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Effect of Telenursing on Attachment and Stress in Mothers of Preterm Infants

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ABSTRACT

Background: The necessity of professional nursing support to increase the role of families in neonatal care and their empowerment has been a subject of growing attention. The aim of this study was to determine the effect of telenursing on attachment and stress in the mothers of premature infants.

Methods: In this clinical trial, 50 mothers with premature infants who were admitted to neonatal intensive care unit (NICU) at Shahid Beheshti Hospital in Isfahan with a gestational age of more than 33 weeks were selected by convenience sampling method. They were randomly assigned to two groups of intervention (n=25) and control (n=25). The intervention group received an educational program designed through telephone and counseling center for the mothers of premature infants that started one week after the admission and continued one week after discharge. However, the control group only received the usual care provided in the NICU. One week after the admission of the infant, Maternal Postnatal Attachment (MPA) and Parent Stressor Scale: Neonatal Intensive Care Unit (PSS-NICU) questionnaires were completed. The PSS-NICU questionnaire and MPA questionnaire were completed at the time of discharge and one week after the discharge by the participants, respectively.

Results: The average increase in total attachment scores one week after discharge was significantly higher in the intervention group, compared to that of the control group (P<0.05). Moreover, the average decrease in the total stress score of the intervention group at the time of discharge in comparison to pre-intervention was significantly higher than that of the control group (P<0.05).

Conclusion: Considering the positive effects of telenursing on increasing attachment and mitigating the stress of mothers with premature infants, it is suggested to employ this supporting method to enhance the attachment and reduce the stress of mothers.

Keywords: Attachment, Iran, Mothers, Premature infant, Stress, Telenursing

Introduction

According to the statistics, it has been reported that about 5-18% of newborns are premature (1). Premature birth is highly risky for infants and is associated with a wide range of complications leading to the hospitalization of infants in most cases (2). Following the admission of infants in neonatal intensive care unit (NICU), parents often experience waves of stress, guilt, anxiety, and fear, which interfere with maternal emotional attachment to her child and the newborn care (3).

The parents of these infants are also subjected to depression, fatigue, and sleep disorder (4). Meanwhile, nurses play a prominent role in providing mental, educational, supportive, and adaptive healthcare and addressing mother's questions (5). By providing information about infants nurses foster maternal compatibility with stress associated with the admission of infants (5, 6). However, the mothers of premature infants require more nursing support than that they currently receive (7).

A new approach to support parenting is

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telenursing. Telenursing is the application of telecommunications and information technology to provide nursing services whenever a long distance exists between the patient and nurse, and it includes the actions ranging from sending medical notes and making phone calls to sending images by camera and computer (8). The possibility to plan without any temporal and spatial constraint, low costs (9), and enhanced nursing care are among the features of telenursing. (10).

Many studies have explored the role of telenursing in helping parents with premature infants admitted to NICU. For instance, Rhoads et al. examined the effect of observing an admitted newborn through a camera and the Internet on parental stress, anxiety, and attachment (11). Gray et al. investigated the impact of providing families with high-risk infants with support based on online and telemedicine education to reduce care costs and enhance emotional support during and after hospitalization (12). Kadivar et al. also explored the impact of Internet-based education on the satisfaction of parents with infants admitted to NICU (13).

Given the low cost of telephone conversation, its accessibility, rapid transfer of information, and the paucity of studies regarding the effect of telenursing intervention on attachment and stress of mothers with premature infants admitted to NICU, in an attempt to explore research subject, this study was designed to investigate the effect of telenursing on the attachment and stress of mothers with premature infants admitted to the NICU in Shahid Beheshti Hospital of Isfahan in 2017.

Methods

This clinical trial was conducted on 50 mothers with premature infants admitted to the NICU in Shahid Beheshti Hospital in Isfahan with a gestational age of more than 33 weeks who met the inclusion criteria. The subjects were selected using convenient sampling method from June to November 2017. For each sample excluded from the study, a new sample was included. The samples were randomly assigned (using card method) to two groups of intervention (n=25) and control (n=25) based on the following formula:

$$n = \frac{(z_1+z_2)^2(2s^2)}{d^2} \quad n = \frac{(1/96+0/84)^2(2s^2)}{(0/8s)^2} = 25$$

The inclusion criteria were the interest and willingness of mothers to participate in the study,

the basic reading and writing literacy, non-engagement of parents in medical and paramedical professions, as well as no history of physical and mental problems in mothers based on their medical records, including postpartum depression, anxiety, and addiction. Moreover, other inclusion criteria included no history of traumas and major stressors, such as divorce, the imprisonment of the spouse, the unemployment of spouse or death of a relative during the past years, mothers with a preterm infant with a gestational age of 37-33 weeks.

