

The physical and emotional health of South Korean mothers of preterm infants in the early postpartum period: a descriptive correlational study

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Purpose: This study investigated the physical and emotional health of South Korean mothers of preterm infants in the early postpartum period. **Methods:** In this descriptive correlational study, the participants included 91 mothers of preterm infants who were admitted to the neonatal intensive care unit of a tertiary hospital in South Korea. Physical health status was measured using a self-reported questionnaire, postpartum depression using the Edinburgh Postnatal Depression Scale, anxiety using the State-Trait Anxiety Inventory, and guilt using a 4-item scale. **Results:** Fatigue had the highest score among mothers' physical health problems, followed by shoulder pain, nipple pain, neck pain. The average postpartum depression score was 11.02 points, and 44% of women had postpartum depression with a score of 12 or above. Postpartum depression significantly was correlated with physical health ($r=.35, p=.001$), anxiety ($r=.84, p<.001$), and guilt ($r=.75, p<.001$) and was significantly higher for women with multiple births, and preterm infants who required ventilator and antibiotic treatment. Anxiety also showed a significant difference according to preterm infants' condition. **Conclusion:** The significant correlations between postpartum depression and physical health, anxiety, and guilt indicate a need for nursing interventions that provide integrated management of mothers' physical and emotional health.

Key words: Premature birth; Mothers; Health; Depression

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E-MAIL: ksbang@snu.ac.kr**Received** Mar 3, 2022**Revised** Mar 22, 2022**Accepted** Mar 24, 2022

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INTRODUCTION

After childbirth, mothers experience various physical and mental changes. During the postpartum period, which usually refers to the first 6 weeks after delivery, mothers often experience physical problems such as rapid hormonal changes, lactation difficulties, postpartum pain, pain in the episiotomy region, extreme fatigue, and emotional problems such as the burden of caring for a newborn and strain related to their new maternal role. These problems have a significant effect on mothers' quality of life [1]. If postpartum health problems persist, mothers may find it difficult to embrace their maternal role [2].

The postpartum experiences of mothers of preterm infants also differ depending on the gestational age of the baby. For late preterm infants between 34 and 37 weeks, the length of

stay in a neonatal intensive care unit (NICU) may be shorter. However, in the case of preterm infants born before a gestational age of 32 weeks, hospitalization may extend for more than a month and could have a significant effect on the health of the mother and family [3].

Although the mothers of preterm babies need rest during the postpartum period, they are often unable to care for themselves adequately if their babies are admitted to the NICU. In these cases, mothers must visit their babies often despite the condition of their own bodies, and they may even experience difficulty standing up when visiting their infants. Due to the difficulty mothers face related to their own care, they often experience physical exhaustion in these scenarios [4]. In addition to physical difficulties, mothers of preterm infants also tend to have higher levels of anxiety, depression, and stress than mothers of full-term infants [5,6] and sometimes experi-

ence guilt, blaming themselves for giving birth to preterm infant [7].

Mothers' physical and emotional health are related, and Hill and Aldag [8] found that physical health problems such as postpartum fatigue, perineal pain, back pain, and hemorrhoids, which health professionals have not seriously considered in the past, could have devastating effects on mothers' lives. Maternal fatigue during the early postpartum period affects mothers' quality of life significantly and is highly correlated with postpartum depression [9]. Functional limitations, depressive symptoms, and mental health problems are consistently associated with physical health problems, and mothers who complain of moderate to severe fatigue, headaches, and nausea also tend to have a relatively poor mental health status [10]. Furthermore, depressive symptoms have been found to persist significantly in mothers with various physical health problems at 3 months postpartum, suggesting a close relationship between emotional and physical health [11].

Previous studies have found that maternal health affects mother-infant attachment and infant development [12]. Therefore, nurses should understand the difficulties experienced by the mothers of preterm infants during the early postpartum period by exploring their physical and emotional health to help them raise their children. Currently, prenatal education provided to pregnant women in hospitals primarily focuses on topics such as fetal abnormalities and pain relief during childbirth, and programs at health centers and local community-led programs also tend to focus on pregnancy management. Only 14.8% of women received education on postpartum management during their pregnancies [13]; therefore, postpartum health care and education are currently insufficient. Additionally, although many studies have been conducted on the mental health of mothers of preterm infants [5,12,14,15], there have been few studies on the physical health of South Korean mothers during the postpartum period.

