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Predictors of Mothers' Early Postpartum Fatigue: A Cross-Sectional Study

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Abstract

Background: Most postpartum mothers experience fatigue. However, it was unclear which day after birth during hospitalization mothers are the most fatigued, and if the mothers' background is a factor. The aim of this study was to investigate hospitalized mothers' characteristic features, fatigue, and relaxation, and then to find the correlated factors of fatigue in order to obtain suggestions for mothers' early postpartum care. **Methods:** This quantitative cross-sectional descriptive correlational study occurred during May to December 2016. A purposive sample of early postpartum hospitalized mothers at a postpartum unit in a Tokyo hospital completed an anonymous self-filled questionnaire survey. The survey included respondents' characteristics, fatigue scale, and relaxation scale. Data were analyzed with descriptive statistics, independent t-test, one-way analysis of variance, multiple regression analyses, and structural equation modeling. **Results:** Returned questionnaires were 251 (83.4%). Fatigue was significantly higher for mothers with longer postpartum days compared to shorter postpartum days ($F = 5.7$, $p < 0.001$). Fatigue was significantly higher in mothers with a previous disease compared to no previous disease ($t = 2.2$, $p < 0.05$). The three significant predictors of Fatigue were 1) relaxation ($\beta = -0.30$, $p < 0.001$), 2) postpartum days ($\beta = 0.26$, $p < 0.001$), and 3) previous disease ($\beta = 0.14$, $p < 0.05$). The structural equation modeling revealed that the same factors were related to Fatigue. **Conclusions:** No relaxation, longer postpartum days, and previous disease were associated with Fatigue for early postpartum mothers. These results suggest that focusing on previous disease, length of postpartum days, and mother's relaxation is needed to provide full support to early postpartum mothers.

Keywords

Postpartum, Mothers, Fatigue, Relaxation

1. Introduction

In Japan, the mothers' average age for a first birth is 30.7 years old, which is approaching that of an aging primipara [1]. The postpartum mother often has a tight schedule due to breast-feeding, dealing with her physical changes after childbirth and she may also be fatigued. About 60% of postpartum women have fatigue resulting from maternal health problems. Women having cesarean sections were found to be more fatigued than women having vaginal delivery [2]. Schytt were reported, that postpartum women had the most common problem such as fatigue, headache, sleep problems, and 63.8% continued to have fatigue two months after childbirth [3]. Definition of fatigue is "the awareness of decreased capacity for physical and/or mental activity due to an imbalance in the availability, utilization, and/or restoration of resources needed to perform activity [4]. Postpartum fatigue has been found to have a negative impact on the mother's health and the newborn's development [5]. Postpartum fatigue is defined as exhaustion and a feeling of being overwhelmed combined with a decrease in mental and physical capacity, all of which can lead to a negative impact on maternal-infant health [6]. Fatigue and depressive symptoms are common among women in the postpartum period, and it has been proposed that fatigue is a risk factor for later depression [7].

Globally, researchers have investigated the background of postnatal mothers' fatigue. Several studies have shown that most postpartum mothers experience fatigue. Postpartum women who experienced a cesarean birth had higher postpartum fatigue scores than women who had given birth vaginally [8]. Health status and fatigue were no different among women with and without postpartum anemia [9]. Statistical testing showed very little difference in fatigue between older and younger Japanese mothers shortly after birth or 1 month later [10]. Fatigue of early postpartum was significantly associated with fatigue during the postpartum period one month later [11]. An RCT intervention study on fatigue for postpartum mothers, found that Pilates exercise could significantly reduce postpartum fatigue over a two-month period [12]. In addition, another study revealed that receiving professionally-led care such as a workbook, home visit, and three telephone support calls also reduced fatigue [13]. However, it was unclear which day after birth during hospitalization mothers are the most fatigued, and if the mothers' background is a factor. During mothers' postpartum hospitalization, the peak tired time, fatigue trends, and a feeling of relaxation have not been investigated. There was almost no research on the predictive factors of postpartum fatigue during hospitalization. There was research on the predictive factors of postpartum fatigue, which was a survey of family life one month after childbirth and six months after birth, but there were few investigations about the early postpartum period. Therefore, this study explored the predictors of fatigue for mothers' days 1 through 7 in their early postpartum period. The aim of this study was to investigate mothers' characteristic features, fatigue, and relaxation, and to find the correlated factors of fatigue in order to obtain suggestions for

postpartum care for mothers in the early postpartum and who are in the postpartum hospital unit.

