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Effect of a Multifaceted Approach on Perceived Support Among Mothers of Preterm Infants: A Quasi-Experimental Study

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Abstract

Introduction: Mothers of preterm infants need support to deal with the issues caused by the early birth of their infants.
Objective: The authors examined the impact of a multifaceted supportive approach on the mothers' perceived support levels.
Methods: The present quasi-experimental study was performed on 143 mother–preterm infant pairs, in two neonatal intensive care units (NICUs) of referral and educational hospitals in Tehran, Iran. The base of developed interventions was known to support system patterns of mothers with preterm infants. Different supportive interventions (appraisal, instrumental, emotional, and informational) of mothers were implemented during three months. The Nurse Parent Support Tool was applied for assessing perceptions of perceived support by mothers. Routine care was provided for the control group. The results were analyzed by STATA software 13. Categorical variables were analyzed by chi-square test, *t*-test, and inverse probability treatment weights.
Results: Following adjustments of mean differences of outcomes between study groups (95% confidence interval), all support scores, such as instrumental support, −1.23 (95% CI −1.04 to −1.43), total support, −1.83 (95% CI −1.6 to −2.06), appraisal support, −2.01 (95% CI −1.73 to −2.29), emotional support, −1.87 (95% CI −2.15 to 1.6), and informational support, −2.12 (95% CI −1.82 to −2.43), were significantly higher in the interventional group than in the control group ($p < .001$).
Conclusions: Support received by mothers of preterm infants determines maternal/neonatal health. Information sharing and effective ways to support are essential elements in the mother's ability to deal with the new, stressful situation. This multifaceted supportive approach considerably improved mothers' perceived support.

Keywords

infant, preterm, mother, support, neonatal intensive care unit

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Introduction

Preterm birth and infant admission in the neonatal intensive care unit (NICU) exposes the family and especially the mothers to stressful, anxiety-provoking, and strange situations, that they are not mentally ready for them. Some mothers have symptoms of depression, anxiety, and posttraumatic stress disorder (Yildiz et al., 2017) and some of them avoid experience sharing due to feelings of shame, social isolation, and guilt; they think, they are not understandable by others (Flacking et al., 2019).

Mothers' perceptions of the emotional support level can anticipate their level of stress (Unesi et al., 2017) and

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mothers' support is crucial for their mental health and also can improve the mother–infant interactions' quality as well as the child's subsequent growth (Kurniawati et al., 2019).

Support of mothers with preterm infants is crucial for public health since economic costs caused by mental health disorders are comparable to the global economic burden caused by noncommunicable diseases (Treyvaud et al., 2019). Support for mothers can be done in the form of various interventions. Several interventions have been designed and assessed for mothers of preterm infants, mostly to boost the infants' nervous development. However, some interventions tried to improve maternal outcomes, like mother–infant interaction, maternal behavior, or mothers' coping skills and health. Some of these interventions were teaching mothers about different infant-related topics (like maternal care practices in the NICU and developmental care) or mother-related topics (like coping and communication skills and promotion of mother–infant communication). Other interventional programs emphasized several topics like developmental care, stress reduction, discharge planning, and breastfeeding support. One-to-one training based on improving maternal–infant interactions and increasing maternal participation in infant care in the form of programs such as creating opportunities for parent empowerment (COPE), Newborn Individualized Developmental Care and Assessment Program (NIDCAP), and mother–infant transaction program (MITP) have considerably reduced maternal stress (Davidson et al., 2017). Nonetheless, most of these programs began a few days after the infant was admitted to the NICU or following discharge, so they could not help the mother in the first days after birth, especially during the first contact with the newborn infant. Mothers are not always supported emotionally or practically by support systems, especially when needed at the bedside (Aftyka et al., 2017; Almasi et al., 2018; Unesi et al., 2017; Zavalgard et al., 2017) which can cause more stress for family engagement patterns, particularly when mothers are not ready for preterm birth (Aftyka et al., 2017; Mousavi et al., 2016). Due to the sensitivity of this era and the lack of appropriate interventions, as a result, it should be the basis of policies and supportive interventions should be strong scientific evidence and maternal preferences and needs. Therefore, desirable and practical interventions should be evaluated in NICUs to support mothers.