Given that the health of mothers of preterm infants affects mother-baby interaction and infant development, it is important to understand the health status of both mothers and infants in the field of child nursing. Therefore, this study aimed to identify the health care needs of South Korean mothers of preterm infants by identifying their physical and mental health status in the early postpartum period and examining the relationship between them. The specific research objectives were as follows: 1) to identify the physical health status of South Korean mothers of preterm infants in the early postpartum period, 2) to identify the emotional health status of South Korean mothers of preterm infants in the early postpartum period, 3) to investigate the correlation between physical and emotional health, and 4) to identify differences in the

physical and emotional health status of South Korean mothers of preterm infants according to the general characteristics of the mothers and their babies.

METHODS

Ethics statement: This study was approved by the institutional review board of Seoul National University Hospital (No. 1706-124-861). Informed consent was obtained from the participants.

1. Study Design

This descriptive research study identified the physical and emotional health status of South Korean mothers who gave birth to preterm infants at a tertiary hospital in South Korea and identified the correlations between them.

2. Study Participants

The participants were mothers aged 19 years or older who gave birth before 37 gestational weeks to preterm infants who were admitted to the NICU, and who could understand and complete the questionnaire. The exclusion criteria included cases in which the infant had a congenital anomaly or required treatment, such as continuous renal replacement therapy or extracorporeal membrane oxygenation. G*Power version 3.1.9.2 was used to calculate the number of subjects required for a two-sided correlation analysis [16]; the effect size, significance level, and power were set at 0.3, .05, and .80, respectively, and the resulting number of subjects was 84. Considering a 10% dropout rate, 93 mothers agreed to participate, and two did not complete the questionnaire, making a dropout rate of 2.1%. The final analysis included 91 mothers.

3. Measurements

1) Physical health

Regarding physical health, a self-reported questionnaire developed in a previous study was used [17]. Seventeen items were classified into general, musculoskeletal system, breast system, urinary system, and gastrointestinal system. The severity of symptoms was measured using a 5-point Likert scale for current physical symptoms. In addition to the symptoms presented, the questionnaire also included open-ended questions that allowed the mothers to fill in the physical symptoms they were experiencing. In this study, Cronbach's α was .76.

2) Postpartum depression

The Edinburgh Postnatal Depression Scale (EPDS) tool de-

veloped by Cox et al.[18] and adapted by Han et al.[19] was used to measure postpartum depression. The EPDS was developed to screen for postpartum depression and consist of a 10-item questionnaire answered using a self-rated scale. Each item is designed to identify symptoms such as depression, anxiety, fear, guilt, and suicidal ideation experienced by mothers within the week prior to taking the questionnaire. Answers are given using a 4-point Likert scale ranging from “not at all” to “strongly agree”, with total possible scores ranging from 0 to 30. A higher score indicates a higher degree of postpartum depression, and a score of 9 to 13 or higher at the time of the tool’s development was considered to be the reference point for postpartum depression. In the study in which the tool was developed, Cronbach’s α was .85 [19], and it was .92 in this study. Given the seriousness of postpartum depression, the cutoff score must be 10 or more for the purposes of early detection and treatment. For the purpose of psychiatric evaluation, a score of 13 or higher is considered to indicate major depression requiring immediate attention [19]. However, this tool should not be construed as a tool for clinical diagnosis, and the reference score varies depending on the characteristics and purpose of each study [18]. Based on existing standard scores, 12 points or above was considered to indicate postpartum depression in this study.

3) Anxiety

The State-Trait Anxiety Inventory, which was used in Kim and So’s study [20] and developed by Spielberger et al.[21], was utilized to measure postpartum anxiety in this study. It is a tool to measure the state of anxiety of normal adults without mental disorders. The State Anxiety Scale contains 20 questions on the respondent’s particular current situation, and the Trait Anxiety Scale contains 20 questions about the characteristics of the respondent’s innate emotional anxiety. The State Anxiety Scale includes 10 positive items each and 10 negative items, which are measured on a 4-point Likert scale. Positive items are scored using a 4-point scale from “strongly agree” to “not at all.” Negative items are counted inversely. Possible scores range from a minimum of 20 to a maximum of 80, with a higher score indicating a higher level of anxiety. Cronbach’s α was .90 in the previous study [20] and .95 in this study.

4) Guilty

To measure the feelings of guilt experienced by mothers of preterm infants, we used a tool developed to measure the feelings of guilt of mothers with children who have rare genetic metabolic diseases [22]. Total scores are measured based on scores for items measuring four major concepts: fault, responsibility, punishment, and feelings of helplessness. The item “I think it is my fault that my child is sick” is used to measure

fault, “Sometimes I feel like I did something wrong” is used to measure responsibility, “I am punished because I have sinned” is used to measure punishment, and “Sometimes I feel distressed because I think there is not much I can do for a sick child” is used to measure feelings of helplessness. The 4 items are answered using a 5-point scale. Possible scores range from a minimum of 4 to a maximum of 20, with a higher score indicating a higher level of guilt. In the study by Kwon et al.[22], Cronbach’s α was .88. In Lee’s study [7], Cronbach’s α was .82, and it was .89 in this study.

