Evidence Based Care Journal

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Original Article

The Effects of Telenursing on Stress in Mothers with Premature Infants

Elham Asghari[1], Azam Shirinabadi Farahani[2*], Manigheh Nourian[2],
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Abstract

Background: The birth and protection of premature infants cause major stress in their mothers. The implementation of strategies to reduce this stress is one of the major tasks of nursing researchers.

Aim: This study aimed to investigate the effects of telenursing on the level of stress in mothers with premature infants, following the infants' discharge from the Neonatal Intensive Care Unit.

Method: This clinical trial was conducted on 120 mothers who were randomly assigned into intervention and control groups. Data collection was performed using Barry and Jones's parental stress scale and the maternal and neonatal demographic questionnaire. Telenursing was performed to educate mothers in the intervention group using the Telegram application for four weeks. The control group only received the usual care at discharge. Data were collected one day after discharge, one day, and four weeks after intervention and analyzed in SPSS software (version 19) through the Kolmogorov-Smirnov test, independent t-test, and Kruskal-Wallis test.

Results: The mean maternal stress level±SD was estimated at 70.8±8.8 and 70.6±8.9 in the intervention and control groups, respectively. These numbers changed to 53.0±1.8 and 59.8±2.8 in the intervention group and 68.1±2.4 and 59.8±5.1 in the control group immediately and four weeks after intervention (telenursing), respectively. Therefore, the mothers in the intervention group experienced less stress (P<0.001).

Implications for Practice: The application of this low-cost and affordable method is recommended for its impact on the reduction of mean maternal stress levels in the intervention group compared to the controls.

Keywords: Neonatal intensive care unit, Premature infants, Stress, Telenursing

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Introduction
Preterm is defined as babies born alive before 37 weeks of pregnancy are completed. The prevalence of premature birth is increasing all around the world (1, 2). The rate of premature birth is estimated at 9.2% in Iran (3, 4). Premature infants are born before their body systems completely form, and they need support and care to survive. Therefore, the hospitalization of premature infants immediately after birth is inevitable in most cases (5, 6).

Although parents would love to have their infants discharged from the hospital, taking premature infants home from the hospital can be a major challenge for the family. Protection of a premature infant who needs special care can cause tension and stress (7-10). Mothers consider themselves to be the main care providers for their newborns and undertake this caregiving role in the majority of cases due to their attachment to the infant during the pregnancy (11-13). As a result, 50% of mothers show symptoms of high levels of stress during their infants' hospitalization, which persists even after discharge and will not be resolved for six months or more (14).

It is essential to examine the level of stress in parents, especially in mothers, since the mother is the most important person in the infant's support system and her emotional turmoil may affect the quality of care and the process of development and growth in an infant (15). Moreover, mother's stress can impede the infant's growth and development makes the infant vulnerable (16), and causes the feeling of being rejected in the infant, which in turn leads to mental changes, the lack of emotional organization, and improper activity levels later in life (17).

Nurses' communication skills in neonatal care and the transfer of appropriate information to the infants' families can improve the quality of neonatal care provided by the parents after discharge (18), maintain the continuity of hospital care at home, and reduce hospital costs as well as infant mortality (19). Therefore, the provision of education plans and follow-up care for mothers after infants' discharge seems to be essential (20). The development of social media has provided various opportunities in different fields of science and knowledge, of which telenursing is an example (21). Researches on telenursing are expanding globally, indicating the efficiency of this method to enhance health (22). Given the fact that nurses are obliged to provide holistic care in a variety of methods to address the needs of their care seekers (23), the implementation of telenursing has become more essential. Moreover, this approach is a suitable tool to address parents' needs (24). The implementation of telenursing in neonatal care has been very limited; however, many studies show a high level of parents' satisfaction with the remote and online visits (25).

Despite the importance of the above issues, researchers could not find any formal training program that helps Iranian mothers with premature infants reduce care problems, concerns, and distress. In addition, no study has yet assessed the average maternal stress in this group of vulnerable Iranian mothers.

