ORIGINAL ARTICLE

Predictors of depressive symptoms in older Japanese primiparas at 1 month post-partum: A risk-stratified analysis

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Abstract

Aim: Older maternal age has become more common in Japan. Studies suggest that older maternal age and primiparity are associated with post-partum depression. The present study aimed to identify predictors of post-partum depression in older Japanese primiparas at 1 month post-partum.

Methods: Participants were 479 primiparas aged 35 years and over, drawn from a prospective cohort study. Data were collected using self-report questionnaires. Depression was measured with the Japanese version of the Edinburgh Postnatal Depression Scale. Stepwise logistic regression analysis was conducted on binary outcome variables of depression at 1 month post-partum, along with a stratified analysis based on the risk status of depression.

Results: Five predictors were identified: (i) the depression score during hospital stay; (ii) financial burden; (iii) dissatisfaction with appraisal support; (iv) physical burden in daily life; and (v) concerns about infant caretaking. Stratified analysis identified dissatisfaction with instrumental support in the low-risk group, and the Child-care Value Scale score as unique predictors in the high-risk group.

Conclusion: These results highlight the importance of early assessment of depressive symptoms and the provision of continuous care.

Key words: depression, maternal age, post-partum, primiparas, risk.

INTRODUCTION

Recently, older maternal age has become more common in Japan. Between 2006 and 2013, the birth rate of Japanese primiparas aged 35 years and over rose from 5.6% to 9.5% (Ministry of Health, Labor and Welfare, 2006, 2013). Older maternal age is associated with perinatal complications such as gestational diabetes, antepartum hemorrhage, preterm birth, and cesarean section (CS) (Sugiura, 2013; Vaughan, Cleary, & Murphy, 2014). This means that older primiparas are carefully managed as a high-risk group during pregnancy and delivery. However, little is known about post-partum care for this group of women.

The characteristics of older post-partum primiparas also mean that they have become a clinical concern from a nursing perspective. Positive aspects of older maternal age, such as psychological maturity based on greater life experience, may play an important role during the transition to motherhood (Camberis, McMahon, Gibson, & Boivin, 2014). However, negative aspects of older primiparas, such as limited physical strength and a lack of social support (Maehara *et al*., 2014; Mori *et al*., 2014), may require special consideration to help with adjustment to motherhood. In addition, post-partum

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depression (PPD) is an area that should be further studied, as it is associated with older maternal age (Matsumoto *et al*, 2011) and primiparity (Satoh *et al.*, 2009). PPD is a significant complication after childbirth that is frequently encountered by nurses. Studies with a Japanese population suggest that the prevalence of PPD is higher in the first month post-partum (16–19%) than at other times during pregnancy and at 4 months post-partum (Ishikawa *et al.*, 2011; Suzumiya, Yamashita, & Yoshida, 2004). The first month post-partum is considered to be the most difficult and problematic with deteriorated sleep quality and feelings of nightmare (Carolan, 2005; Iwata *et al.*, 2015b). Therefore, the present authors considered a study of PPD during the first month post-partum in older Japanese primiparas to be important.

The present study aimed to identify factors for predicting post-partum depressive symptoms in Japanese primiparas aged 35 years and over at 1 month post-partum. Based on the risk of developing PPD during hospital stay, the authors used a stratified analysis to assess differences in predictors between two risk groups; in doing so, they aimed to identify appropriate nursing care based on the PPD screening results.

METHODS

Participants and procedure

The participants in the present study were part of a prospective cohort study, conducted in Japan between May 2012 and September 2013. The cohort study is described in detail elsewhere (Iwata *et al.*, 2015a). In brief, the present study sample comprised 479 primiparas aged 35 years and over, drawn from the 3769 women who met the inclusion criteria and agreed to participate in the original study. Of the 3769 women, 3248 women responded to the questionnaire at 1 month post-partum (86.2% response rate). The original sample consisted of women with mixed parity and of various ages. Participants eligible for the present study were Japanese women who had a singleton birth vaginally or operatively. Those who had serious health problems (either the mother or the newborn) were excluded.