4. Data Collection

After receiving institutional review board approval (No.: 1706-124-861) from the researchers’ affiliated hospital, permission to collect research data was secured from the Department of Nursing and the head nurse of the ward. During the visiting hours of the NICU, the researcher explained the purpose and methods of the study to prospective subjects who met the subject selection criteria and administered the questionnaire if they agreed to participate. The researcher sent a link to an online questionnaire to the participants after 2 to 3 weeks, with an average response time of 19 days after childbirth. The time to complete the questionnaire was approximately 15 to 20 minutes. The data collection period was from March 2018 to August 2019.

5. Data Analysis

The data collected in this study were analyzed using SPSS Statistics 28.0 (IBM corp., Armonk, NY, USA). The participants’ general characteristics, and scores for postpartum depression, anxiety, and guilt were analyzed using descriptive statistics. For continuous variables, normality was confirmed using the Kolmogorov-Smirnov test, finding a normal distribution of .05 or more. The relationship between the physical and emotional health status of mothers of preterm infants was analyzed using Pearson correlation coefficients, and the differences in physical and emotional health status according to general characteristics were analyzed using the independent t-test.

RESULTS

1. General Characteristics of Participants

The average age of the mothers was 35.3 years. A total of 83 mothers (91.2%) had a university degree or higher, and 54 (59.3%) were employed. Sixty-eight of the participants (74.7%) were first-time mothers, 40 (44.0%) experienced natural preg-

nancies, and 51 (56.0%) had infants conceived from artificial insemination. There were 52 mothers (57.1%) who had a single birth and 39 (42.9%) who had multiple births. Thirty mothers (33.0%) had an underlying prenatal disease, and 73 (80.2%) did not receive education on postpartum health care. Of the 18 mothers who had received education, 3 (16.7%) were educated before childbirth and 15 (83.3%) after childbirth. The most common frequency of visits was daily, with 55 mothers (60.4%) making visits every day, and grandparents were the most common additional caretakers, with 39 mothers (42.8%) answering that grandparents helped care for the baby (Table 1).

2. Characteristics of Preterm Babies

There were a total of 141 premature infants, including multiple births; however, for data analysis, the infant with the lowest weight among sets of twins was selected and analyzed, and a total of 91 infants were included in the analysis. There were 45 boys (49.5%) and 46 girls (50.5%). The average gestational age was 31.8 weeks, and the average birth weight was 1,489.5 g. The highest proportion of infants weighed 1,500 g or more, at 43 infants (47.2%). Thirty infants (33.0%) received ventilator treatment, 63 infants (69.2%) received oxygen treatment other than a ventilator, and 56 infants (61.5%) received antibiotic treatment. At the time of the survey, 66 infants (72.5%) were still hospitalized, and 25 infants (27.5%) had been discharged (Table 1).

3. Physical and Emotional Health

1) Physical health

The average total score for physical health (17 items) rated on a 5-point scale was 35.59 ± 8.52 points. Fatigue was the most common symptom, with an average of 3.42 ± 0.96 points, followed by shoulder pain in the musculoskeletal system at 3.12 ± 1.22 points. The least common symptom was nausea or vomiting in the gastrointestinal system at 1.20 ± 0.53 points (Table 2).

2) Emotional health

Possible postpartum depression scores ranged from 0 to 30, and the average score for postpartum depression in mothers of premature infants in this study was 11.02 ± 6.72 points. In total, 40 subjects (44%) were considered to be at risk of postpartum depression, with a score of 12 points or higher. Possible state anxiety scores ranged from a minimum of 20 points to a maximum of 80 points. The average state anxiety score was 48.04 ± 13.24 points. Possible scores for guilt ranged

from 4 points to 20 points, with an average score of 13.46 ± 4.44 points (Table 3).

4. Correlations with Physical and Emotional Health

Significant correlations were observed between mothers' physical and emotional health status. First, the correlations between physical health and postpartum depression ($r = .35$, $p = .001$), state anxiety ($r = .34$, $p = .001$), and guilt ($r = .27$, $p = .009$) were significant. For emotional health, postpartum depression showed a significant correlation with state anxiety ($r = .84$, $p < .001$), and guilt ($r = .75$, $p < .001$). The relationship between state anxiety and guilt was also significant ($r = .72$, $p < .001$) (Table 4).