The conducted studies have been limited to the assessment of mothers' anxiety during the infants' hospitalization in the neonatal intensive care unit (NICU) (26-28), the examination of stressful factors in the experiences of mothers with premature infants, and the effects of mothers' involvement in the hospitalization of premature infants (29). Mothers with premature infants have limitations and cannot participate in face-to-face training classes. Accordingly, these mothers can benefit from the telenursing method which is defined as the use of electronic information and technologies to support long-distance, client-related education (22). Therefore, the present study aimed to determine the effects of telenursing on the average stress in mothers with premature infants after hospital discharge.

Methods
This randomized controlled trial was conducted in the NICU of the selected educational-medical hospitals (Imam Khomeini, Razi, Bu-Ali-Sina), affiliated with the Mazandaran university of medical sciences, Mazandaran, Iran. The necessary referral letters and the parents' written consent were obtained after they were justified about the purpose of the study. The sampling process lasted from October 31, 2017 to March 18, 2018.

The participants were selected through the convenience sampling method and based on the inclusion criteria. The inclusion criteria included the ability to read and write in Persian, lack of chronic anxiety in the mother (self-reported), the possession of a mobile phone (supporting the Telegram program), the avoidance of infertility treatment methods, the birth of a single baby, hospitalization only due to

prematurity (not because of illness). However, the exclusion criteria included the mother's not being available for more than a week and the lack of interest in participation any time during the study. The samples were randomly assigned to two groups of intervention and control based on their hospital file number; the even and odd file numbers were assigned to the control and intervention groups, respectively.

The sample size was calculated using the sample size formula of comparing two independent samples (30) and the previous study (26), where $s_1^2 = 63.84$, $s_2^2 = 51.76$, $\varepsilon = \mu_1 - \mu_2 = 3.95$, $\alpha = 0.05 \Rightarrow z_{0.025} = -1.96$, $\beta = 0.2 \Rightarrow z_{0.2} = -0.85$. In total, 60 individuals were selected in each group. According to the number of beds in the neonatal wards of each hospital, 54, 41, and 25 samples were taken from Imam Khomeini, Bouali, and Razi Hospitals, respectively.

The data were collected using the mother and the infant's demographic questionnaires and the parental stress scale. The mother and the infant's demographic questionnaires included items such as the mother's age, occupation and education, the infant's age at the time of discharge, and birth weight. The parental stress scale was designed by Berry and Jones in 1995 and included 18 items. Each item is scored based on a 5-point Likert scale from 1 to 5. Therefore, the minimum and maximum scores for this scale are 18 and 90, respectively, with higher scores indicating increased tension. The advantage of this tool is that due to fewer items compared to similar tools, it is easier for parents to use (31).

The permit to implement the above-mentioned scale was obtained through correspondence with its designers. The internal consistency and stability of this scale have also been reported at 0.83 and 0.80, respectively, by the original designers (Berry and Jones, 1995). Cronbach's alpha and intra-class correlation coefficient were estimated at 0.73 and 0.75 for this scale and its content validity index was calculated at 0.84 in a conducted study in Iran (7).

The scale was presented to 10 faculty members of the Shahid Beheshti School of Nursing and Midwifery, neonatal specialists, and instrument development experts to evaluate its qualitative content validity which was approved after the application of the provided corrective comments of these experts. The scale's face validity was ensured after the scale was provided to 10 mothers with inclusion criteria. The internal consistency of the scale was measured at 0.7, according to Cronbach's alpha, and after the scale was completed by 25 eligible mothers (with inclusion criteria).

On the day of discharge, the researcher attended the ward and introduced both herself and the study procedure to the infant's family and explained the method of working on Telegram to the infant's mothers for 30 min. The mother and the infant's demographic questionnaires were completed by the participants. The mother's phone number and home address were also collected. Additionally, the researcher's special phone number was given to the mothers so that they could be provided with consultations on their problems and questions. It was explained to the mothers that they had to take care of their infants for a month through videos, photos, informative texts, and questions and answers provided in cyberspace and via mobile phones (Figure 1).