Comprehensive guidelines are developed aiming at supporting mothers in the neonatal wards. The National Perinatal Association (NPA) developed a multidisciplinary committee in 2015 (consisting of professionals and mothers with hospitalized infants) for preparing a guideline. Finally, the NPA proposed a multifaceted approach to support mothers, including strategies at hospitals (development of family centered care) and maternal-specific programs (mental education, mental well-being support, and peer support). To the researcher's knowledge, there are not many reports supporting such recommendations, and further studies are needed to identify the benefits, most effective interventions, or their harms to families, staff, and patients (Altimier & Phillips, 2016).

This study aimed to investigate the effect of a multifaceted support approach on mothers' perceived support levels. Evidence-based interventions were the basis for the formation of this multi-faceted approach (Mousavi et al., 2016; Mousavi et al., 2017a; Mousavi et al., 2017b).

Methods

Study Design

This was a quasi-experimental study conducted during February–May 2016 in two educational and referral medical centers; Shahid Akbarabadi and Mahdiyeh, Tehran, Iran. The study population consisted of mother–preterm infant pairs.

Eligibility Criteria

The inclusion criteria consisted of mothers who gave birth to infants with weighting < 2500 g or gestational age < 37 weeks, high possibility of survival, willingness to participate in the study, ability to communicate verbally, and Iranian nationality. Exclusion criteria consisted of preterm infants without congenital anomalies or disabling conditions, Such as grade 3 to 4 intraventricular hemorrhage (IVH).

Randomization, Concealment of Allocation, and Blinding

Due to the nature of the intervention, it was not possible for mothers to be blinded to the group allocations. In order to prevent contamination, two hospitals were randomly allocated to intervention (Mahdiyeh) or control (Shahid Akbarabadi) centers. Eligible study subjects were enrolled within three months (Grieb et al., 2023; Preyde & Ardal, 2003). A total of 75 pairs were allocated to the intervention group and 68 pairs to the control group.

Intervention Description

The support system pattern of preterm infants' mothers was based on developed interventions in which mothers and infants are at the center of the supportive pattern and should be supported at important transitional stages including preconception, pregnancy, postpartum, hospitalization period, discharge, and at home. For every mother, the designed interventions were delivered within 3 months after delivery. In the first stage, mothers were prepared for the first visit of a newly admitted infant in the NICU. Mothers were asked to stay at the NICU as long as possible to become empowered gradually in the maternal process

through observation and guided participation in infant care (appraisal and instrumental support). The researcher with the experience of having a preterm infant was also present in the NICU 6 days a week between 9 a.m. and 4 p.m. She communicated with the nurses and neonatologists to be informed about the details of the baby's conditions and then conveyed the proper information to the mothers using fluent and simple words. Also, mothers were provided with the information about physical environment of the NICU, the behavior and appearance of preterm babies, and the way maternal roles are based on their literacy, understanding, and needs. The researcher answered the questions of mothers, and if needed, repeated the training. The researcher assessed the mother's relationship with the baby, and mothers were guided in how to interact with their babies and recognize their behavioral signs (appraisal support). Mothers were guided on how to do baby calming interactions by odor exchange (teaching mothers to place breast pad under the baby's head and pick up the past pad to keep it on her side while milking and during separation), touching slowly and steadily, eye contact with the baby and quiet whispering (emotional support). Breastfeeding training was provided in the neonatal ward, and mothers were followed up through phone calls (informational support) following the discharge of the baby. Mothers were also provided with practical assistance, encouragement, training, and counseling for starting kangaroo care and performing it when possible (instrumental and appraisal support). Whenever the babies were transferred from one ward to the other wards or between hospitals, mothers were accompanied and were informed about the new conditions (informational support). In the social network, the mothers became members of the "MATIN mothers" group for expressing their concerns (emotional support) and gaining practical information through communicating with mothers with the experience of having preterm babies. This group was supervised by the researcher, in which new mothers and mothers with a successful experience of having preterm babies were available. The researcher uploaded various educational content regarding kangaroo care, breastfeeding, infant follow-up, massage, etc. based on the mothers' needs, responded to the questions, and monitored mothers' interactions for preventing any misguided recommendation (informational support).