5. Comparison of Physical and Emotional Health

The physical health status of mothers did not differ according to their or their infant's characteristics. However, the emotional health scores of mothers did differ according to their characteristics. Postpartum depression ($t = 2.74$, $p = .008$) and guilt ($t = 2.30$, $p = .024$) were significantly higher among mothers with multiple births. In addition, guilt was significantly higher among first-time mothers ($t = 2.92$, $p = .004$). Mothers with infants born at a gestational age of below 34 weeks had higher state anxiety scores than those with infants born at or after 34 weeks ($t = 2.48$, $p = .015$). Postpartum depression was also significantly higher among mothers of preterm infants who required ventilator care ($t = 2.25$, $p = .027$) and antibiotic treatment ($t = 2.43$, $p = .017$). State anxiety was also significantly higher in mothers with preterm infants who required ventilator care ($t = 3.45$, $p = .001$), oxygen treatment ($t = 2.32$, $p = .022$), and antibiotic treatment ($t = 2.72$, $p = .008$). Postpartum depression ($t = 2.05$, $p = .044$) and anxiety ($t = 2.78$, $p = .007$) were significantly higher among mothers of infants who had not yet been discharged from the hospital at the time of the survey (Table 5).

DISCUSSION

This study aimed to examine the physical and emotional health status of mothers of premature infants in the early postpartum period and the correlation between them. Since several studies have shown that found that mothers' physical and mental health affects children [12], this is a crucial topic of study for the health and development of children.

In this study, fatigue was the most common symptom of mothers of preterm infants in terms of physical health problems, followed by shoulder pain, nipple pain, and neck pain. Although it is difficult to make a direct comparison due to the lack of studies examining mothers' physical health problems

Table 1. Characteristics of Mothers and Preterm Infants (N=91)

Variables	Characteristics	Categories	n (%)	M±SD (Min-Max)	
Mothers	Age (year)	≤ 35	48 (52.7)	35.3±3.5	
		≥ 36	43 (47.3)		
	Education level	≥ University	83 (91.2)		
		High school	8 (8.8)		
	Employment status	Yes	54 (59.3)		
		No	37 (40.7)		
	Birth history	Primipara	68 (74.7)		
		Multipara	23 (25.3)		
	Pregnancy method	Natural	40 (44.0)		
		Artificial	51 (56.0)		
	Multiple births	Yes	39 (42.9)		
		No	52 (57.1)		
	Education on postnatal care	Yes	18 (19.8)		
		No	73 (80.2)		
	Time of education on postnatal care (n=18)	Antenatal	3 (16.7)		
Postnatal		15 (83.3)			
Location of education on postnatal care (n=18)	Postnatal care center	12 (66.7)			
	Hospital	2 (11.1)			
	Others	4 (22.2)			
Underlying prenatal disease status	Yes	30 (33.0)			
	No	61 (67.0)			
Weekly visits (day)	Daily	55 (60.4)			
	5 – 6	12 (13.2)			
	3 – 4	13 (14.3)			
	1 – 2	11 (12.1)			
	Assistance from other caretakers	Husband	13 (14.3)		
	Grandparents	39 (42.8)			
	Postpartum caretaker	28 (30.8)			
	None	11 (12.1)			
Preterm infants	Sex	Male	45 (49.5)	31.8±2.8 (23-36)	
		Female	46 (50.5)		
	Gestational age (week)	< 34	60 (65.9)		
		≥ 34	31 (34.1)		
	Birth weight (g)	< 1,000	17 (18.7)		1,489.5±543.3 (520-3,536)
		1,000 – 1,499	31 (34.1)		
		≥ 1,500	43 (47.2)		
	Ventilator care	Yes	30 (33.0)		
		No	61 (67.0)		
	Oxygen treatment*	Yes	63 (69.2)		
No		28 (30.8)			
Antibiotic treatment	Yes	56 (61.5)			
	No	35 (38.5)			
Hospitalization	Yes	66 (72.5)			
	No	25 (27.5)			

*Excluding ventilator.

during the postpartum period, the participants in this study felt substantial fatigue during their recovery after childbirth since the study was conducted just 2 to 3 weeks after they had given birth. However, it is believed that they felt even more fatigue due to the difficulty of visiting their infants in the NICU. In addition to fatigue, nipple pain is also a common problem experienced by lactating mothers. According to a recent study, the period during which mothers experience the most

nipple pain is 1 to 3 weeks after childbirth [23]. Therefore, nurses who meet mothers at this stage in the NICU should consider mothers' breastfeeding problems and nipple management and provide appropriate education.

