Factors associated with maternal stress while caring for premature infants at home

Rinik Eko Kapti,[1] Yuni Sufyanti Arief,[2] Nurona Azizah,[1] Sholihatul Amaliya,[1] Lilik Supriati,[1] Ari Damayanti Wahyuningrum[3]

[1]Department of Nursing, Faculty of Health Sciences, Universitas Brawijaya, Malang, East Java; [2]Faculty of Nursing, Universitas Airlangga, Surabaya, East Java; [3]Nursing Science of Widyagama Husada Health Science College, Malang, East Java, Indonesia

Abstract

The occurrence of stress in mothers with premature infants is known to have a negative impact on both mothers and their infants. To overcome the condition, nurses must understand its influential factors to provide effective assistance. Therefore, this study aims to identify factors associated with stress in mothers with premature infants. The study procedures were carried out using a cross-sectional design with a purposive sampling technique comprising 188 mothers with premature infants. In addition, the instruments used were questionnaires for assessing the PSS (Parent Stress Scale), knowledge about the benefits of caring for infants, and support. Data analysis was then carried out using univariate analysis, chi-square, and binary logistic regression. The majority of mothers had a moderate level of stress, accounting for 46.3% of the total population. In addition, the results showed that factors associated with moderate levels of stress in mothers with premature infants were younger age, low level of education, SC delivery method, living in rural areas, low knowledge of care, very low infant weight, and low partner support. Based on the results, maternal factors and unfavorable infant conditions could increase stress in mothers with premature infants.

Introduction

According to the World Health Organization (WHO), the incidence rate of premature births was 11.1% of all live births globally, and in 2015, approximately 15 million cases were recorded annually.[1,2] Several studies have shown that 60% of these cases typically occur in low and middle-income countries in Africa and South Asia.[2] In addition, premature birth is widely known as the leading cause of death in children under 5 years, and its incidence rate has shown an increasing annual trend.[3] The high risk of mortality and morbidity associated with the condition necessitates specialized care in the hospital neonates unit and at home. This is to ensure the continuity of appropriate care after discharge as well as the well-being and adequate health of premature infants.[1]

In line with previous studies, mothers typically serve as the main caregivers for their infants at home. However, caring for premature infants is a challenging process, requiring mothers' acceptance and understanding of the differences compared to full-term babies.[4] Previous reports have shown that the caregiving process is characterized by various requirements, such as adequate feeding, close monitoring, and comprehension of behavior. These requirements often lead to a range of emotional conditions, such as fear of harming their babies, loneliness, and feeling of being left alone to bear the burden, leading to an increased risk of mental health disorders. A previous study showed that mothers experienced fatigue and stress, further exacerbating symptoms of depression.[1,2,5]

Several studies have shown that maternal distress and psychological problems often persist and increase after hospital discharge due to the severe stress of hospitalization and the severity of infants' condition at home.[6] The transition from hospital to home often presents several stressors to mothers, including the appearance of premature infants, changes in maternal roles, and the challenges associated with daily child care.[6] A recent report showed that mothers with premature infants had higher stress compared to others with full-term infants.[7,8] This result was inconsistent with other studies that stress of caregivers who cared for their infants at home on average was normal daily stress.[9]

Stressful conditions have been reported to have a negative impact on mothers and their infants. Maternal stress can present obstacles in achieving optimal maternal behavior and fulfilling caregiving roles.[10-13] Stress due to premature birth typically causes poor mother-infant interactions, thereby affecting their physical and mental health.[14] Prolonged levels can also lead to psychological disorders in mothers, such as postpartum depression or infants blues.[15]

Maternal stress is often influenced by several factors, namely age, education level, occupation, and infants weight during stay at the NICU.[16] Previous studies also showed that personality, mental health, and family contributed to its type and levels. In addition, other influential factors include the function of the family, socioeconomic status, and parent's perception of premature infants.[17] Although various reports have explored the incidence of maternal stress during NICU stay,[18-23] there are limited studies on its occurrence at home.[9] This shows that nurses need to understand stress and associated influential factors to provide effective intervention

Significance for public health

This study is the first study to critically examine factors related to stress in mothers when caring for premature infants at home. The results of this study encourage health workers at the community level to be able to pay attention to maternal psychology and provide appropriate interventions so that mothers can care for their premature infants at home reasonably and adequately. Mothers with low stress will help premature infants become healthy in growth and development.

to mothers.[24,25] Therefore, this study aims to assess factors associated with maternal stress when caring for premature infants at home. Based on findings, this is the first study conducted in Indonesia within this context.