2. Methods

2.1. Design

Following the aims of this study, this research used a descriptive cross-sectional survey design using an anonymous structured questionnaire.

2.2. Definition of the Terms

"Fatigue" indicates poor physical condition and sleep deprivation from childbirth and infant care by the postpartum mother.

"Mothers" indicates hospitalized women on 1st to 7th day after birth and who had a normal spontaneous delivery or a C-section.

2.3. Participants and Setting

The authors collected data using a purposive sample of participants from one general hospital in Tokyo Japan. Participants were mothers (N = 301) in their early postpartum period. The inclusion criteria were as follows: 1) after normal delivery or on repeat cesarean section day one to day through seven, 2) fluent in Japanese, and 3) permission to participate by the obstetric primary physician and nurse manager. Exclusion criteria were patients with: 1) emergency cesarean section, and/or 2) severe psychiatric disorders. This large-scale general hospital had a maternity unit and perinatal and life-saving transport support. An average of 750 cases per year in the hospital was assisted delivery. The average age of hospitalized mothers was early 30s. The ratio of cesarean sections was 27.7%. Almost all of the mothers and babies used the rooming-in system. For an adequate multiple regression analysis, it is appropriate that the number of samples is 10 times the number of parameters [14]. Assuming a collection rate of 30%, our calculated target number was 267 participants to ensure 80 responses.

2.4. Procedures

The authors recruited eligible participants, during their hospital stay after childbirth, assisted by the nurse manager of the hospital. After the mothers delivered, the authors and the nurse manager confirmed that they met the inclusion criteria. The authors also informed the mothers verbally and in writing about the study's purpose as well as about confidentiality, anonymity, and safety of their personal data. The authors provided an explanation of their right to withdraw from the study without penalty, and provided the mothers with a "withdrawal from the study" form. The data collection period was from May to December 2016. The self-report questionnaires were administered during their hospital stay. Mothers responded to the questionnaire in their rooms of the maternity unit and they placed their completed questionnaires in a secure box on the unit, providing convenience and anonymity.

2.5. Ethical Considerations

This study was conducted after obtaining approval from the Ethics Committee for Epidemiological Studies at Tokyo Healthcare University Tokyo, Japan (approval no. 27-27). Following the Declaration of Helsinki, a written explanation regarding the study objectives, methods, protection of anonymity, and voluntary basis of participation was provided to each participant. It was also explained that the collected data would only be used for this study.

2.6. Outcome Measures

The quantitative data of demographics, fatigue scale and relaxation scale were collected.

2.6.1. Demographics

Respondents provided data about their age, delivery method, birth experience, previous disease, and pregnancy complications.

2.6.2. Fatigue Scale

Fatigue was assessed using the 13-item subscale "subjective symptoms" of the Self-Diagnosis Check List for Assessment of Worker's Accumulated Fatigue [15]. This scale was chosen because of the frequent use in Japan, as the number of items was small, and the burden on mothers was low. Originally constructed for a working population, after the validity was examined it was modified to 12 items [16]. The reliability of the scale was established based on its Cronbach's alpha coefficient range, 0.72 - 0.84 [16]. Although participants are instructed to rate their psychological health during the past month, in the present study, participants were asked to consider their current symptoms. The scale consists of 12 items with four response categories ranging from 0 (no fatigue) to 3 (higher fatigue). Higher scores indicated higher fatigue. A score from 5 to 10 is slightly higher fatigue, a score of 11 and above is indicated as the highest fatigue. The Cronbach's alpha coefficient of the scale in this study was 0.87.