A systematic literature review and meta-analysis study on the correlation between postpartum fatigue and depression [24] reported a very strong correlation between the two. Postpartum depression measured at 1, 3, and 6 weeks postpartum has been found to correlate with physical health [25], and in a study by Aksu et al.[17], postpartum depression also corresponded to high postpartum fatigue. Scores were significantly high, indicating a correlation between physical and emotional health. In this study, postpartum depression, anxiety, and guilt were significantly correlated with physical health, supporting the relationship between physical and emotional health. According to a recent integrative literature review [26], psychological care, education, additional social support, and health behaviors should be considered when assessing maternal well-being, since mothers' health conditions and lifestyle behaviors are related to prenatal and postpartum stress.

Currently, national and local governments provide postpartum management services after childbirth as a component of maternal and child health projects. Among these, the usage rates of maternal examination and health guidance services are 7.3% for maternal health guidance, 11.1% for postpartum anemia testing, and 5.2% for postpartum depression testing [27]. Nevertheless, the satisfaction of parents who used these services was high [27], indicating that active publicity is needed to raise awareness and promote the use of these services. Providing and managing knowledge about and emphasizing the importance of postpartum physical and emotional health care, which may be neglected by hospitals, is necessary.

Concerning emotional health status, the average postpartum depression score was 11.02 points, indicating that nearly half of the mothers (n=40, 44%) had postpartum depression with a score of 12 or above. There have been many studies on postpartum depression in mothers of premature infants, one of which found that 30% of mothers were consid-

Table 2. Physical Health of Mothers of Preterm Infants (N=91)

Variables	Categories	M±SD
General symptoms	Fatigue	3.42±0.96
	Headache	1.85±1.10
	Sleep problems	2.86±1.26
Musculoskeletal system	Shoulder pain	3.12±1.22
	Neck pain	2.98±1.20
	Backache	2.87±1.39
Breast system	Nipple pain	3.05±1.05
	Mastitis	1.60±0.89
Urinary system	Pain in the surgical area	2.36±1.13
	Urinary incontinence	1.28±0.66
	Hemorrhage in the perineal area	1.56±0.93
	Dysuria	1.64±0.96
Gastrointestinal system	Hemorrhoids	1.54±0.92
	Constipation	1.73±0.99
	Diarrhea	1.44±0.85
	Dyspepsia	1.55±0.87
	Nausea or vomiting	1.20±0.53
Total score		35.59±8.52

Table 3. Emotional Health of Mothers of Preterm Infants (N=91)

Variables	Categories	M±SD	Min-Max
Emotional health	Postpartum depression	11.02±6.72	0-27
	State anxiety	48.04±13.24	21-75
	Guilt	13.46±4.44	5-20

Table 4. Correlations between Physical and Emotional Health (N=91)

Variables	Physical health	Postpartum depression	State anxiety	Guilt
	r (p)	r (p)	r (p)	r (p)
Physical health	1			
Postpartum depression	.35 (.001)	1		
State anxiety	.34 (.001)	.84 (< .001)	1	
Guilt	.27 (.009)	.75 (< .001)	.72 (< .001)	1

Table 5. Comparisons of Physical and Emotional Health According to the Characteristics of the Participants and Their Preterm Infants (N=91)