In addition, the performance of kangaroo care for infants under the study, the absence of any severe disabling conditions, such as intraventricular hemorrhage grades 3 or 4 in the infant, physical impairment, acute physical illness based on the medical records of mothers, and the non-participation of mothers in any parallel research interventions were the other inclusion criteria.

The exclusion criteria consisted of mother's reluctance to participate in the study, physical or mental problems of the mother during the study, as indicated by her medical records, which prevents her from playing a supportive-caring role for the newborn. Furthermore, the cases with less than two phone calls (made by the mother), infant discharge before the completion of the study, deterioration or alteration of the infant's condition during the study in a way that interferes with the intervention, and finally the infant death were considered as other exclusion criteria.

For the intervention group, the researcher prepared the educational materials and then recorded the contents at the acoustic studio. The mentioned materials were based on the relevant textbooks, such as Cloherty and Stark's Manual Of Neonatal Care, Core Curriculum for Neonatal Intensive Care, and Wong's Nursing Care of Infants and Children, a survey of mother's opinions, nurses, neonatal specialist, and faculty members of the Children and Infants Department of Isfahan Nursing and Midwifery School.

In the next step, the researcher referred to the Central Telecommunications Office of Isfahan with the telenursing audio file, introduction letter, and an approved proposal and managed to gain the approval of the head of the Central Telecommunications Office. Accordingly, they assigned a telephone number (59730472) without a calling code that was accessible to all the residents of Isfahan (24/7). By dialing the mentioned number through all landlines in Isfahan province and even in the hospital, it was

possible to connect to an interactive voice response (IVR) system for educating and counseling of mothers with preterm infants.

This system was free of charge and only the cost of an intrastate call (4.5 Toman) was calculated. After dialing the number, the caller declared his agreement by pressing #1 to gain access to the audio content page. The page contained 11 codes (the first 10 codes were offline and the 11th code was online). By pressing numbers 1 to 10, the relevant code was activated and the caller could listen to the descriptions. The caller could return to the content page by pressing #0 and the content was accessible at all time without any limitations. By dialing #11 in the content list on all workdays with the exception of weekends and holidays from 10 to 12 am, the caller was diverted to the researcher's mobile phone for further counseling and information.

In addition, the researcher made a contact list of the subjects in the intervention group that allowed her to contact them when it was necessary. The mothers in the intervention group also received the contact number of the researcher for emergency calls. The content of the offline list consisted of 10 codes with the following explanations. Code (1) was defined as NICU with the subgroups of introduction to the neonatal unit, no visiting policy of this unit, the need for handwashing, and the introduction of the health staff of this unit (for 2 min).

Code (2) was described as the features of a premature infant with the subgroups of the definition of the premature infant, the characteristics of eyes, ears, breasts, genital system, skin, nervous system, and respiratory system of the premature infant (for 7 min). Code (3) was stated as the changes in weight, height, and head circumference of the premature baby (for 1 min and 30 sec). Code (4) was explained as the treatment methods of the premature infant with the subgroups of venipuncture and lumbar puncture (for 2 min).

Code (5) was defined as the NICU-related devices and equipment with the subgroups of incubator, resuscitation bed, plastic cover or shield, heart rate and breathing rate monitor, infusion pump, continuous positive airway pressure, ventilator, phototherapy device, as well as catheters and tubes attached to the infant (for 6 min). Code (6) was described as neonatal pacification techniques with the subgroups of preparation, kangaroo care, infant massage, baby nest, and bath (for 11 min).

Code (7) was stated as breastfeeding and various types of infant feeding with the subgroups of breastfeeding, cup feeding, and nutrition by nasogastric tube (for 8 min). Code (8) was explained as how to express and store milk with the subgroups of breast milk expressing technique, as well as devices used for expressing breast milk and milk storage (for 4 min). Code (9) was stated as breast milk increasing techniques with the subgroups of increasing milk supply and breastfeeding (for 3 min). Moreover, Code (10) was described as relaxation music (for 15 min).

During the first week of infant admission, all the subjects completed a demographic information form, Parent Stressor Scale: Neonatal Intensive Care Unit (PSS-NICU) questionnaire, and Maternal Postnatal Attachment (MPA) questionnaire. Then, the above-mentioned phone number, along with the necessary training about how to use this system and its features (24/7 accessibility, no busy signal, free services that only cost 4.5 Toman per minute for interstate calls, and direct contact with the researcher), were delivered to the mothers in the intervention group.

Telenursing, including the contact of the researcher with the intervention group, the contact of mothers with the IVR system, and the mobile number of the researcher, was conducted one week after the admission of the premature infant until one week after the discharge of the infant. The researcher contacted the intervention group at least once (15 min) during the first week from the admission of the premature infant and according to the information of Central Telecommunications Office at least two phone calls were made by the mother to the IVR system that the average duration of each call was 10 min. Other contacts depended on the mother's demands.