Materials and Methods

Design

This study was carried out using a cross-sectional design with an observational approach.

Sample

Data collection was carried out from July to November 2022, and the sample population comprised mothers who cared for premature infants at home in the Malang area (Malang City, Malang Regency, and Batu City). In addition, the inclusion criteria were mothers who cared for premature infants at home for 1 day to 3 months, mothers and premature infants were in good health, and premature infants had no congenital diseases. The number of participants in this study was 188 individuals who were selected using the purposive sampling method.

Ethical considerations

The study procedures were granted ethical clearance under number 2605-KEPK by the Institutional Review Board (IRB) Faculty of Nursing, Universitas Airlangga, Indonesia.

Data collection and procedure

The procedures began with licensing and obtaining ethical clearance. Detailed informed consent was provided to each respondent without any coercion to participate in the study, followed by offline data collection using a paper-based questionnaire. The participants filled out the questionnaires according to their conditions, and analysis was performed using SPSS. The data input process began with editing, which referred to checking the completeness of the data in the questionnaire. In addition, coding facilitated the scoring and interpretation of the range value. The missing and error data were also assessed and analyzed using univariate and bivariate analyses.

An instrument for data collection

Stress questionnaire used the parental stress scale (PSS), consisting of 18 questions with a minimum score of 18 and a maximum of 90 with 5 statement items (1=Strongly disagree, 5=Strongly disagree). The questionnaire on knowledge of the benefits of caring for premature infants at home was modified from a previous questionnaire.[26] In addition, it had a Likert scale possessing 6 statement items, with maximum and minimum scores of 24 and 4, respectively. The questionnaire of spousal support, and health worker support, was assessed using a variant compiled from the postpartum social support screening tool, consisting of 5 questions and 4 questions.[27] The instruments used in this study had been tested for reliability and validity. Stress questionnaire was declared valid with a value range of r 0.538-0.861, while, it had a reliability value of 0.860. The knowledge questionnaire was valid with an R-value range of 0.449-0.920, and its reliability was 0.980. The total score was 5-25 for partner *support, and 4-20 for health worker support. The support questionnaire was valid with an R-value range of 0.601-0.991 and a reliability value of 0.988.*

Data analysis

Data was screened for missing items. Total scale scores were computed for measures of maternal stress, knowledge, spousal support, and health worker support. The score of each variable is categorized as follows: ≤55%, moderate: 56-≤75%, and high: 76-100%. Descriptive statistics (frequency and percentage) were computed to describe the experience, mothers' age, education level, employment, birth methods, economic status, residence, infants' birth weight, prematurity, benefits of care, spousal support, and health worker support. Univariate analysis, chi-square tests, and binary logistic regression were performed with a final report of odds ratios (OR) and 95% confidence intervals (CI). All the analyses used SPSS version 25.

Results and Discussion

As shown in Table 1, this study shows that among 188 participants, the majority had no experience with premature infants, were in late adolescence age of 17 - ≤25 years, the last education was high school, were not used, the method of delivery was by Sectio Caesarea, had low economic status, and living in rural areas. In addition, most of the participants had Very Low Birth Weight (1000-<1500 grams), prematurity in the category of moderate premature infants (31-36 weeks), knowledge of caring infants benefits in the low category, getting spousal support and health workers in the high category, and stress in the mild category. Based on the results of the analysis with crosstab, the participants with mild stress mostly did not have experience with premature infants, were of the age of early adult mothers aged 26 - ≤35 years, high school education, not used, method of delivery by cesarean section, low economic status (≤ regional minimum wage), residing in rural areas, and infants condition with very low birth weight (1000-<1500 grams). The analysis results with chi-square showed that the p-value on the variables of residence, birth weight, benefits of care, spouse support, and health worker support was lower than 0.05. This showed that there was a significant relationship between residence, birth weight, care benefits, spouse support, and health worker support with stress, as shown in Table 2.