Training sessions were held once a week under the guidance of the researcher as a leader-facilitator in the mothers' restroom by inviting peer volunteers. These volunteer mothers were previously trained in supportive boundaries during a four-hour workshop. In every session, the informational needs of mothers and the practical experiences of the peer mothers were discussed (appraisal and informational support).

Spiritual support was done for mothers through emphasizing recourse, trust, patience, as well as submission to divine destiny. Mothers were provided with phone numbers to ask their questions during hospitalization and after discharge, for 3 months after the birth of the infant (informational support). Prior to discharge, mothers were educated regarding checking of temperature, how to bathe, giving medications, etc. (appraisal support). Mothers were trained and reminded until three months after birth about postdischarge follow-ups such as hearing, vision, etc. until 3 months after birth (informational and appraisal support). Routine care was provided for the control group.

Data Collection Tools

Demographic and clinical data of mothers and infants were obtained by a general information questionnaire. To determine face and content validity, the questionnaire was reviewed by three honorable members of the Department of Reproductive Health, so the necessary modifications were implemented.

Nurse Parent Support Tool (NPST) was used for assessing the mother's perception of the perceived support in fields of emotional, instrumental, informational, and appraisal support (Miles et al., 1999). The Miles Questionnaire (Miles et al., 1999) has 21 items and evaluates the mother's perception of perceived support on a Likert scale in the fields of appraisal, instrumental, informational, and emotional. Score one means the minimum support and five indicates the maximum support. The validity and reliability of its English and Persian versions have been confirmed (Miles et al., 1999; Valizadeh et al., 2012).

Ethical Consideration

This research was approved by the ethics committee of Shahrod University of Medical Science (code: 930/24). Also, permission was obtained from Iran and Shahid Beheshti University to introduce researchers to medical centers and colleges. Written consent was obtained from all mothers who passed the initial eligibility screening.

Statistical Analysis

Data were analyzed using Stata 13. The independent sample *t*-test was applied to analyze the quantitative data. The chi-square test was used for categorical variables. Inverse probability treatment weights (IPTWs) (Kalia et al., 2023; Mansournia & Altman, 2016) were applied to control preintervention variables' heterogeneity due to cluster randomization between two groups. At first, the variable of severity of disease was created based on the use or nonuse of kinds of ventilation. A logistic regression model was developed for the generation of the treatment variable including the age of the infant, severity of disease, weight at birth, state, and trait anxiety at admission, named to the propensity score (PS). 1/PS and 1/(1−PS) were the weights for the mothers of two groups of intervention and control, respectively. Scores of difference between groups were adjusted based on weights and known average treatment effect (ATE).

Results

The baseline characteristics of mothers and infants are listed in Table 1. The intervention and control groups were significantly different regarding some demographic characteristics (education, mother ethnicity, and insurance status) as well as clinical features (birth weight, duration of noninvasive ventilation, and gestational age) (Table 1). Table 2 indicates the mean differences in outcomes along with a confidence interval of 95% based on adjustment.

There was a significant difference between the score of Instrumental support between the two groups (4.61 ± 0.05 vs. 3.38 ± 0.08, $p < .001$), and the average score in the intervention group is higher than the control group, 1.23 (95% CI −1.04 to −1.43).

Table 1. Clinical and Demographic Characteristics.