For the control group, only regular care was provided on a daily basis. At the time of discharge, all the subjects received a pamphlet about kangaroo care, and the PSS-NICU questionnaire was completed during discharge. In addition, MPA questionnaire was filled out one week after the discharge at the time of referral to the neonatal clinic.

Data Collection Tool
The data collection tool was a three-part questionnaire, including the demographic characteristics of mothers and infants, mother-infant attachment, and maternal stress. The demographic section that was completed by the mothers included items about demographic information of mothers, and the demographic part that was filled out by the researcher contained the characteristics of the infant.

The MPA questionnaire was used to assess mother-infant attachment. The original version of this scale was designed in Australia (14) and adapted by Ghadiri Sefat et al. in Iran (15). This 19-item questionnaire had a minimum score of 19 (for poor attachment) and a maximum score of 95 (for strong attachment). In the present study, the questionnaire was once completed by mothers one week after the admission of infants and then again one week after the discharge at the time of referral to the clinic.

The PSS-NICU questionnaire developed by Miles et al. (16) was used to assess maternal stress. This scale was adapted in Iran by Abdeyazdan et al. (17). It consists of 26 items that are divided into the three subscales of NICU environment (5 items), the appearance and behavior of the infant, as well as special treatments (14 items), and parents' relationship with the infant, along with the alteration of parental role (7 items).

The PSS-NICU questionnaire examines parental stress in NICU. There are six options for each question, including "I did not notice this case in the unit", "I do not feel stressed here", "It causes a little stress", "It cases moderate stress", "It causes a lot of stress", and "It causes extreme stress". As such, the score range could be between 0 and 100 with high scores indicating greater parental stress. The questionnaire was once completed by the mothers one week after the admission of the infant and then again at the time of discharge.

Statistical Analysis

All the collected data were analyzed by Chi-square test, Fisher's exact test, Mann-Whitney U test, and independent t-test using SPSS software (version 20). P-value less than 0.05 was considered statistically significant.

Ethical Considerations

The authorization of this study was obtained from the relevant organization. Informed consents were obtained from parents following the explanation of the aims and procedures of the study. The participants had the right to withdraw from the study whenever they desired and they were assured about the confidentiality of their information. The clinical trial was registered with the code of IRCT2017052034040N1.

Results

In this study, 50 mothers with premature newborns were assigned to the intervention (n=25) and control (n=25) groups. The mean score of neonatal birth weight was 2185±468 g and the average length of hospitalization in NICU was 7 days. The obtained results revealed that demographic data, such as mother's age, gestational age, birth weight, hospitalization duration, type of delivery, type of pregnancy, baby gender, mother's educational level, and infant's birth order were not different between the two groups (Table 1 and Table 2; P>0.05).

The results of independent t-test showed that

Table 1. Mean scores of maternal age, gestational age, birth weight, and duration of hospitalization in two groups

Variables	Case group	Control group	P-value
	Mean±Standard deviation	Mean±Standard deviation	
Mother's age (year)	29.30±4.90	30.92±4.86	0.26
Gestational age (week)	34.33±1.11	34.34±1.05	0.96
Birth weight (gr)	2178.60±104.52	2192.61±363.82	0.91
Duration of hospitalization	7.64±0.69	6.56±2.45	0.21

Table 2. Frequency distribution of type of delivery, type of pregnancy, baby sex, mother's education level, and infant's birth order in two groups

Variables		Case group	Control group	P-value
		n (%)	n (%)	
Type of delivery	Normal	2 (8)	4 (16)	0.33
	Cesarean section	23 (92)	21 (84)	
Type of pregnancy	Wanted	19 (82.6)	18 (72)	0.38
	Unwanted	4 (17.4)	7 (28)	
Baby gender	Girl	12 (48)	13 (52)	0.78
	Boy	13 (52)	12 (48)	
Mother's educational level	Under diploma	6 (27.3)	10 (41.7)	0.27
	Diploma	9 (40.9)	9 (37.5)	
	Academic	7 (31.8)	5 (20.8)	
Baby's birth order	First	10 (40)	12 (48)	0.77
	Second	12 (48)	10 (40)	
	Third	2 (8)	2 (8)	
	Fourth	1 (4)	1 (4)	

Table 3. Comparison of mean score changes of MPA questionnaire one week after discharge and baseline, as well as mean score changes of PSS-NICU questionnaire at discharge time and baseline in two groups

Variables	Intervention group		Control group		Independent t-test	
	Mean	Standard deviation	Mean	Standard deviation	t	P
Changes of MPA scores one week after discharge, compared to baseline	15.31	7.94	1.66	6.28	6.75	<0.001
Change of PSS-NICU scores during discharge, compared to baseline	-36.32	24.07	-3.84	2.94	6.09	0.001

MPA: Maternal Postnatal Attachment
PSS-NICU: Parent Stressor Scale: Neonatal Intensive Care Unit

the increase of mean score of MPA questionnaire in the intervention group one week after discharge was significantly higher than that of the control group (P<0.05). Also, the mean score reduction of PSS-NICU questionnaire at the time of discharge, compared to the baseline, was significantly higher in the intervention group, compared to that of control group (Table 3; P<0.05).

