova and colleagues additionally supported that women's physical health was negatively associated with PPD (Yakupova & Liutsko 2021). The second path showed that the child's health partially mediated the relationship between fathers' childcare involvement and women's PPA and PPD level, indicating fathers' childcare involvement might mitigate levels of maternal PPA and PPD by improving the child's health status. Previous studies have supported that paternal involvement was associated with better child health (Jeong et al. 2016; Maselko et al. 2019). Furthermore, Wan et al. (2009) and Zhang et al. (2012) supported that child health is associated with the mother's mental health (Wan et al. 2009; Zhang et al. 2012).

We found that maternal age was negatively associated with the PPD and PPA scores, which was in line with previous literature (Liu et al. 2017). Household income was also significantly associated with fathers' childcare involvement, which is consistent with studies from other countries (Maselko et al. 2019).

Implications for research and practice

This study's finding that paternal childcare involvement plays an important role in preventing PPD and PPA has implications for policy and practice. This study highlights the father's important role in maintaining and improving maternal mental health. Increased paternal involvement should be an important intervention point when designing prevention programs targeting PPD and PPA in China. Health education programs targeting maternal mental health should promote fathers' support and involvement in childcare. For instance, starting from the pregnancy period, it is

practical for expectant fathers to attend prenatal health education programs to learn childcare skills (Kasamatsu et al. 2021). In addition, a previous study indicated that paternity leave was associated with better maternal mental health, suggesting that prolonging the length of paternity leave may increase paternal childcare involvement, which can benefit maternal mental health (Redshaw & Henderson 2013).

Limitations

There are several limitations to mention. First, this study utilized a correlational approach to assess the relationships between paternal involvement and maternal mental health. Thus, causal conclusions cannot be drawn (Creswell & Creswell 2017). In addition, our mediation effects were conducted by testing the direct and indirect pathways in the SEM model, which provides empirical evidence for direct and indirect relationships among our study variables. Our findings indicate that the underlying mechanism of the relationship between fathers' involvement in childcare and mothers' PPD exists. However, the causality between study variables may not be fully concluded, and mediation interpretation should be interpreted with caution due to the nature of using cross-sectional data. A longitudinal study will be our next step to further verify the causal mediation effect estimations. Second, father involvement information was collected from the maternal women whose expectations for fathers' involvement may influence their responses. Moreover, a woman's mental health status may influence her perception of her partner's childcare involvement level (Raskin et al. 2015). Future studies will consider adopting more reliable methods to assess paternal involvement level, for example, collecting information from both fathers and mothers to triangulate the assessment. Third, all mental and physical health statuses were assessed in our survey by self-reported screening tools rather than a clinical diagnosis or medical record review data collection approach. This may increase self-reported response bias, although the scales and measures adopted in our survey have been validated in previous studies. In addition, the measures of women's and children's health were based on one question rather than a full measure. Lastly, the COVID-19 pandemic may be a strong risk factor that impacts maternal mental health status, and we will include COVID-19-related contextual factors in future studies.

Conclusions

This study examined the association between paternal childcare involvement and maternal PPD and PPA. The results yielded a salient association between paternal involvement in childcare and improved maternal mental health. The study also explored the path through which the association works. An interesting finding is that mothers' health status partially mediated the effects between paternal involvement and PPD. Furthermore, the child's health partially mediated the possible effects of paternal involvement on PPA and PPD. The findings of this study highlight the role of paternal involvement and support in maternal mental health. Health programs should encourage and promote fathers' proactive participation in childcare.