Variable	Control ($n = 68$) Mean (*SD*) or %	Intervention ($n = 75$) Mean (*SD*) or %	*p*-value
Maternal education[c]			
High school or less	24 (35.3%)	15 (20.0%)	.01
Diploma	35 (51.5%)	36 (48.0)	
University	9 (13.2%)	24 (32.0%)	
Maternal occupation[c]			
Housewife	65 (95.6%)	64 (85.3%)	.05
Employee	3 (4.4%)	11 (14.7%)	
Insurance[c]			
Social	39 (57.4%)	33 (44%)	.03
Rural	25 (36.8%)	26 (34.7%)	
Complementary	4 (5.9%)	16 (21.3%)	
Maternal ethnicity[c]			
Persian ethnic	8 (11.8%)	36 (48.0%)	<.001
Non-Persian ethnic	60 (88.2%)	39 (52.0%)	
Parity[c]			
1	35 (51.5%)	51 (68.0%)	.13
2	24 (35.3%)	20 (26.7%)	
≥ 3	9 (13.2%)	4 (5.3%)	
Method of childbirth[c]			
Vaginal delivery	13 (19.1%)	10 (13.3%)	.26
Cesarean	55 (80.9%)	65 (86.70%)	
Family income ($)[b]	341.5 ± 138.7	400/2 ± 312/2	.08
Mother's age[b]	28.3 ± 5.8	28.5 ± 5.4	.84
Birth age[b]	32.3 ± 2.1	30.9 ± 2.6	<.001
Birth weight (kg)[b]	1.7 ± 0.4	1.5 ± 0.48	<.001
Number of invasive ventilation days[a]	0.7 ± 3.1	2.4 ± 10.4	.09
Number of noninvasive ventilation days[b]	0.8 ± 3.5	2.4 ± 3.8	.01

[a]Values are given as mean ± *SD* using Mann–Whitney's *U*-test.
[b]Values are given as mean ± *SD* using student's *t*-test.
[c]Values are given as a number (%) using the chi-squared test.

Also, the appraisal support score in the intervention group is significantly higher than in the control group, 2.01 (95% CI −1.73 to −2.29).

The score of emotional support was 4.55 ± 0.05 in the intervention group and 2.67 ± 0.13 in the control group, showing a significant the emotional support score in the intervention group was 1.87 points higher at the time of discharge, 1.87 (95% CI −2.15 to 1.6).

There was a statistically significant difference in the score of informational support between the two groups, −2.12 (95% CI −1.82 to −2.43).

In addition, the total support score was significantly higher in the interventional group compared to the control group, 1.83 (95% CI −1.6 to −2.06), $p < .001$.

Discussion

As the requirements of preterm infant mothers are very sophisticated and diverse, so it is more helpful for experts to cover several needs through providing multidimensional support.

Maternal satisfaction is achievable through a focus on fulfilling the mothers' certain requirements by mother-to-mother and professional-to-mother support programs. This study intervention could positively affect the perceived sense of support in mothers in various fields of emotional, informational, appraisal, and instrumental support. Generally, the results showed that the mean of all support scores in the mother in the intervention group was higher than the control.

There are significant differences in requirements, response to requirements, and satisfaction with a response to requirements in mothers. The requirements and priorities of mothers are individualized, thus, need management should be personalized (Govindaswamy et al., 2019). Such findings indicate that professional-to-mother or mother-to-mother support programs can be helpful in fulfilling these requirements. Some mothers are not comfortable in public settings, and one-by-one support is effective in adaptation to the experience of having a preterm infant. The researchers could attract the attention of mothers to obtain maximum support based on multifaceted interventions, like available mobile phone consultation, the daily presence of the professional peer in the hospital, and using the social group named "Matin Mothers." Early interventions, focusing on the improvement in the maternal–infant interaction, were other supportive aspects of this research study.