Discussion

The results of comparing the mean scores of maternal stress and attachment between the intervention and control groups showed that telenursing had a significant effect on the stress and attachment in the intervention group by mitigating stress and fostering attachment in the mothers of admitted premature infants. The results of this study are consistent with those reported by Ericson et al. in Sweden in 2013. They investigated the effect of active telephone support on breastfeeding premature infants.

The findings of the aforementioned study revealed that telephone improved breastfeeding, maternal satisfaction, mother and infant attachment, and alleviated maternal stress. The telephone follow-up was conducted during the discharge of premature infants from the hospital by a team of trained nurses who were in contact with mothers (18). In a study carried out by Jean Hannan et al. regarding term infants, the similar results indicated reduced maternal stress, enhanced birth weight of infants, and reduced neonatal emergency after Access point name follow-ups were reported (9).

Valentina Isetta et al. reported that telenursing via the Internet was more effective and less costly than the conventional hospital-based follow-up, particularly through reducing subsequent emergency department visits. The aforementioned study was a retrospective cohort study conducted on low-risk newborns in Spain between January 2011 and January 2012.

The results of a study carried out by Kadivar et al. (2017) also showed the effectiveness of the Internet-based education on the satisfaction of

parents with infants admitted to NICU. In a study performed by Gray et al., it was shown that telemedicine during and after hospitalization reduce care costs and enhance emotional support. In a study conducted by BikMoradi et al., telenursing was proposed as an effective treatment plan for accelerating recovery after coronary artery bypass grafting (19).

Fakharzadeh et al. also reported that telenursing was effective in reducing the level of glycosylated hemoglobin in type 2 diabetic patients (20). Contrary to previous studies, Tan and Lai in their review study did not confirm the effect of telenursing on reducing the hospitalization length of high-risk infants. In addition, they contended that there was not adequate data to assess the satisfaction of staff and parents of these infants; therefore, further studies were required in this regard (21).

According to Akbarbegloo et al. (2003), the mothers of premature infants expected to receive more nursing support than today indicating that planning is essential to promote family-based care for parents in NICU (7). Abdeyazdan et al. reported identical results about the effect of family-based interventions on reducing the stress of parents with preterm infants in NICU (17). Karbandi et al., also suggested that the active involvement of mothers in their newborn care before discharge was effective in reducing the length of hospitalization (22).

Dashti et al. stated that the support diminished the probability of readmission of infants one month after discharge (23). One of the causes of stress relief and reinforced attachment in the aforementioned study was facilitated communication of parents with nurses and the exchange of information without time constraints. Considering the admission of infants in NICU that Del Fabbro et al. (2000) described as an unexpected event some emotions are aroused, such as stress, feelings of guilt, anxiety, and fear in parents (3). Moreover, in a study carried out by Busse et al., it was reported that some problems arise, such as depression, fatigue, and sleep

disorders by parents (4).

Penny et al. discussed even the need to address the psychological problems of these parents after the discharge of infants (24). Furthermore, Lyons-Ruth et al. pointed out communication problems between parents and children even in adolescence (25). Therefore, it is necessary to initiate programs for familiarizing parents with NICU's stressful environment. Moreover, the Pichler et al. emphasized establishing programs to inform parents about NICU's stressful environment and parental empowerment (26). In addition, Namnabati et al. reported the benefits of implementing early discharge plans for both infants and parents (27). The findings of a study carried out by Iranmanesh et al. revealed the effect of nurses' emotional support on reducing the stress of parents (28). Given all the aforementioned studies, the present study demonstrated that providing mothers with support and information through telenursing continued one week after the admission of the newborn until one week after the discharge. This could be seen as an effective program to improve the discharge process.

Conclusion

Telenursing through IVR system increases maternal and neonatal attachment and mitigates stress in mothers with premature infants. Given its convenient access and application, round-the-clock access of many users to the system at the same time, low cost, and rapid data transfer it is recommended that nurses use this system for greater educational support of mothers.

Practical implications

The results of this study help nurses in NICU to improve communication and educational support for mothers with infants admitted to NICU.

Acknowledgments

Conflicts of interests

The authors declare that there is no conflict of interest.

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