The parental stress scale was filled out the first day after discharge (to relieve the stress caused by the discharge procedure), the day after the one-month intervention period, and four weeks after the end of the intervention by the members of intervention and control groups, through the researcher's visiting them at home. Educational materials were provided by the researcher based on the booklet of premature neonatal care (which has been prepared and compiled in collaboration with the Neonatal Health Department and the Iranian Neonatal Medical Association), the main curriculum for neonatal intensive care nursing, and books on neonatal nursing and medical care (e.g., Nelson Essential Pediatrics and The Core Curriculum; Neonatal Intensive Care Nursing). Materials were categorized in terms of temporal priority and the importance of content, after measuring the validity, and were provided to mothers in form of movies, photos, and written instructions in a simple and easy-to-understand language, within four consecutive weeks (9) (Table1). The possibility of phone consultation, when necessary, was also provided to the mothers 24 hours a day. The contents of the conversations and the mothers' questions were recorded by the researcher and the necessary strategies were presented. The follow-ups were done by calling the mothers every weekend to ask about the content of the previous week's session and the best way it should be done in order to create educational feedback and receive their feedback on the implementation of provided training.
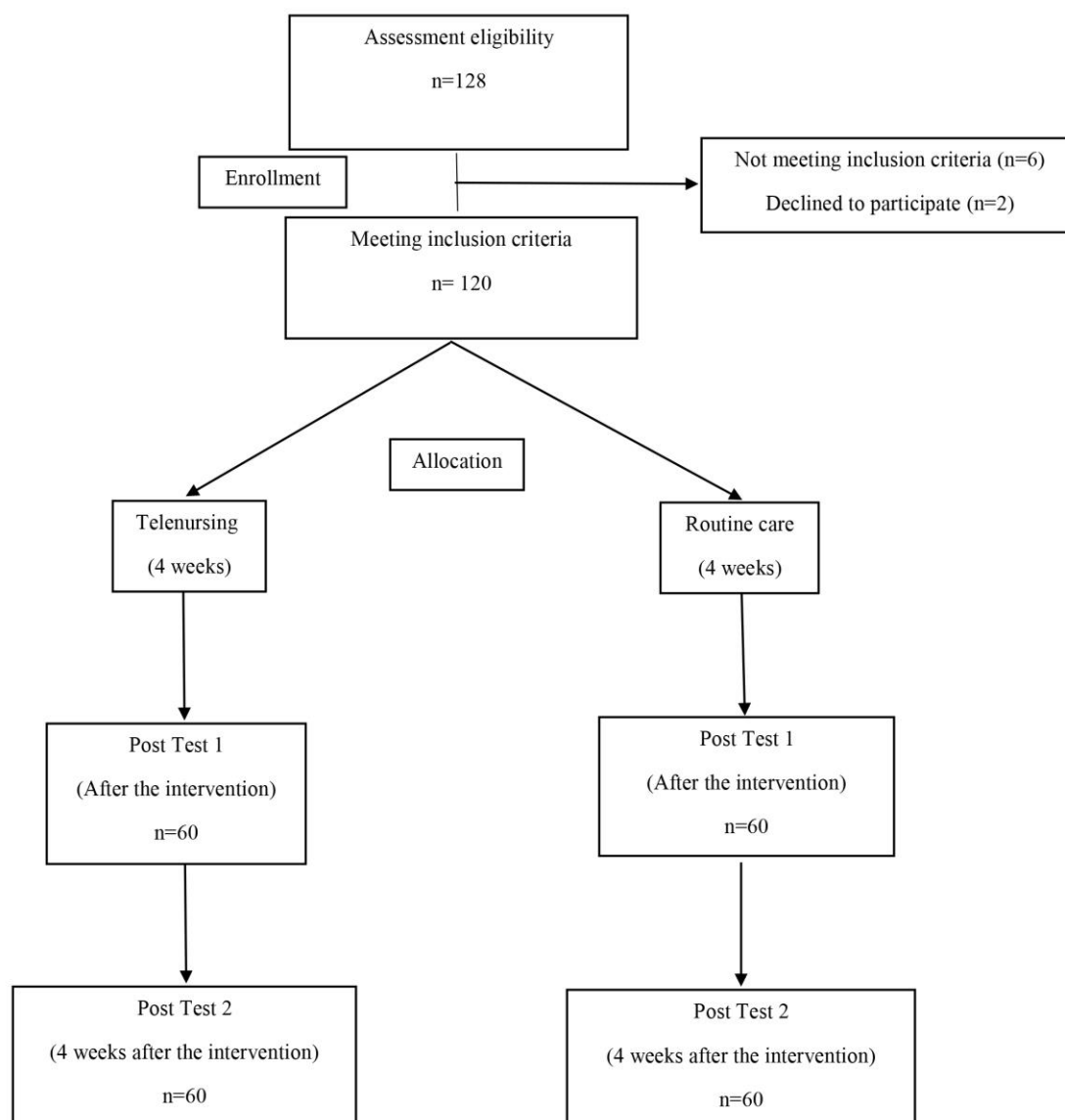
Figure 1. CONSORT fellow chart for study