Participants were recruited during the hospital stay after childbirth. Longitudinal data were collected using self-report questionnaires at two time points: one questionnaire was administered on the day before hospital discharge and the second at 1 month post-partum. In addition, data from medical records were collected by the researchers or research nurses. Before initiating the study, ethics approval was obtained from the institution of the principal investigator, and informed consent was obtained from all participants.

Data collection

The self-report questionnaires administered during hospital stay and at 1 month post-partum were slightly different. However, both questionnaires included common items: depressive symptoms; physical symptoms; perceptions of daily life; concerns about child care and daily life; infant feeding; and background information. Unique items in the questionnaire administered during hospital stay concerned child-care values. Unique items in the questionnaire administered at 1 month post-partum were demographics and dissatisfaction with social support.

Depressive symptoms

Depressive symptoms were assessed with the Japanese version (Okano *et al.*, 1996) of the Edinburgh Postnatal Depression Scale (EPDS) (Cox, Holden, & Sagovsky, 1987). The Japanese EPDS contains 10 items that are rated on a 4 point Likert scale ranging 0–3. The total score ranges 0–30, with a higher score indicating more depressive symptomatology. For Japanese post-partum women, a cut-off point of 9 was considered to be optimal for screening for depression (Okano *et al.*, 1996). In the present sample, Cronbach's alpha at 1 month post-partum was 0.83.

Physical symptoms

General, breast, and excretory symptoms were measured. General symptoms included: tiredness/languor; loss of appetite; eyestrain; dizziness/instability; palpitation/shortness of breath; hypertension; headache; swelling; thirst; muscular pain; stiff shoulders; back pain; tenovaginitis; discomfort in the pelvis/hip joint; pubic pain; hip joint pain; feeling of descent of uterus; pain of incision/tear; discomfort in incision/tear; slow recovery of incision/tear; lochia/genital bleeding; slow recovery of body shape; hair loss; and pigmentation. Breast symptoms included: nipple tear/bleeding; nipple pain; breast pain; and breast lump. Excretory symptoms included: frequent urination; decreased urination; urination pain; sensation of residual urine; urinary incontinence; difficulty in urination; constipation; loose bowels; and hemorrhoids pain. All physical symptoms were measured with yes or no responses.

Perceptions of daily life

Perceived physical burden in daily life was assessed with the question, "Do you think you are pushing yourself physically in daily life?" Satisfaction with sleep was assessed by the question, "How was your sleep last night?" Participants were also asked to estimate their minutes of sleep per night.

Concerns about child care and daily life

Concerns about child care and daily life were assessed using 11 items developed by the authors. The types of concerns used were extracted from a factor analysis: concerns about infant caretaking (Cronbach's alpha = 0.75); concerns about the participant's own life (Cronbach's alpha = 0.73); and concerns about social support (Cronbach's alpha = 0.53). Questions that assessed concerns about infant caretaking were: "I don't have sufficient knowledge about my baby and baby's health"; "I think I can detect my baby's health problems and handle them"; "I have little confidence in soothing my baby or putting my baby to sleep well"; and "I think I can feed my baby well on her/his demand". Questions that assessed concerns about the participant's own life were: "It will be hard work to change to a child-centered life"; "I'm afraid I'm not strong enough to take care of my baby"; "It will be difficult to find time for myself"; and "It will become difficult to take care of my health". Questions that assessed concerns about social support after discharge were: "I think I can obtain sufficient support for my housework and child care"; "I feel anxious because I haven't talked much about the role division of housework and child care with my husband"; and "I think I can help people learn about my way of child caretaking". For the questionnaire administered during hospital stay, all questions were asked about life after discharge. For the questionnaire administered at 1 month post-partum, all questions were asked about life at present. Each item was rated on a 4 point Likert scale ranging 1–4. A higher score indicated more concerns about child care and daily life.