Declarations

References

Biaggi A, Conroy S, Pawlby S, Pariante CM (2016) Identifying the women at risk of antenatal anxiety and depression: a systematic review. J Affect Disord 191:62–77

Castillo R, Carlat D, Millon T, Millon C, Meagher S, Grossman S, Association AP (2007) Diagnostic and statistical manual of mental disorders Washington. American Psychiatric Association Press, DC

Chen X, He Y (2004) The family in mainland China: structure, organization, and significance for child development. Fam Global Perspect 51–62

Cox JL, Holden JM, Sagovsky R (1987) Detection of postnatal depression: development of the 10-item Edinburgh Postnatal Depression scale. Br J Psychiatry 150(JUNE):782–786

Creswell JW, Creswell JD (2017) *Research design: qualitative, quantitative, and mixed methods approaches* Sage publications

de Mendonça JS, Bussab VS, Rodrigues A, Siqueira J, Cossette L (2012) Postpartum depression, father's involvement, and marital and co-parental relationships from mothers' and fathers' perspectives in a low-income Brazilian sample. Family Science 3(3–4):164–173

Dennis C-L, Brown HK, Brennenstuhl S (2017) The Postpartum Partner Support Scale: development, psychometric assessment, and predictive validity in a Canadian prospective cohort. Midwifery 54:18–24. https://doi.org/10.1016/j.midw.2017.07.018

Drury SS, Scaramella L, Zeanah CH (2016) The neurobiological impact of postpartum maternal depression: prevention and intervention approaches. Child Adolesc Psychiatr Clin 25(2):179–200

Evans J, Melotti R, Heron J, Ramchandani P, Wiles N, Murray L, Stein A (2012) The timing of maternal depressive symptoms and child cognitive development: a longitudinal study. J Child Psychol Psychiatry 53(6):632–640

Fagan J, Lee Y (2010) Perceptions and satisfaction with father involvement and adolescent mothers' postpartum depressive symptoms. J Youth Adolesc 39(9):1109–1121

Field T (2018) Postnatal anxiety prevalence, predictors and effects on development: a narrative review. Infant Behav Dev 51:24–32

Fisher J, de Mello MC, Patel V, Rahman A, Tran T, Holton S, Holmes W (2012) Prevalence and determinants of common perinatal mental disorders in women in low-and lower-middle-income countries: a systematic review. Bull World Health Organ 90:139–149

Garfield CF, Fisher SD, Barretto D, Rutsohn J, Isacco A (2019) Development and validation of a father involvement in health measure. Psychol Men Masculinities 20(1):148

Gelaye B, Rondon MB, Araya R, Williams MA (2016) Epidemiology of maternal depression, risk factors, and child outcomes in low-income and middle-income countries. Lancet Psychiatry 3(10):973–982

Ghaedrahmati M, Kazemi A, Kheirabadi G, Ebrahimi A, Bahrami M (2017) Postpartum depression risk factors: a narrative review. J Educ Health Promot 6:60. https://doi.org/10.4103/jehp.jehp_9_16

Gressier F, Guillard V, Cazas O, Falissard B, Glangeaud-Freudenthal NM, Sutter-Dallay A (2017) Risk factors for suicide attempt in pregnancy and the post-partum period in women with serious mental illnesses. J Psychiatr Res 84:284–291

Hu L, Bentler PM (1999) Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct Equ Modeling 6(1):1–55

Jeong J, McCoy DC, Yousafzai AK, Salhi C, Fink G (2016) Paternal stimulation and early child development in low-and middle-income countries. Pediatrics 138(4)

Kasamatsu H, Tsuchida A, Matsumura K, Hamazaki K, Inadera H (2021) Paternal childcare at 6 months and risk of maternal psychological distress at 1 year after delivery: the Japan environment and children's study (JECS). European Psychiatry 1–31

Kim TH, Delahunty-Pike A, Campbell-Yeo M (2020) Effect of fathers' presence and involvement in newborn care in the NICU on mothers' symptoms of postpartum depression. J Obstet Gynecol Neonatal Nurs 49(5):452–463

Klainin P, Arthur DG (2009) Postpartum depression in Asian cultures: a literature review. Int J Nurs Stud 46(10):1355–1373. https://doi.org/10.1016/j.ijnurstu.2009.02.012

Lee DT, Yip SK, Chiu HF, Leung TY, Chan KP, Chau IO, Chung TK (1998) Detecting postnatal depression in Chinese women. Validation of the Chinese version of the Edinburgh Postnatal Depression Scale. Br J Psychiatry 172:433–437