Variables	Characteristics	Categories	Physical health		Postpartum depression		State anxiety		Guilt	
			M±SD	t (p)	M±SD	t (p)	M±SD	t (p)	M±SD	t (p)
Mothers	Age (year)	≤ 35	36.17±7.83	0.68	12.02±6.86	1.51	49.92±13.32	1.43	13.92±4.54	1.03
		≥ 36	34.95±9.27	(.501)	9.91±6.46	(.135)	45.95±12.97	(.155)	12.95±4.32	(.304)
	Education level	≥ University	35.40±8.52	0.70	11.08±6.65	0.28	48.34±13.38	0.68	13.57±4.41	0.72
		High school	37.63±8.79	(.483)	10.38±7.89	(.777)	45.00±12.03	(.499)	12.38±4.92	(.472)
	Employment status	Yes	36.09±8.10	0.67	10.17±5.57	1.38	48.06±11.47	0.01	13.07±4.33	1.01
		No	34.86±9.15	(.503)	12.27±8.03	(.172)	48.03±15.63	(.992)	14.03±4.59	(.317)
	Birth history	Primipara	36.01±8.36	0.81	11.72±6.81	1.72	49.85±12.72	2.29	14.22±4.10	2.91
		Multipara	34.35±9.03	(.420)	8.96±6.11	(.088)	42.70±13.57	(.024)	11.22±4.72	(.004)
	Multiple births	Yes	35.92±8.00	0.42	12.63±6.75	2.74	49.85±13.11	1.51	14.37±4.51	2.30
		No	35.15±9.24	(.672)	8.87±6.13	(.008)	45.64±13.19	(.135)	12.26±4.08	(.024)
Education on postnatal care	Yes	32.67±9.23	1.64	8.89±6.24	1.51	43.61±15.25	1.60	11.78±4.79	1.82	
	No	36.32±8.24	(.104)	11.55±6.77	(.134)	49.14±12.57	(.113)	13.88±4.28	(.072)	
Underlying prenatal disease status	Yes	37.03±8.26	1.13	11.83±6.71	0.81	48.90±13.03	0.43	14.23±4.28	1.17	
	No	34.89±8.61	(.260)	10.62±6.74	(.423)	47.62±13.42	(.668)	13.08±4.50	(.247)	
Pregnancy method	Natural	36.38±8.67	0.77	11.03±6.57	0.00	48.58±13.04	0.34	13.35±4.63	0.21	
	Artificial	34.98±8.43	(.441)	11.02±6.90	(.997)	47.63±13.50	(.737)	13.55±4.32	(.833)	
Preterm infants	Sex	Male	35.93±9.11	0.38	11.16±7.08	0.19	48.24±13.76	0.14	13.71±4.64	0.53
		Female	35.26±7.98	(.709)	10.89±6.43	(.853)	47.85±12.86	(.887)	13.22±4.26	(.599)
	Gestational age (week)	< 34	35.72±8.33	0.19	11.82±7.06	1.58	50.45±12.76	2.48	14.03±4.46	1.73
		≥ 34	35.35±9.00	(.849)	9.48±5.81	(.117)	43.39±13.10	(.015)	12.35±4.25	(.088)
	Ventilator care	Yes	33.90±7.74	1.33	13.23±6.25	2.25	54.50±11.77	3.45	14.73±4.38	1.95
		No	36.43±8.81	(.185)	9.93±6.72	(.027)	44.87±12.84	(.001)	12.84±4.36	(.055)
	Oxygen treatment*	Yes	35.49±8.87	0.17	11.70±6.74	1.45	50.14±12.98	2.32	13.84±4.43	1.23
		No	35.82±7.81	(.866)	9.50±6.54	(.151)	43.32±12.79	(.022)	12.61±4.41	(.223)
	Antibiotic treatment	Yes	35.41±8.38	0.26	12.34±7.20	2.43	50.93±14.01	2.72	13.89±4.63	1.18
		No	35.89±8.84	(.797)	8.91±5.31	(.017)	43.43±10.52	(.008)	12.77±4.08	(.243)
Hospitalization	Yes	35.50±8.35	0.17	11.89±6.99	2.05	50.33±13.05	2.78	13.86±4.40	1.41	
	No	35.84±9.10	(.866)	8.72±5.42	(.044)	42.00±11.98	(.007)	12.40±4.43	(.162)	

*Excluding ventilator.

ered to be at risk of postpartum depression at the time of discharge [15], while another found that 29.7% of mothers were at risk at 4 to 6 weeks postpartum [28]. Another study found that 86.1% of the subjects were considered to have postpartum depression with a score of 12 or higher at 2 to 3 weeks postpartum, similar to the findings of the present study [29]. Therefore, postpartum depression appears to be higher in the early postpartum period.

In addition, postpartum depression was significantly higher for mothers of twins and preterm infants receiving ventilator and antibiotic treatments. Maternal anxiety also showed significant differences according to the condition of the infants. Therefore, in the case of mothers of premature infants who are admitted to the NICU immediately after birth and are separated from their babies, interventions to provide emotional support and postpartum depression relief are

needed beginning in the early postpartum period.

This study has some limitations. The generalizability of the results may be limited since only mothers of preterm infants admitted to the NICU at a single hospital with a high overall rate of preterm infants in severe condition were included as participants. In addition, since physical health was measured using self-reported questionnaires only, there may be a discrepancy between mothers' subjective and objective health status. Nevertheless, it is meaningful that, through this study, we were able to identify the major physical health problems of mothers of preterm infants in the early postpartum period. Although we did not observe any differences in mothers' physical health according to the characteristics of mothers or their infants, there were significant correlations between physical health and postpartum depression, anxiety, and guilt. Nursing intervention for integrated physical and emotional

health management is required, given the long-term effects of the mother's health status on an infant's development [30].