2.6.3. Relaxation Scale

Relaxation was evaluated using a revised version of the rating scale of emotions using the items referring to relaxation. A Japanese psychologist developed the scale as a measurement of a subjective sense of relaxation [17]. Later, Takahashi revised it to increase item representation [18]. The relaxation scale is a four-item inventory: "I feel laid-back" "I feel unclenched" "I feel relieved" and "I feel in a receptive mood". The response categories range from 0 (strongly disagree) to 10 (strongly agree). Higher scores indicate the presence of higher relaxation. Takahashi reported the instrument had acceptable reliability (Cronbach's alpha coefficient, 0.81 - 0.87) [18]. This scale was used because it was reliable and the number of items and the burden on the mother was small. The Cronbach's alpha coefficient of the scale in this study was 0.83.

2.7. Statistical Analysis

The software programs SPSS version 23.0 (SPSS, Chicago, IL, USA) and AMOS version 23.0 (IBM, Armonk, NY, USA) were used for the data analyses. The significance level was set at 5%. The alpha coefficient and factor loadings were calculated to examine the reliability of the responses on each scale. As the aim of this study was to create a fatigue prediction model for postpartum mothers, the two main variables (fatigue and relaxation) were examined to clarify the reliability and validity of each scale. The Student t-test, one-way analysis of variance (ANOVA), stepwise multiple regression analysis and covariance structure analysis were used in three steps. For the first step, the correlations among the Fatigue, Relaxation, and participants' characteristics were examined using the Student t-test and one-way ANOVA. For the second step, seven variables were entered as independent variables, to determine which variables affected fatigue as dependent variables, using stepwise multiple regression analysis. For the third step, a fatigue prediction model of factors was examined to determine whether these factors affected fatigue in postpartum mothers using structural equation modeling.

3. Results

During the study period, 301 questionnaires were distributed to eligible participants. A total of 263 questionnaires (87.4%) were returned, of which 251 were usable for analyses. This gave an effective response rate of 83.4%. Data with missing values were excluded.

3.1. Participants

Table 1 shows the demographic characteristics of the participants. The mean age was 33.6 (SD 4.2) years; 151 participants (60.2%) were primipara and 100 participants (39.8%) were multipara. The number of postpartum days was in the range from the 1st to the 7th day. Mothers responding to the survey on the second day after delivery were the most frequent with 26.7%. There were 166 participants (66.1%) with normal vaginal delivery and 85 participants (33.9%) with caesarean section. Of the participants, 9.2% of the mothers had significant previous disease such as potential depression and bronchial asthma; 30.3% of the mothers had pregnancy complication such as threatened premature delivery and pregnancy anemia.

3.2. Reliability and Validity of the Scales

The factor structure was confirmed for each variable of fatigue, and relaxation. The construct validity was confirmed by factor analysis. The results of the factor analysis yielded a factor loading of 0.38 or more for all items, and the cumulative contribution rate was 46.4% or more for all scales. The reliability of the scales was confirmed using the Cronbach's α coefficient, which indicated from 0.87 and 0.83 respectively. Accordingly, reliability and validity were reconfirmed for fatigue, and relaxation. The results are shown in Table 2.

Table 1. Demographic data of the participants (N = 251).

Partisipants's characteristics	Mean	SD
	n	%
Age (years)	33.6	4.2
Postpartum days	3.0	1.4
Puerperal days		
day 1 of postparturition	29	11.6
day 2 of postparturition	67	26.7
day 3 of postparturition	66	26.3
day 4 of postparturition	59	23.5
day 5 of postparturition	12	4.8
day 6 of postparturition	11	4.4
day 7 of postparturition	7	2.8
Delivery methods		
Normal vaginal	166	66.1
Caesarean section	85	33.9
Birth experience		
primipara	151	60.2
multipara (2 times)	80	31.9
multipara (3 times)	18	7.2
multipara (4 times)	2	0.8
Previous disease		
yes	23	9.2
no	228	90.8
Pregnancy complication		
yes	76	30.3
no	175	69.7
Each scales and subscales	Mean	SD
Fatigue	9.0	7.5
Relaxation	23.0	8.7

Table 2. Descriptive statistics for each scale (N = 251).