Table 3 showed that mothers in their late adolescence aged 17 - ≤25 years were at risk of experiencing moderate stress 11.059 times higher compared to those in their late adulthood aged 36 - 45 years. In addition, education with an odds ratio value of 7.901 showed that mothers who had an elementary school education were 7.901 more at risk of moderate stress compared to others with college education. Mothers who gave birth by cesarean section had a moderate risk of stress, which was 15.301 higher compared to those who gave birth normally with an odds ratio of 15.301. Participants who lived in rural areas had a moderate risk of stress 6.665 higher than others living in urban areas with an odds ratio of 6.665. The results also showed that the category of Very Low Birth Weight had a moderate stress risk of 0.033 times higher than Low-Birth-Weight. The low category in knowledge with an odds ratio value of 14.851 showed that moderate category care knowledge had a moderate risk of experiencing moderate stress 14.851 times higher compared to others with high category care knowledge. Spousal support in the moderate category had an odds ratio value of 75.809, showing that moderate category spousal support had a risk of experiencing moderate stress 75.809 times higher than others in low category spousal support.

A stressor was a situation that exceeded the ability of the mind

or body when dealing with stress source. When the event or situation provided stimulation, individuals typically performed an assessment and cope, leading to the progression of stress to a higher or lower stage.[28] According to Lazarus and Folkman's transactional theory of stress and coping, individuals constantly assessed stimuli from their environment.[29] In addition, stress was a relationship between individuals and the environment, which was assessed as an inability to deal with a dangerous or threatening situation.

The results of this study showed that stress of mothers who cared for premature infants at home was mostly (53.7%) in the low category, with 46.3% being in the moderate category. These results were consistent with previous reports conducted where more than 50% of mothers were under moderate stress.[18,21,22,30] In this study, none of the participants had a high category of stress compared to a previous report, where approximately 20-30% experienced high stress.[22,31,32] This condition could be because those 3 studies measured mothers' stress in the hospital. Meanwhile, premature infants who were already at home and cared for by their mothers were assessed in this study. The sample population comprised mothers who cared for premature infants at home from 1 day to 3 months. A study conducted by De Castro Pereira et al. in 2019 on mothers of premature infants who were already at home showed that the average stress was at a total score of 42, showing normal levels. These stress levels did not require referral to a specialist, but close monitoring by the health team, both from the outpatient clinic and the health center.[9]

Stress of mothers who cared for premature infants at home was correlated to babies' birth weight, residence, knowledge of caring, spouse support, and health worker support. Maternal age in the 17-25 years category had a higher risk of experiencing stress compared to others in late adulthood aged 36 - 45 years. The results were inconsistent with previous studies, where there was no difference in stress levels between mothers aged <25 years and those aged ≥25 years, although the mean score was slightly higher in mothers aged ≥25 years.[15] A significant association was found between parental age and general stress when faced with the appearance of infants in the NICU with the older age group reporting higher levels of stress ($K = 13.6$, $p = 0.004$).[16] Younger age was associated with emotional instability[33] and in this study, most mothers lacked experience in caring for premature infants.

Mothers with lower education levels had stress risk higher than those with higher education. The results obtained were inconsistent with a study conducted in the NICU setting. Previous reports showed that education level had no effect ($p>0.05$) on parental

Table 1. Maternal and infant characteristics.