In a meta-analysis, the researcher reported that based on the mothers' perspective, instrumental support was the most important factor; mothers evaluated the highest support received from health caregivers in the field of instrumental support (Hambisa et al., 2023; Mousavi et al., 2016). Similarly, instrumental support was reported as the highest perceived support in this study (Enke et al., 2017). In this study, the researchers could attract the attention of the

Table 2. Mean Scores for Perceived Support.

Perceived support	Intervention (before adjustment)	Control (before adjustment)	Intervention (*SE*)	Control (*SE*)	[a]Average treatment effect (*SE*)	95% CI for difference	*p* value
Total support	4.49 ± 0.44	2.42 ± 0.76	4/49 (0/05)	2/66 (0/10)	1.83 (0/12)	1.6 to 2.06	<.001
Instrumental support	4.6 ± 0.44	3.25 ± 0.68	4/61 (0/05)	3/38 (0/08)	1.23 (0/10)	1.04 to 1.42	<.001
Emotional support	4.55 ± 0.41	2.41 ± 0.94	4/55 (0/05)	2/67 (0/13)	1.87 (0/14)	2.15 to 1.60	<.001
Appraisal support	4.57 ± 0.06	2.34 ± 1.08	4/56 (0/06)	2/54 (0/13)	2.01 (0/14)	1.73 to 2.29	<.001
Informational support	4.33 ± 0.61	1.94 ± 0.83	4/33 (0/07)	2/21 (0/14)	2.12 (0/16)	1.82 to 2.43	<.001

[a]ATE after adjusting for illness severity of the infant, birth weight, birth age, admission state-trait anxiety by the IPTW method.

mothers to receive maximum support. The highest perceived support level for instrumental support was because of the fact that health professionals' training has considered acquiring competency in care procedures as well as working with advanced equipment as the educational priority (Aftyka et al., 2017). In a meta-analysis, informational support was the second most important. Unlike other studies (Aftyka et al., 2017; Mousavi et al., 2016) this study could attract the attention of mothers to receive maximum support.

Women in the NICU, struggle with the frustration of an altered maternal path, and claiming to be a mother is a difficult process. Mothers in the NICU are different concerning the type of emotional exposure after having a preterm infant; thus, the nature and time of supporting them is needed to be designed and implemented separately (Fowler et al., 2019).

In a meta-analysis, the third field of support was reported to be emotional support, whereas it was at the lowest level regarding reception (Almasi et al., 2018; Mousavi et al., 2016).

In this area, there was the highest gap between the perception of the importance as well as the perceived reality of support by mothers. Nonetheless, the researchers could influence the mothers' adaptation to the baby's illness and other influenced aspects of their lives and attract their attention to receive the highest support. Nurses do not have enough time to meet mothers' emotional needs, therefore, involving other team members, such as volunteer support groups and social workers can be effective (Galanis et al., 2016). The scope of maternal support can be expanded by the health team through referring mothers to other mothers with similar experiences. Taheri et al. showed that the unique empirical knowledge offered by experienced mothers was an opportunity for the mutual sharing of experiences and creating a support system pre and long after discharge. In this setting, a mother obtains justification, sympathy, and confirmation from other mothers and she knows how other mothers control the stress of facing similar conditions (Taheri et al., 2018). The groups can decrease maternal stress, and learn helpful adaptation (Kurniawati et al., 2019). According to Iris et al., dialogue as well as providing a place and time for questions and answers between inexperienced and experienced mothers can result in effective assimilation and education (Chertok et al., 2014; Hirtz et al., 2023).

Receiving support from peer groups or professionals can improve maternal self-confidence in caring for their babies (Taheri et al., 2018). Valizadeh reported appraisal support as the lowest field of receiving support (Valizadeh et al., 2012). In a meta-analysis, receiving the appraisal support from mothers was at a moderate level, whereas this study could improve and support the maternal role, and empower the mothers to care for the infants (Mousavi et al., 2016). If mothers do not realize their important role, they will refuse to care for their preterm babies in the NICU; They will not stay in this ward if it is not welcoming for them (Treyvaud et al., 2019); thus, mothers should be supported to manage such challenges.