Table 1. Calendars and training materials

Week	Issue
	Educational content
First week	Breastfeeding training - Different breastfeeding situations - How to store breast milk - Ways to increase breast milk - Midwifery and formula milk - How to properly diaper the infant – Learning about infant's bowel movement- Umbilical cord care - Follow-up after discharge (the first part) - Early signs and symptoms of the disease
Second week	Follow-up after discharge (the second part) – Provision of a suitable environment to care for a premature baby - Medication supplements - Infant bathing - Infant safety - Daily care of the infant - Personal hygiene and infection prevention
Third week	Prevention and treatment of maternal nipple ulcers - Causes of infant refusal to breastfeed - Infant vomiting - Maternal nipple thrush and oral thrush in infant - Best positions for premature infants
Forth week	Colic in newborn - Infant massage - Gastric reflux - Infant room temperature - Adjusting premature infant's sleep

The data were collected and examined. It should be noted that all mothers in both intervention and control groups received the care conventionally provided in the ward at the time of discharge.

However, instructions were only sent to the intervention group and the control group was not aware of this training. No information was exchanged between the two groups since the interventions were applied on the day of discharge, and the day after it, and the research process was explained to each mother individually.

The research protocol was approved by the Mazandaran University of Medical Sciences and the authorities of the involved hospitals. Informed consent was obtained from the infants' mothers. The mothers were ensured that their names and other information would remain confidential. Participation in the study was based on willingness and the participants were allowed to withdraw from the study any time they liked.

The data were analyzed in SPSS software (version 19) through the Kolmogorov-Smirnov test, independent t-test, and Kruskal-Wallis test. A confidence level of 95% was used in this study and a p-value less than 0.05 was considered statistically significant.

Results

Demographic characteristics of mothers and infants in both control and intervention groups were assessed. Some of these characteristics are presented in Table 2.

The determination and comparison of the mean maternal stress before the intervention in both groups showed that there was no significant difference between the mean of stress in the two groups before the intervention (telenursing). However, a significant difference was reported in the mothers' stress level immediately and four weeks after the intervention (P-value<0.05). Table 3 shows the comparison of mean maternal stress between the intervention and control groups in three stages (before, after, and four weeks after intervention).

The results also showed that the mean maternal stress in three stages (before, after, and 4 weeks after intervention) was significantly different in the intervention group (P-value <0.05). It should be noted that the mean maternal stress level decreased in each stage. In the control group, the mean maternal stress decreased significantly in stage 3, compared to stages 1 and 2. As a result, a significant difference was observed in the mean maternal stress in the three stages (P<0.05). Repeated ANOVA analysis showed that stress was significantly reduced in both intervention and control groups (Pillai's Trace=0.8, P<0.001); however, this stress reduction was significantly greater in the intervention group.