Scale	N	Mean	SD	Number of items	Factor loadings	Cumulative contribution ratio	Cronbach's α
Fatigue	251	9.0	7.5	12	0.38 - 0.92	46.4	0.87
Relaxation	251	23.0	8.7	4	0.67 - 0.81	55.0	0.83

*Both scale was assessed using exploratory factor analysis.

3.3. Related Factors

Fatigue and relaxation as dependent variables and participants' characteristics as independent variables were analyzed using a two-sample Student t-test and one-way ANOVA. The results are shown in Table 3. Multiple comparisons of the means were performed using the Tukey honest significant difference method for fatigue and relaxation scores. Significant differences in fatigue and relaxation were found depending on the postpartum day. Fatigue was significantly associated with the postpartum days ($F = 5.7$, $p < 0.001$). In particular, mothers on postpartum day 7 had significantly higher fatigue scores than mothers on postpartum day 1. ($p < 0.01$). In addition, the mothers with previous disease had a significantly higher fatigue score than the mothers without previous disease ($t[249] = 2.2$, $p < 0.05$). Relaxation was significantly associated with the postpartum days ($F = 4.0$, $p < 0.01$). Mothers in postpartum day 7 had significantly lower relaxation scores than mothers during postpartum, day 1 ($p < 0.05$). The relaxation score of multipara mothers was significantly higher than the primipara mothers' score ($t[249] = 2.5$, $p < 0.05$).

Table 3. Relationships between the participants' characteristics and Fatigue, Relaxation (N = 251).

Participant's characteristics	n	%	Fatigue		Relaxation	
			Mean	SD	Mean	SD
Puerperal days*			F = 5.7***		F = 4.0**	
day 1 of postparturition	29	11.6	6.3	± 3.9	26.3	± 7.9
day 2 of postparturition	67	26.7	6.6	± 5.7	25.0	± 7.7
day 3 of postparturition	66	26.3	8.6	± 6.5	20.0	± 9.2
day 4 of postparturition	59	23.5	10.7	± 8.9	23.5	± 7.9
day 5 of postparturition	12	4.8	12.9	± 7.2	21.8	± 9.6
day 6 of postparturition	11	4.4	13.4	± 12.5	24.1	± 10.0
day 7 of postparturition	7	2.8	17.9	± 5.6	14.7	± 9.4
Birth experience			t = 1.6		t = 2.5*	
primipara	151		9.6	± 7.3	21.9	± 8.4
multipara (2 - 4 times)	100		8.1	± 7.6	24.7	± 9.0
Previous disease			t = 2.2*		t = 0.1	
yes	23	9.2	13.4	± 10.6	23.2	± 7.3
no	228	90.8	8.5	± 6.9	23.0	± 8.9

Student's t-test; one-way ANOVA (Tukey's muitiple comparisons test). *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

3.4. Predictors of Fatigue

To determine which variables affected fatigue, stepwise multiple regression analysis was carried out. Seven variables were entered as independent variables: age, postpartum days, delivery methods, birth experience, previous disease, pregnancy complication, and relaxation. The multiple regression analysis showed an association between fatigue and relaxation, postpartum days, and previous disease (Table 4). The three significant predictors of fatigue were relaxation (β = −0.30, $p < 0.001$), postpartum days (β = 0.26, $p < 0.001$), and previous disease (β = 0.14, $p < 0.05$). Postpartum days and previous disease had a positive impact, whereas relaxation had a negative impact on the fatigue scores. Four variables such as age, delivery methods, birth experience, and pregnancy complication were excluded.

3.5. Fatigue Prediction Model

A fatigue prediction model was created using structural equation modeling. The latent variables selected were seven factors: age, postpartum days, delivery methods, birth experience, previous disease, pregnancy complication, and relaxation. The age, delivery methods, birth experience, and pregnancy complication among the latent variables were excluded from the model because they had no significant path coefficient. Thus, the fatigue value for the mothers in the early postpartum period association model used in this study can reliably explain the relationships among the postpartum days, previous disease, and relaxation. The measurement model was then retested resulting in a better model fit index. The final model was created by drawing the partial correlation coefficient for the same error variables. The final values were as follows: GFI = 0.874; AGFI = 0.83; CFI = 0.883, RMSEA = 0.077, AIC =405.6, chi-square score = 317.58, degree of freedom = 127, and chi-square/degree of freedom ratio = 2.501. The final model is shown in Figure 1. The standardized estimates were all significant at the 5% level. The fit indices demonstrated an adequate fit of the model to the data. The fatigue score was significantly affected by relaxation (standardized partial regression coefficient: β = −0.32, $p < 0.001$), postpartum days (β = 0.31, $p < 0.001$),

Table 4. Predictors of Fatigue (N = 251).