The medical staff's identity-based performance, which is capable of sympathizing with mothers and respecting mothers, and is committed to informing and involving them in the babies' care and also promoting the medical-technical competency of caregivers and making a socio-cultural atmosphere, is able to boost the self-confidence of mothers for taking their responsibility (Ghadery-Sefat et al., 2016). Similarly, Kurniawati indicated that using peer support in Kangaroo Mother Care (KMC) training in comparison with training by nurses caused a significant increase in the confidence of mothers in the implementation of KMC as well as the infants' weights (Kurniawati et al., 2019). The clinical trials, cross-sectional, case, and qualitative investigations declared that the professionally-led and peer-led support groups increased mothers' self-confidence in their skills (Hall et al., 2015; Rossman et al., 2015; Taheri et al., 2018). The total average NPST score is of great importance since it can determine the mother's perception of the support level of the medical staff, however, it is very low in Iran (Almasi et al., 2018; Valizadeh et al., 2012; Zavalgard et al., 2017). Mother's perception of support provision was very high in this study, which is not similar to other studies (Brødsgaard et al., 2019; Bry and Wigert, 2019; Raiskila et al., 2016).

Recommendations. Defining a job position known as maternal peer is suggested in all NICUs who take the deep, broad, and full, responsibility to fulfill the mother's supportive requirements considering that they are familiar with the mothers' supportive boundaries with preterm babies. Such maternal peers, which can be experienced midwives,

physicians, or nurses can establish a trusting relationship with mothers for persuading them to acceptance of professional support. The impact of defining and implementing this job position on perceived maternal support can be the subject of future research.

Limitation

In this study, concerns regarding contamination were the main limitation, so sampling was done in two medical centers. Despite this limitation, developed evidence-based interventions were very efficacious in increasing perceived support in mothers in various dimensions. Furthermore, the results were the same following baseline characteristics adjustment. Also, cultural issues can be another influencing factor in this field.

Conclusion

Support received by mothers of preterm infants determines maternal/neonatal health. Information sharing and effective ways to support are essential elements in the mother's ability to deal with the new, stressful situation. This multifaceted approach consists of different interventions based on specific needs to improve the maternal perceived support.

List of Abbreviations

NICUs	neonatal intensive care units
NPST	Nurse Parent Support Tool
IPTWs	inverse probability treatment weights
COPE	Creating Opportunities for Parent Empowerment
NIDCAP	Newborn Individualized Developmental Care and Assessment Program
MITP	mother–infant transaction program
NPA	National Perinatal Association
IVH	intraventricular hemorrhage
PS	Propensity Score
ATE	average treatment effect
KMC	Kangaroo mother care

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Authors' Contributions

SSM, AK, and PM contributed to the conception and design of the study. SSM and AKh were involved in data collection and analysis of results. SSM, AK, PM, and SHJ were involved in writing the main manuscript text. All authors reviewed the manuscript. All authors have read and approved the manuscript.

Availability of Data and Materials

The data sets used and analyzed for the current study are available upon reasonable request of the corresponding authors.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethics Approval and Consent to Participate

The study protocol was approved by the Ethics Committee of Shahroud University of Medical Sciences, Shahroud, Iran (code: 930/24) (URL:https://ris.shmu.ac.ir/webdocument/load.action?webdocument_code=1000&masterCode=16001172). All procedures were in accordance with the ethical standards of the Regional Research Committee and with the Declaration of Helsinki 1964 and its later amendments. After explaining the study's purposes, informed written consent and verbal assent were obtained from all participants. They were also informed that their participation was voluntary, confidential, and anonymous and that they had the right to withdraw from the research at any time.

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Relevance to Clinical Practice

The results of the study could help health providers develop a multifaceted supportive program for mothers of preterm infants.

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