Variables	Category	Frequency	Percent
Experience with premature infants	None	164	87.2
	Experienced	24	12.8
Mother's age	Late adolescence (17 – ≤25 years)	75	39.9
	Early adulthood (26 – ≤35 years)	73	38.8
	Late adulthood (36 – 45 years)	40	21.3
Education level	Primary school	24	12.8
	Secondary school	54	28.7
	High school	76	40.4
	Diploma	12	6.4
	Bachelor's degree	22	11.7
Employment	Not used	136	72.3
	Used	52	27.7
Birth methods	Sectio Caesarea	144	76.6
	Normal	44	23.4
Economic status	Low (≤ regional minimum wage)	127	67.6
	High (> regional minimum wage)	61	32.4
Residence	Rural	99	52.7
	Urban	89	47.3
Infant's birth weight	Extreme low birth weight (<1000 grams)	20	10.6
	Very low birth weight (1000-<1500 grams)	137	72.9
	Low birth weight (1500-<2500 grams)	31	16.5
Prematurity	Very premature (24-30 weeks)	20	10.6
	Moderately premature (31-36 weeks)	164	87.2
	Borderline premature (37-38 weeks)	4	2.1
Benefits of care	Low	82	43.6
	Medium	28	14.9
	Large	78	41.5
Spousal support	Low	8	4.3
	Medium	47	25.0
	Large	133	70.7
Health worker support	Low	2	1.1
	Medium	38	20.2
	Large	148	78.7
Stress	Mild stress	101	53.7
	Moderate stress	87	46.3

Table 2. Correlation between stress and respondent characteristics.

Variables	Category	Stress		p
		Mild	Moderate	
Experience with premature infants	None	87 (86.1)	77 (88.5)	0.628
	Experienced	14 (13.9)	10 (11.5)	
Mother's age	Late adolescence (17 – ≤25 years)	33 (32.7)	42 (48.3)	0.070
	Early adulthood (26 – ≤35 years)	42 (41.6)	31 (35.6)	
	Late adulthood (36 – 45 years)	26 (25.7)	14 (16.1)	
Education level	Primary school	16 (15.8)	8 (9.2)	0.107
	Secondary school	22 (21.8)	32 (36.8)	
	High school	45 (44.6)	31 (35.6)	
	Diploma	8 (7.9)	4 (4.6)	
	Bachelor's degree	10 (9.9)	12 (13.8)	
Employment	Not used	69 (68.3)	67 (77.0)	0.184
	Used	32 (31.7)	20 (23.0)	
Birth methods	Sectio Caesarea	73 (72.3)	71 (81.6)	0.132
	Normal	28 (27.7)	16 (18.4)	
Economic status	Low (≤ regional minimum wage)	70 (69.3)	57 (65.5)	0.580
	High (> regional minimum wage)	14 (30.7)	10 (34.5)	
Residence	Rural	69 (68.3)	30 (34.5)	0.000
	Urban	32 (31.7)	57 (65.5)	
Infant's birth weight	Extreme low birth weight (<1000 grams)	4 (4.0)	16 (18.4)	0.003
	Very low birth weight (1000-<1500 grams)	82 (81.2)	55 (63.2)	
	Low birth weight (1500-<2500 grams)	15 (14.9)	16 (18.4)	
Prematurity	Very premature (24-30 weeks)	10 (9.9)	10 (11.5)	0.926
	Moderately premature (31-36 weeks)	89 (88.1)	75 (86.2)	
	Borderline premature (37-38 weeks)	2 (2.0)	2 (2.3)	
Benefits of care	Low	35 (34.7)	47 (54.0)	0.002
	Medium	12 (11.9)	16 (18.4)	
	High	54 (53.5)	24 (27.6)	
Spousal support	Low	0 (0.0)	8 (9.2)	0.000
	Medium	6 (5.9)	41 (47.1)	
	High	95 (94.1)	38 (43.7)	
Health worker support	Low	0 (0.0)	2 (2.3)	0.037
	Medium	15 (14.9)	23 (26.4)	
	High	86 (85.1)	62 (71.3)	

Table 3. Multivariate analysis factors associated with stress in mother with premature infant.