Factors	Standardized multivariate regression coefficient
Relaxation	−0.30***
Puerperal days	0.26***
Previous disease	0.14*
R^2	0.22
F	23.4***

Stepwise multiple regression analysis. *$p < 0.05$, ***$p < 0.001$.

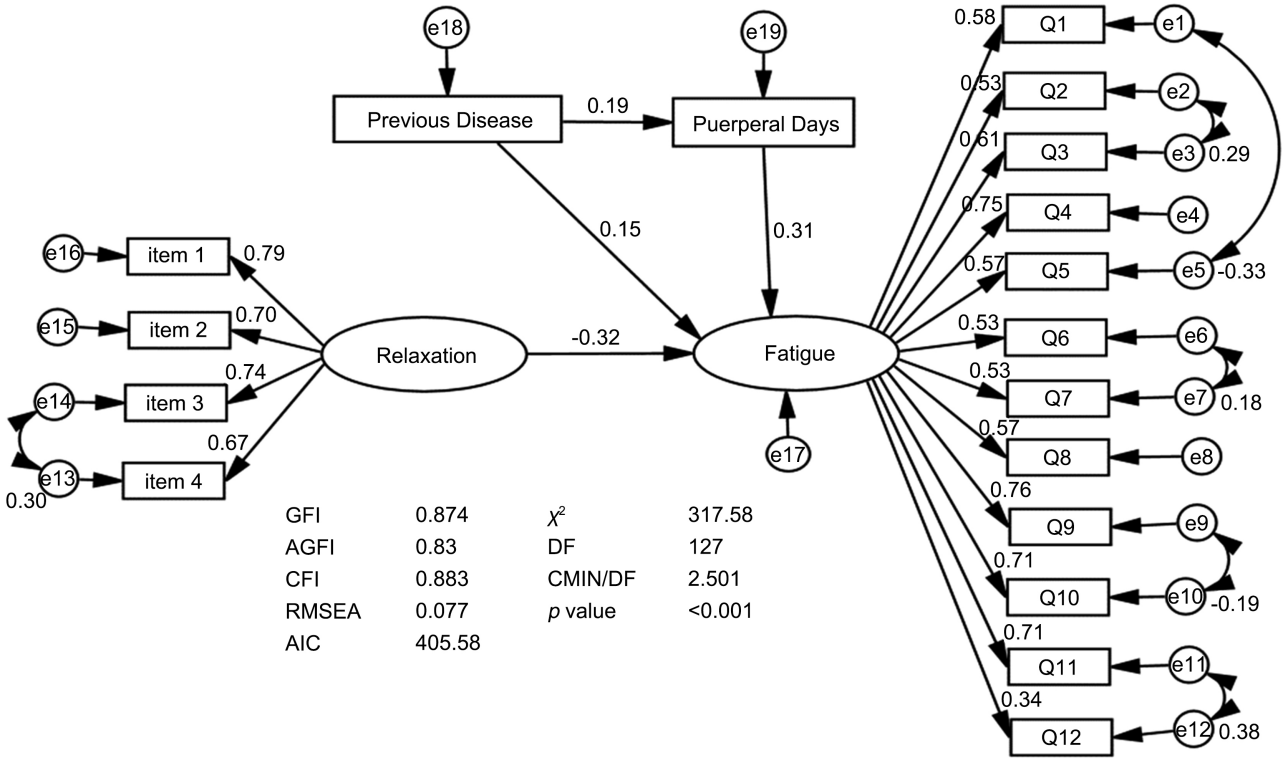

Figure 1. The Fatigue prediction model for mothers in the early postpartum period (N = 251).

and previous disease ($\beta = 0.15$, $p < 0.05$). Therefore, postpartum days and previous disease had a positive effect, whereas relaxation had negative effects on the fatigue score.