Table 2. Distribution of some demographic characteristics of mothers and infants

Variables/Groups		Intervention Frequency (Percentage)	Control Frequency (Percentage)	P-value
Type of birth	Natural	30 (50)	29 (51.7)	0.07
	C-Section	30 (50)	31 (48.3)	
Mother's Education level	Below diploma	8 (13.4)	7 (11.6)	0.79
	Diploma	26 (43.3)	23 (38.4)	
	Academic	26 (43.3)	30 (50)	
Mother's occupation	Housewife	39 (65)	41 (68.3)	1.005
	Self-employed	12 (20)	8 (13.3)	
	Employee	9 (15)	11 (18.3)	
Hospital Stay status	Commuting between home and hospital	10 (16.7)	15 (25)	0.26
	Permanent stay in hospital's lactation room	50 (83.7)	45 (75)	
Infant's gender	Male	36 (60)	28 (46.7)	2.14
	Female	24 (40)	32 (53.3)	
Birth weight	≤1500gr	8 (13.4)	7 (11.6)	1.81
	>1500gr	52 (86.6)	53 (88.4)	

Table 3. Comparison the mean ±SD of maternal stress in Study stages between two groups of intervention and control

Study stages	Intervention	Control	P-value*
Before intervention	70.8±8.8	70.6±8.9	<0.001
After intervention	59.3±2.8	Control	<0.001
Four weeks after intervention	53.0±1.8	59.8±5.1	<0.001
P-value**	<0.001	<0.001	

*Between groups (paired t-test)
**Within groups (repeated measures)

The level of stress was higher in mothers who were always in the presence of their infants and stayed in the mother's room in all three stages, compared to mothers who sometimes went home to handle their personal affairs. The results also indicated that the rate of stress was higher in housewives in all three stages, compared to working mothers (Table 4).

Table 4. Comparison of mean ±SD of maternal stress in three stages (before, immediately after, and four weeks after the intervention) based on the variables of "How to stay in the hospital" and "Mother's job" between intervention and control groups

Variable		Study stages	group		P-value*
			Intervention	Control	
How to stay in the hospital	Commuting	Before intervention	15.7±2	16.7±2.1	0.78
		After intervention	5.1±0.6	20.9±5.1	0.001
		Four weeks after intervention	6.8±0.1	20.2±2.1	0.00
	Stay in the moms' room	Before intervention	42.1±4.3	44.2±3.9	0.70
		After intervention	25.9±2.3	67.3±5.5	0.001
		Four weeks after intervention	30±4.3	61.4±5.1	0.00
Mother's job	Housewife	Before intervention	40.5±4.1	37.4±3.1	0.54
		After intervention	19.7±3.1	57.7±6.1	8.50
		Four weeks after intervention	24.8±3.2	52.7±6.4	0.00
	Free	Before intervention	9.9±1.1	11.3±1.1	0.61
		After intervention	6.5±0.7	16.5±1.7	0.001
		Four weeks after intervention	7.7±0.7	14.6±2.3	0.00
	Employee	Before intervention	10.1±1	10.8±1	0.78
		After intervention	5.6±0.8	14.4±1.1	0.001
		Four weeks after intervention	5.3±0.1	14.7±2.4	0.00

* Mann–Whitney U test

Discussion

In this study, the mother's stress was rooted in her uncertainty about the health status of the premature infant and how to care for the infant in this situation. The mother's stress can prevent the infant's normal growth and make it vulnerable. In addition, this stress increases in parents with the lack of information (16). The current study aimed to investigate the impact of telenursing on stress levels in mothers with premature infants following their infants' discharge from the NICU.

Determination and comparison of the stress level in mothers with premature infants after discharge from NICU, between the two groups of intervention and control immediately and four weeks after the intervention showed that the mean scores of mothers' stress levels were statistically similar and high before intervention. In general, mothers are very vulnerable in the postpartum period and undergo too much stress (32-34). These findings were in line with the results of the studies that investigated the impact of the discharge plan on the level of stress in mothers with premature infants (7, 11). In all three studies, the mothers' stress levels were high in both groups at the time of discharge and prior to the interventions, and no significant statistical difference was observed between the stress levels of mothers in the control and experimental groups. High levels of stress indicated that these mothers were vulnerable; therefore, it was necessary to intervene and reduce the

stress levels in this group.