Child-care values

Child-care values were assessed using two subscales of the Child-care Value Scale (CVS) (Chen *et al.*, 2006): the views about parenting role subscale (10 items); and the need for support from others in the parents' environment subscale (10 items). Responses were rated on 4 point Likert scales ranging 1–4. For the parenting role subscale, the total score ranged 10–40, with a higher score indicating views that put more priority on the parental role. The total score on the parents' environment subscale ranged 10–40, with a higher score indicating that involvement with others was regarded as helpful. In the present sample, Cronbach's alpha was 0.76 for the views about parenting role subscale and 0.72 for the support from others in the parents' environment subscale.

Satisfaction with social support

Satisfaction with social support was measured with four items developed by the authors. Participants indicated to what extent they were satisfied with four types of social support: instrumental (support with child care and housework); informational (support with child-care information); appraisal (support that made the participant feel respected or admired); and emotional support (opportunity to share complaints or worries). Each type of social support was assessed with a single question: "She/he helped me with child care and housework" for instrumental support; "She/he helped me by providing useful information" for informational support; "She/he acknowledged my effort and praised me" for appraisal support; and "She/he shared my complaints and worries" for emotional support. Each item was rated on a 4 point Likert scale: 1 (very satisfied), 2 (a little satisfied); 3 (a little dissatisfied), and 4 (very dissatisfied).

Infant feeding

Infant feeding method (breast, mixed, or formula) was measured, and participants were asked to estimate the minutes required for one infant feeding.

Demographic and background information

Demographic information collected included: maternal age; marital status; employment; and education. Background information collected included: type of conception; desired pregnancy; financial burden; and satisfaction with the birth experience.

Medical records data

Data collected from the participants' medical records included: type of delivery; complications during pregnancy and delivery; health problems after delivery; infant birthweight; and infant complications.

Data analysis

Means and percentages were calculated to describe study participants. The study sample was divided into two groups (a high-risk group and a low-risk group) using scores on the Japanese EPDS administered during

hospital stay after childbirth. The low-risk group included women with EPDS scores below 9 and the high-risk group included women with EPDS scores of 9 or higher. The high-risk group was assumed to have a higher tendency to develop PPD. Differences between the low-risk group and the high-risk group were analyzed using independent Student's *t*-tests and χ^2-tests. To identify significant predictors for PPD at 1 month post-partum, a stepwise logistic regression analysis was performed. The binary outcome variable was whether a participant scored 9 or more on the Japanese EPDS at 1 month post-partum. Bivariable analyses were conducted to identify correlates of post-partum depressive symptoms with a significance level of $P < 0.10$, and a stepwise logistic regression analysis was performed. Independent variables were entered in two sets; the type of delivery (vaginal *vs* elective CS *vs* emergency CS) was entered first, followed by all remaining variables based on the maximum likelihood-ratio statistic. All analyses were performed with SPSS version 21 (IBM, Armonk, NY,

USA). This procedure was repeated three times: with the entire sample ($n = 479$), with the low-risk group ($n = 376$), and with the high-risk group ($n = 103$).

RESULTS

Sample characteristics

Demographics and background information for the 479 participants are shown in Table 1. The mean age of the entire sample was 37.7 years (range, 35–48 years). Most participants were married (97.7%), 54.9% were unemployed, and 46.6% had college or graduate school degrees. Of the participants, 66.4% conceived their babies naturally and 77.2% gave birth vaginally. Statistically significant differences were observed between the low-risk and high-risk groups for infant feeding method and type of delivery. In the high-risk group, fewer women breast-fed their infants, and more women experienced emergency CS than in the low-risk group.

Table 1 Participants' demographics and background information ($n = 479$)