Variables	Category	OR	95% Confidence interval	
		Mild	Mild	Moderate
Experience with premature infants	Experienced	.264	.067	1.034
Mother's age	Late adolescence (17 – ≤25 years)	11.059*	2.181	56.068
	Early adulthood (26 – ≤35 years)	1.985	0.444	8.882
Education level	Primary school	7.901*	1.010	61.833
	Secondary school	1.177	0.164	8.443
	High school	10.989	0.768	157.301
	Diploma	5.502	0.542	55.877
Birth methods	Sectio Caesarea	15.301***	3.352	69.847
Residence	Rural	6.665***	2.392	18.569
Infant's birth weight	Extreme low birth weight (<1000 grams)	3.452	0.456	26.135
	Very low birth weight (1000-<1500 grams)	0.254*	0.072	0.893
Benefits of care	Low	3.611*	1.285	10.146
	Medium	14.851**	2.765	79.763
Spousal support	Low	3664621118.106	0.000	.
	Medium	75.809***	15.920	360.981

* p-value < 0.05. ** p-value < 0.01. *** p-value < 0.001.

stress during the care of premature infants in the NICU.[34,35] Although not very significant, low education level was a predictor of PTSD (Post Traumatic Stress Disorder) in mothers who were caring for infants at home.[36] Low levels of maternal education could affect mothers' knowledge and skills in caring for infants.[33]

Mothers who gave birth using the SC method had a higher level of stress than the vaginal method. A related study found that the incidence of moderate stress after SC delivery was 36.7%, which was higher than the incidence of stress post-vaginal delivery of 6.7%.[37] Another study also showed that most mothers experienced moderate anxiety (86.7%),[38] caused stress, postpartum blues, and psychosis.[38]

The results showed that mothers of premature infants in the Very Low Birth Weight category were at higher risk of stress compared to others in the Low-Birth-Weight category. These results were consistent with previous reports, where low birth weight was associated with maternal stress.[39] The severity of premature condition was found to correlate with stress score because mothers saw the appearance and behavior of premature infants that were different from infants born normally.[40] The appearance and behavior were the highest stressors in causing maternal stress, where low infants' weight at birth also affected health and development in the future.[16]

Another variable related to stress in this current study was where mothers lived. The risk of mental health problems was found to be higher in individuals who were in rural areas[41] due to limited resources and support, leading to a stressful life.[42] In addition, preterm birth rates were higher in rural areas, along with inadequate access to specialist health services and support.[43] Limited resources, support, access, and health services caused stress when mothers cared for premature infants at home and lived in rural areas.

The results showed that mothers with moderate levels of knowledge were 14,851 times more at risk of stress than others with high levels of knowledge. According to Aldirawi, 42.6% of participants had a low level of knowledge to care for premature infants at home after treatment in the NICU.[44] Another study showed that the majority of mothers (53%) had a low level of knowledge regarding premature infants care.[45] Ong stated that stress correlated with the level of knowledge and ability of mothers. This showed that the higher stress, the lower the level of knowledge and ability of mothers in caring for premature infants.[35] Premji also recorded that maternal knowledge indicators affected maternal stress ($p<0.00$).[46] Some knowledge indicators of caring for premature infants, such as nutrition (54.2%), temperature regulation (50%), and umbilical cord care (46%) were also still low compared to infection prevention (73.3%), vaccination (60.2%), and jaundice (67.1%).[44]

Lack of partner support could trigger stress 75,809 times higher compared to mothers with great partner support. The results of this study were in line with Abdeyazdan and Racine that adequate partner support could help relieve maternal stress in caring for infants in the NICU ($p<0.01$) and at home ($p<0.001$) (47,48). Family support, specifically spouses, was the support that mothers needed during the first 6 weeks after giving birth to premature infants.[49]

Conclusions

In conclusion, most of stress experienced by mothers when caring for premature infants at home was in the moderate category. This study showed several factors that could influence mothers' stress while caring for premature infants. In addition, support from health workers was very essential to optimize the participants' ability to cope and reduce stress levels. Health workers also needed to provide psychological interventions, which have not been optimally given to individuals with premature infants in Indonesia.

Correspondence:Rinik Eko Kapti, Department of Nursing, Faculty of Health Sciences, Universitas Brawijaya, Jl. Puncak Dieng, Kunci, Kalisongo, Kec. Dau, Malang, East Java Indonesia 65151.
Tel.: +62341569117 - Fax: +62341564755,
E-mail: rinik.eko@ub.ac.id

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