CONCLUSION

This study aimed to examine the physical and emotional health status of South Korean mothers of preterm infants in the early postpartum period and to identify correlations between them. For physical health problems, fatigue and shoulder pain were the most common symptoms, and physical health showed significant correlations with postpartum depression, anxiety, and guilt. Given that approximately half of the mothers experienced postpartum depression, with mothers of infants that had more severe conditions displaying more symptoms of postpartum depression, an integrated health care intervention for mothers of premature infants is needed. Nurses who meet mothers in the NICU during their nursing practice can create a positive primary environment for babies not only by giving advice to mothers on baby health, but also by considering mothers' physical and emotional health. The health problems of mothers of preterm infants identified in this study are expected to be used as basic data for future NICU nurses to understand mothers' health problems and develop interventions to mitigate those problems.

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Conceptualization: all authors; Data collection, Formal analysis: Jiyun Park; Writing-original draft, Writing-review and editing: all authors; Final approval of published version: all authors.

Conflict of interest

No existing or potential conflict of interest relevant to this article was reported.

Funding

None.

Data availability

Please contact the corresponding author for data availability.

Acknowledgements

None.

REFERENCES

1. McGovern P, Dowd B, Gjerdingen D, Dagher R, Ukestad L, McCaffrey D, et al. Mothers' health and work-related factors at 11 weeks postpartum. *Annals of Family Medicine*. 2007;5(6):519-527. <https://doi.org/10.1370/afm.751>
2. Chien LY, Tai CJ, Hwang FM, Huang CM. Postpartum physical symptoms and depressive symptomatology at 1 month and 1 year after delivery: a longitudinal questionnaire survey. *International Journal of Nursing Studies*. 2009;46(9):1201-1208. <https://doi.org/10.1016/j.ijnurstu.2009.02.007>
3. Kantrowitz-Gordon I. Expanded care for women and families after preterm birth. *Journal of Midwifery and Womens Health*. 2013;58(2):158-166. <https://doi.org/10.1111/j.1542-2011.2012.00242.x>
4. Choi EA, Lee YE. A mother's experience of hospitalization of her newborn in the neonatal intensive care unit. *Child Health Nursing Research*. 2018;24(4):407-419. <https://doi.org/10.4094/chnr.2018.24.4.407>
5. Bouras G, Theofanopoulou N, Mexi-Bourna P, Poullos A, Michopoulos I, Tassiopoulou I, et al. Preterm birth and maternal psychological health. *Journal of Health Psychology*. 2015;20(11):1388-1396. <https://doi.org/10.1177/1359105313512353>
6. Hanko C, Bittner A, Junge-Hoffmeister J, Mogwitz S, Nitzsche K, Weidner K. Course of mental health and mother-infant bonding in hospitalized women with threatened preterm birth. *Archives of Gynecology and Obstetrics*. 2020;301(1):119-128. <https://doi.org/10.1007/s00404-019-05406-3>
7. Lee JY. Guilt and social support in the mothers of premature infants [master's thesis]. Busan: Dong-A University; 2011. p. 1-59.
8. Hill PD, Aldag JC. Maternal perceived quality of life following childbirth. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*. 2007;36(4):328-334. <https://doi.org/10.1111/j.1552-6909.2007.00164.x>
9. Choi SY, Gu HJ, Ryu EJ. Effects of fatigue and postpartum depression on maternal perceived quality of life in early postpartum mothers. *Korean Journal of Women Health Nursing*. 2011;17(2):118-125. <https://doi.org/10.4069/kjwhn.2011.17.2.118>
10. Webb DA, Bloch JR, Coyne JC, Chung EK, Bennett IM, Culhane JF. Postpartum physical symptoms in new mothers: their relationship to functional limitations and emotional well-being. *Birth (Berkeley, Calif)*. 2008;35(3):179-187. <https://doi.org/10.1111/j.1523-536X.2008.00238.x>
11. Woolhouse H, Gartland D, Perlen S, Donath S, Brown SJ. Physical health after childbirth and maternal depression in the first 12 months post partum: results of an Australian nulliparous preg-