Lin W, Chang S, Chen Y, Lee H, Chen Y (2017) Postnatal paternal involvement and maternal emotional disturbances: the effect of maternal employment status. J Affect Disord 219:9–16

Liu S, Yan Y, Gao X, Xiang S, Sha T, Zeng G, He Q (2017) Risk factors for postpartum depression among Chinese women: path model analysis. BMC Pregnancy Childbirth 17(1):133

Madigan S, Oatley H, Racine N, Fearon RP, Schumacher L, Akbari E, Tarabulsy GM (2018) A meta-analysis of maternal prenatal depression and anxiety on child socioemotional development. J Am Acad Child Adolesc Psychiatry 57(9):645-657. e8

Maselko J, Hagaman AK, Bates LM, Bhalotra S, Biroli P, Gallis JA, Rahman A (2019) Father involvement in the first year of life: associations with maternal mental health and child development outcomes in rural Pakistan. Soc Sci Med 237:112421

Qi W, Zhao F, Liu Y, Li Q, Hu J (2021) Psychosocial risk factors for postpartum depression in Chinese women: a meta-analysis. BMC Pregnancy Childbirth 21(1):1–15

Raskin M, Fosse NE, Easterbrooks MA (2015) Influence of mother's depression on her reports of father involvement and child behavioral problems: a latent state-trait approach. Infant Ment Health J 36(1):88–103

Redshaw M, Henderson J (2013) Fathers' engagement in pregnancy and childbirth: evidence from a national survey. BMC Pregnancy Childbirth 13(1):1–15

Robertson E, Grace S, Wallington T, Stewart DE (2004) Antenatal risk factors for postpartum depression: a synthesis of recent literature. Gen Hosp Psychiatry 26(4):289–295

Robertson E, Celasun N, Stewart D (2003) Risk factors for postpartum depression

Sejourne N, Vaslot V, Beaumé M, Goutaudier N, Chabrol H (2012) The impact of paternity leave and paternal involvement in child care on maternal postpartum depression. J Reprod Infant Psychol 30(2):135–144

Singley DB, Cole BP, Hammer JH, Molloy S, Rowell A, Isacco A (2018) Development and psychometric evaluation of the Paternal Involvement With Infants Scale. Psychol Men Masculinity 19(2):167

Slomian J, Honvo G, Emonts P, Reginster J, Bruyère O (2019) Consequences of maternal postpartum depression: a systematic review of maternal and infant outcomes. Womens Health 15:1745506519844044

Spitzer RL, Kroenke K, Williams JB, Löwe B (2006) A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med 166(10):1092–1097

Stewart DE, Robertson E, Dennis C, Grace SL, Wallington T (2003) Postpartum depression: literature review of risk factors and interventions. University Health Network Women's Health Program for Toronto Public Health, Toronto

Tang L, Zhu R, Zhang X (2016) Postpartum depression and social support in China: a cultural perspective. J Health Commun 21(9):1055–1061

Vigod SN, Villegas L, Dennis C, Ross LE (2010) Prevalence and risk factors for postpartum depression among women with preterm and low-birth-weight infants: a systematic review. BJOG An Int J Obstet Gynaecol 117(5):540–550

Wan EY, Moyer CA, Harlow SD, Fan Z, Jie Y, Yang H (2009) Postpartum depression and traditional postpartum care in China: Role of Zuoyuezi. Int J Gynecol Obstet 104(3):209–213. https://doi.org/10.1016/j.ijgo.2008.10.016

Yakupova V, Liutsko L (2021) Perinatal depression, birth experience, marital satisfaction and childcare sharing: a study in Russian mothers. Int J Environ Res Public Health 18(11):6086

Zhang Y, Zou S, Cao Y, Zhang Y (2012) Relationship between domestic violence and postnatal depression among pregnant Chinese women. Int J Gynecol Obstet 116(1):26–30. https://doi.org/10.1016/j.ijgo.2011.08.011

Zhou Y, Yahong B, Lao L, Jiang S (2018) Application of GAD-7 in population screening for generalized anxiety disorder. Chin J Gen Pract 17(9):735–737