Variable	Entire group ($n = 479$) N (%)		Low-risk group ($n = 376$) N (%)		High-risk group ($n = 103$) N (%)		P
Age (mean [SD])	37.7	(2.3)	37.7	(2.3)	37.5	(2.0)	NS[†]
Marital status							NS[‡]
Married	468	(97.7)	367	(97.6)	101	(98.1)	
Single	9	(1.9)	7	(1.9)	2	(1.9)	
Missing	2	(0.4)	2	(0.5)	0	(0.0)	
Employment							NS[‡]
Employed	216	(45.1)	201	(53.5)	62	(60.2)	
Not employed	263	(54.9)	175	(46.5)	41	(39.8)	
Education							NS[‡]
Junior or high school	74	(15.4)	60	(16.0)	14	(13.6)	
Vocational school or junior college	182	(38.0)	148	(39.4)	34	(33.0)	
College or graduate school	223	(46.6)	168	(44.7)	55	(53.4)	
Conception							NS[‡]
Natural	318	(66.4)	254	(67.6)	61	(59.2)	
Infertility treatment	159	(33.2)	121	(32.2)	41	(39.8)	
Missing	2	(0.4)	1	(0.3)	1	(1.0)	
Infant feeding							0.009[‡]
Breast	183	(38.2)	155	(41.2)	28	(27.2)	
Mixed	289	(60.3)	218	(58.0)	71	(68.9)	
Formula	7	(1.5)	3	(0.8)	4	(3.9)	
Type of delivery							0.001[‡]
Vaginal	370	(77.2)	300	(79.8)	70	(68.0)	
Planned CS	49	(10.2)	40	(10.6)	9	(8.7)	
Emergency CS	60	(12.5)	36	(9.6)	24	(23.3)	

[†]Two sample Student's *t*-test. [‡]χ^2-Test. CS, cesarean section; NS, not significant; SD, standard deviation.

Table 2 Results of logistic regression analysis for the entire group ($n = 455$)

Independent variables	B	Wald	OR	(95% CI)
EPDS score during hospitalization (≥9)	1.60	28.57***	4.93	(2.75–8.85)
Financial burden[†]	0.85	9.44**	2.34	(1.36–4.02)
Dissatisfaction with appraisal support[‡]	0.92	6.18*	2.52	(1.22–5.22)
Physical burden in daily life[§]	1.20	8.71**	3.31	(1.50–7.33)
Concerns about infant caretaking	1.20	25.49***	1.45	(1.26–1.68)
Constant	−7.85	68.30***		
−2 log likelihood	336.70			
Cox–Snell R^2	0.26			
Nagelkerke R^2	0.40			
Model log likelihood	134.82			
P	<0.001			
Percentage of correct classification (%)	84.0			

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$. [†]No (reference) *versus* yes. [‡]Satisfied (reference) *versus* not satisfied; [§] No (reference) *versus* yes. CI, confidence interval; CS, cesarean section; EPDS, Edinburgh Postnatal Depression Scale; OR, odds ratio.

Table 3 Results of logistic regression analysis in the low- and high-risk groups

	Low-risk group ($n = 358$)				High-risk group ($n = 99$)			
Independent variables	B	Wald	OR	(95% CI)	B	Wald	OR	(95% CI)
Concerns about infant caretaking	0.44	22.13***	1.55	(1.29; 1.86)	0.36	6.19*	1.43	(1.08–1.89)
Dissatisfaction with instrumental support[†]	1.14	9.89**	3.12	(1.54; 6.34)				
Financial burden[‡]					1.21	5.91*	3.36	(1.27–8.94)
CVS subscale score					−0.19	6.05*	0.83	(0.71–0.96)
Constant	−7.43	47.54***			−1.74	0.32*		
−2 log likelihood	226.61				100.22			
Cox–Snell R^2	0.14				0.31			
Nagelkerke R^2	0.26				0.42			
Model log likelihood	55.54				37.02			
P	<0.001				<0.001			
Percentage of correct classification (%)	87.7				76.8			

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$. [†]Satisfied (reference) *versus* not satisfied. [‡]No (reference) *versus* yes. CI, confidence interval; CVS, Childcare Value Scale; OR, odds ratio.

Depressive symptoms at 1 month post-partum and results of multivariate analysis

The mean score of the Japanese EPDS was 5.4 (standard deviation [SD] = 4.5) during hospital stay and 5.4 (SD = 4.3) at 1 month post-partum. A total of 21.5% of participants scored 9 or more on the Japanese EPDS during hospital stay and 21.1% scored 9 or more at 1 month post-partum (data not shown).