4. Discussion

4.1. Participants

Participants' characteristics are average age of 33.6 years, vaginal deliveries 66.1%, and primipara women 60.2%. The average age of primipara women in Japan was 30.7 years old [1], in other countries was 28.8 years old [19]. However, participants in this study were older than the average Japanese primipara. The caesarean section rate was higher (33.9%) compared to the cesarean section rate in Japan as a whole of 18.5% and the Japanese metropolitan of 25.6% [20]. In addition, 9.2% of participants previous disease and 30.3% had pregnancy complications. A likely explanation was because the hospital where the research was conducted with perinatal and life-saving transport support was located in the metropolitan area, and high-risk pregnant women were referred to the hospital for delivery. Participants in this study were an older and higher-risk group compared to the average Japanese primiparas; however, they were representatives of mothers giving birth at large hospitals in the metropolitan areas.

4.2. Care for Reducing Fatigue

The factors related to fatigue of mothers in the early postpartum period were

more days after birth, no relaxing, and had previous diseases. In particular, mothers with more postpartum days had significantly higher fatigue scores than mothers with fewer postpartum days. In addition to childbirth fatigue, sleep deprivation such as a rooming-in system, frequent breast-feeding, and care for her infants likely contributed to fatigue. Early in the postpartum period, mothers feel tired due to the delivery, and increased fatigue due to breast-feeding and infant-care [21]. There was a strong correlation between fatigue and depressive symptoms among women in the systematic review, although there was a high degree of heterogeneity between studies [22]. Because having previous disease during the postpartum period mothers do not feel fatigue, it is necessary for nurses to promote physical rest such as urging their mothers to take a nap, and to take care of their newborns. At the same time it is also important to encourage mothers' relaxation to reduce their fatigue. For example, lavender aromatherapy for postpartum mothers resulted in improved physical and mood status [23]. Hand aromatherapy treatments for postpartum mothers increased their relaxation [24]. Hand and foot baths for women after cesarean section stabilized vital signs such as blood pressure and pulse [25]. In particular, it was suggested that necessary for postpartum mothers with previous diseases who are hospitalized to promote rest and relaxation.

4.3. A Fatigue Prediction Model

A fatigue prediction model was finally selected as the most applicable among several models. For the final model the root mean square error of approximation (RMSEA) was 0.077 meeting the criterion of less than 0.08. Therefore the fit of the model was considered as reasonable or acceptable [26] [27] [28]. The minimum AIC was 405.6, and this final version model was applicated. Although the GFI and comparative fit index (CFI) were 0.9 or less, it met the criterion of GFI being more than AGFI. Significant path coefficients were obtained in all the items between the latent variables and the observed variables (See **Figure 1**).

4.4. Future Limitations and Challenges

The limitations of this research are the following three points. First, the research facility is one of many facilities in the metropolitan area, and data collection entailed convenience sampling, therefore the data are inherently biased. Also, because it was a survey at a facility with many high-risk mothers in the urban area, there was a high caesarean section rate at higher age therefore generalizability is limited. Second, the scales of fatigue and relaxation were used in the survey, were subjective measures of the individual and do not measure objective states. Also, we have not investigated the degree of depression and maternity blues. These states may have influenced the outcomes. Third, 16.4% of mothers could not response and there were missing values. Mothers may not have responded to the questionnaire due to strong fatigue and not being able to relax. Also, we did not confirm the breast feeding method such as complete breast milk, mixed

breast milk, complete milk, and that too may have had an effect on fatigue. As a future challenge, for clinical implications, relaxation care for mothers with previous disease is recommended and making necessary alterations in care as postpartum days increase. Future research should include large-scale randomized cross-sectional surveys to, include young low risk mothers from rural areas.

5. Conclusion

Predictors of fatigue for mothers in the early postpartum period were long days after childbirth, not feeling able to relax, and having previous disease. For mothers with previous disease, fatigue increased as postpartum days increased, so it was suggested that simple relaxation care is required while promoting rest and sleep.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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