In this study, a significant difference was observed between the stress levels of intervention and control groups immediately and four weeks after the intervention; however, the stress level was higher in the control group. The results of a study conducted by Kashaninia et al. showed that the stress levels in the mothers with premature infants decreased significantly in the experimental group, compared to the controls after four weeks of kangaroo care interventions (35). Other studies have shown that proper interventions have reduced stress in mothers with preterm infants (7, 11, 36). These interventions can be done in different ways through the identification of mothers and their needs.

The study findings suggested that the mean stress in mothers in both intervention and control groups was lowest in the third stage and was lower in the second stage compared to the first and this reduction was significant in both groups. Therefore, the stress level was proportional to time and decreases over time (1). The necessary skills of providing care to premature infants are acquired over time. These skills can be mastered by practice and result in stress reduction. The results of this study were in line with those of several other studies (37, 38).

Furthermore, the findings of this study indicated that there was a higher stress level in mothers who stayed in the mother's rooms, compared to those who visited the ward during the infant's hospitalization. This result was consistent with the result of the study performed by Sadat Hosseini et al. (5). However, the results were not consistent with those of other studies that suggested parents' presence and participation in providing care for infants during the hospitalization reduced their stress after discharge (11). In other words, it can be interpreted that the group of mothers staying in the hospital have their full attention on their infants. Moreover, due to the constant presence in the ward and being involved in the babies' issues, these mothers closely observe the invasive and therapeutic procedures performed on their infants. They also experience higher levels of stress due to the provision of care to premature infants after discharge and being present in emotional situations for a long period of time.

It is worth mentioning that, the mean stress level in housewife mothers was higher than working mothers, according to several investigations. In addition, the results of another study showed that the perceived stress was higher in housewife mothers, compared to working mothers, which was in line with the results of the present study (39). This can be attributed to the fact that working females have higher self-confidence and better management and planning abilities and are less affected by financial stresses due to their economic independence. Furthermore, working mothers have higher mental satisfaction, compared to housewife mothers. However, based on the result of another study the stress levels of working mothers were higher than those of housewife mothers (40), which was inconsistent with the results of the present study.

In this study, appropriate planning for telenursing, the existence of specific guidelines for it, and monitoring its implementation were important steps in the reduction of the stress level in mothers after their infants were discharged. Therefore, it is necessary for nursing managers to consider strategies for the implementation of telenursing and monitor its execution in order to reduce the stress levels in mothers and prevent emotional and financial consequences.

Regarding the limitations of the present study, one can refer to the fact that the mothers' responses to the questionnaire may be influenced by their mental state and the shock of giving birth to a premature infant. Moreover, the differences in lifestyle and the family structure of infants, such as infants' parents being supported by their families, economic status, infants' resistance, and parent's attitudes toward caring for their infants, and their experiences in this regard can affect the mothers' stress levels. Moreover, the possibility of interaction between intervention and control groups in a place outside the hospital or receiving information about caring for premature infants through other media was beyond the researchers' control. Furthermore, this study has been performed in hospitals in Mazandaran, which limits the generalization of the findings.

Therefore, further studies need to be carried out in order to investigate the correlation between the infant's life condition after discharge (i.e., family factors, the socio-economic and psychological status of parents, and access to socio-economic support for premature infant care) and the level of parents' stress. It is also recommended to conduct more studies on the impact of telenursing on the level of stress in parents with premature infants, compare the results, and evaluate the level of nurses' and parents' satisfaction with telenursing.

Implications for Practice

According to the results, telenursing has been able to reduce the stress level in mothers within a month through ongoing educational interventions. Therefore, after the development of legal, professional, and ethical infrastructures, it is expected to implement this method in neonatal care programs for infants admitted to NICUs. The use of this low-cost and affordable method is recommended due to the further reduction of mothers' stress levels in the intervention group compared to the controls.

Acknowledgments

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this study.

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