Stepwise logistic regression analysis showed that only five predictors provided an adequate model for the entire sample (Table 2). The EPDS score during hospital stay (odds ratio [OR], 4.93; 95% confidence interval [CI], 2.75–8.85), financial burden (OR, 2.34; 95% CI, 1.36–4.02), dissatisfaction with appraisal support (OR, 2.52; 95% CI, 1.22–5.22), physical burden in daily life (OR, 3.31; 95% CI, 1.50–7.33), and concerns about infant caretaking (OR, 1.45; 95% CI, 1.26–1.68) were associated with depressive symptoms at 1 month post-partum. In the low-risk group, two significant predictors were identified: Dissatisfaction with instrumental support (OR, 3.12; 95% CI, 1.54–6.34); and concerns about infant caretaking (OR, 1.55; 95% CI, 1.29–1.86) (Table 3). Three significant predictors were identified in the high-risk group: financial burden (OR, 3.36; 95% CI, 1.27–8.94); concerns about infant caretaking (OR, 1.43; 95% CI, 1.08–1.89); and the score on the need for support from others in the parents' environment

subscale of the CVS (OR, 0.83; 95% CI, 0.71–0.96) (Table 3).

DISCUSSION

Early assessment of depressive symptoms

In all participants, the strongest predictor of PPD tendency at 1 month post-partum was the EPDS score during hospital stay. Participants who scored 9 or more on the EPDS during hospital stay had a risk of developing later PPD almost five times higher at 1 month post-partum. This suggests there is a need for early identification of elevated depressive symptoms. A previous Japanese study reported that many women experienced the early onset of PPD within 1 week after childbirth (Yoshida, Yamashita, Ueda, & Tashiro, 2001). Japanese women tend to be reluctant to report their feelings (Yoshida *et al.*, 2001). Therefore, using the EPDS may mean that women are more comfortable reporting depressive symptoms during hospital stay, a time when nurses may have more opportunities to interact with and help new mothers. Using the EPDS also leads to early detection and effective management of PPD based on the risk status of depressive symptoms.

Continued assessment after discharge from hospital

A perceived physical burden in daily life was another significant predictor of PPD tendency in primiparas. The physical demands of caring for a newborn are considered to be enormous, especially for inexperienced mothers during the first month after childbirth (Mori *et al.*, 2014). Women often report experiencing reduced minutes of sleep and frequent waking during the night (Iwata *et al.*, 2015b), which may increase the physical burden and affect women's emotional health (Park, Meltzer-Brody, & Stickgold, 2013). Dissatisfaction with appraisal support was also identified as a significant predictor of PPD tendency in primiparas. Providing appraisal support is considered to be effective in reducing depressive symptoms when mothers are assumed to be struggling with inexperience of child care. Appraisal support can include understanding mothers through listening, being non-judgmental, and providing warm encouragement (Uyama & Kume, 2005). A unique predictor of PPD identified in the low-risk group was dissatisfaction with instrumental support. This indicates that mothers who were evaluated as low risk using the EPDS during hospital stay, may be at risk for elevated depressive symptoms if they receive dissatisfying instru-

mental support after discharge from hospital; meaning they may report elevated depressive symptoms in the post-partum period. Therefore, continuous assessment of a new mother's satisfaction with instrumental support, such as support with housework and child care, will be important to help prevent later development of PPD in low-risk mothers.

Financial burden was a significant predictor of PPD tendency in the entire group and in the high-risk group. Financial burden or lower economic status has also been reported as a risk factor for PPD in a previous study (Post-partum Depression: Action Towards Causes and Treatment (PACT) Consortium, 2015). Japanese mothers are usually considered to be hesitant to talk about economic problems to others. Therefore, asking new mothers if they have financial concerns about child care may create an opportunity to talk about their actual financial burden. This can lead to the provision of appropriate support, such as providing information about available public assistance (e.g. a postnatal support worker or a benefit) (A nation-wide network for the poor child, 2015), and decrease new mothers' financial burden.