- nancy cohort study. *Midwifery*. 2014;30(3):378-384.
<https://doi.org/10.1016/j.midw.2013.03.006>
12. Anderson C, Cacula P. Implications of preterm birth for maternal mental health and infant development. *MCN: American Journal of Maternal/Child Nursing*. 2017;42(2):108-114.
<https://doi.org/10.1097/NMC.0000000000000311>
13. Lee JY, Kim HY. Development and validation of a postpartum care mobile application for first-time mothers. *Korean Journal of Women Health Nursing*. 2017;23(3):210-220.
<https://doi.org/10.4069/kjwhn.2017.23.3.210>
14. Misund AR, Nerdrum P, Diseth TH. Mental health in women experiencing preterm birth. *BMC Pregnancy and Childbirth*. 2014;14:263. <https://doi.org/10.1186/1471-2393-14-263>
15. Bang KS, Kang HJ, Kwon MK. Relations of postpartum depression with socio-demographic and clinical characteristics of preterm infants and mothers. *Child Health Nursing Research*. 2015;21(1):1-10. <https://doi.org/10.4094/chnr.2015.21.1.1>
16. Faul F, Erdfelder E, Buchner A, Lang AG. Statistical power analyses using G*Power 3.1: tests for correlation and regression analyses. *Behavior Research Methods*. 2009;41(4):1149-1160.
<https://doi.org/10.3758/BRM.41.4.1149>
17. Aksu S, Varol FG, Hotun Sahin N. Long-term postpartum health problems in Turkish women: prevalence and associations with self-rated health. *Contemporary Nurse*. 2016;53(2):167-181.
<https://doi.org/10.1080/10376178.2016.1258315>
18. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression development of the 10-item Edinburgh Postnatal Depression Scale. *The British Journal of Psychiatry*. 1987;150(6):782-786.
19. Han KW, Kim MJ, Park JM. The Edinburgh Postnatal Depression Scale, Korean version: reliability and validity. *Journal of the Korean Society of Biological Therapies in Psychiatry*. 2004;10(2):201-207.
20. Kim SY, So HS. The effects of puerperium maternal anxiety, marital relationships, and depression on late postpartum depression. *Journal of the Korean Society of Maternal and Child Health*. 2017;21(2):139-148.
<https://doi.org/10.21896/jksmch.2017.21.2.139>
21. Spielberger CD, Gorsuch RL, Lushene RE. Manual for the state-trait anxiety inventory. Palo Alto, CA: Consulting Psychologist press; 1970.
22. Kwon EK, Choi MH, Kim SK. Parenting stress and guilty feeling for mothers having children with rare genetic metabolic diseases. *Journal of Korean Clinical Nursing Research*. 2008;14(3):153-163.
23. Laageide L, Radke S, Santillan D, Eyck PT, Powers J. Postpartum nipple symptoms: risk factors and dermatologic characterization. *Breastfeeding Medicine*. 2021;16(3):215-221.
<https://doi.org/10.1089/bfm.2020.0030>
24. Wilson N, Lee JJ, Bei B. Postpartum fatigue and depression: a systematic review and meta-analysis. *Journal of affective disorders*. 2019;246:224-233. <https://doi.org/10.1016/j.jad.2018.12.032>
25. Gomez-Perez L, Cumsille P, Roman C. Bidirectional relationship between physical health symptoms and depressive symptoms in the pre-and postpartum period. *Journal of Psychosomatic Research*. 2020;139:110280.
<https://doi.org/10.1016/j.jpsychores.2020.110280>
26. Saur AM, Santos MA. Risk factors associated with stress symptoms during pregnancy and postpartum: integrative literature review. *Women and Health*. 2021;61(7):651-667.
<https://doi.org/10.1080/03630242.2021.1954132>
27. Kang EJ. Plan of health care and supporting child care for mother and neonatal. *Child Care Policy Forum*. 2019;59:16-32.
28. Helle N, Barkmann C, Bartz-Seel J, Diehl T, Ehrhardt S, Hendel A, et al. Very low birth-weight as a risk factor for postpartum depression four to six weeks postbirth in mothers and fathers: cross-sectional results from a controlled multicentre cohort study. *Journal of Affective Disorders*. 2015;180:154-161.
<https://doi.org/10.1016/j.jad.2015.04.001>
29. Lee JY, Ju HO. Predictors of early postpartum depression in mothers of preterm infants in neonatal intensive care units. *Child Health Nursing Research*. 2014;20(2):87-95.
<https://doi.org/10.4094/chnr.2014.20.2.87>
30. Kim MJ, Park JA, Sung OH, Hong SJ, Lee KS. A longitudinal cohort study of postpartum depression: mother's mental health and parent-child relationship. *Korean Journal of Infant Mental Health*. 2018;11(2):53-73. <https://doi.org/10.47801/KJIMH.11.2.3>