Concerns about infant caretaking were also identified as a significant predictor of PPD in the entire group, as well as in both the low- and high-risk groups. In a previous analysis with the same sample, this variable was also found to be a significant predictor of PPD tendency during hospital stay (Iwata *et al.*, 2015a). This suggests that continued assessment of women's concerns about infant caretaking, including concerns about infant health and feeding, is important during the first month post-partum.

Social support

A unique predictor of PPD identified in the high-risk group was the need for support from others in the parents' environment (CVS subscale), indicating that mothers who usually regarded the involvement of others' as less helpful had a higher risk of PPD. This variable was a mother's child-care value, and not her perception about support received at a specific time point. Therefore, this suggests that a low level of ability to actually use social support increases the risk of PPD. Studies have suggested there are several barriers to help-seeking, such as a woman's inability to disclose her feelings, lack of knowledge about PPD, fear of judgment, feeling like a burden, perceived criticism, and independence (Dennis & Chung-Lee, 2006; Foulkes, 2011; Negron, Martin, Almog, Balbierz, & Howell, 2013). Some of these are considered to be characteristics

of older primiparous women (Carolan, 2004; Niimura & Ogawa, 2012). A qualitative study with Japanese post-partum primiparas also showed that women's pride based on greater life experiences became a barrier to help-seeking behavior (Maehara *et al.*, 2014); some women reported difficulty in accepting advice from others and some felt reluctant to rely on others. Therefore, assessment of a new mother's discomfort or difficulty in asking for help may lead to increased use of social support. This assessment during hospital stay will be especially effective in decreasing depressive symptoms after discharge from hospital in women at high-risk for PPD.

LIMITATIONS

The timing of onset of PPD is a subject of discussion. Most of the more severely depressed mothers have reported onset of symptoms during pregnancy (Post-partum Depression: Action Towards Causes and Treatment (PACT) Consortium, 2015). A limitation of the present study is the focus on depressive symptoms only during the first month post-partum. This means the present authors may have missed earlier opportunities to detect and manage more severely depressed mothers. This indicates that further investigation of depressive symptoms over extended periods including during pregnancy are warranted.

The second limitation is a low level of reliability of "concerns about social support" (Cronbach's alpha = 0.53), which could be due to a low number of items and poor internal consistency between items. Therefore, refinement of items will be needed for an adequate testing in future. The third limitation is our focus on older primiparous mothers. Although the present study was conducted in response to a need for information about PPD in this group of women (Mori, 2014), it does not mean nurses should believe that older primiparas are special cases. Negative stereotypes of older primiparas, such as that they are needy or demanding, may contribute to their anxiety and distress (McMahon *et al.*, 2015). Just as every mother needs individualized care, so too do older primiparous mothers. The findings of the present study should be considered to contribute to providing individualized care. However, future studies should include other groups of women, such as younger primiparas and multiparas.

CONCLUSIONS

Five factors reliably predicted a PPD tendency at 1 month post-partum in older primiparas: (i) the EPDS score during hospital stay; (ii) financial burden; (iii) dissatisfaction with appraisal support; (iv) physical burden in daily life; and (v) concerns about infant caretaking. A stratified analysis based on the risk status for developing PPD during hospital stay identified that dissatisfaction with instrumental support was a unique predictor in the low-risk group and the CVS score was a unique predictor in the high-risk group. These results highlight the importance of early assessment of women's depressive symptoms and the need to provide continuous care after discharge from hospital.

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CONFLICT OF INTEREST

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

AUTHOR CONTRIBUTIONS

All the authors have contributed significantly to the present manuscript. H. I. contributed to the acquisition of data, analysis and interpretation of data, conceptualization of the paper, and writing of the initial draft of the manuscript. E. M. contributed to the conception and design of the project, obtaining funding, and supervision of the whole study process. M. T. contributed to the conception and design of the project, analysis and interpretation of data, and intellectual support. A. S., H. O., A. M., and T. M. contributed to the conception and design of the project, acquisition of data, and intellectual support. K. M. and K. A. contributed to the conception and design of the project, and intellectual support. K. T. contributed to the analysis and interpretation of data, and intellectual support. All authors read and approved the final manuscript.

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