

Development of an educational module for mothers of premature infants admitted to the neonatal intensive care unit in Iran: a narrative review

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Abstract

Introduction: Mothers of preterm infants, as the primary caregiver, need to learn more about their infants and the complex environment of neonatal intensive care. This study aimed to develop and evaluate the educational module for the mothers of premature infants admitted to the neonatal intensive care unit (NICU) in Iran.

Methods: The online databases (SID, Magiran, Google Scholar, ScienceDirect, PubMed, Elsevier, and Scopus) were accessed from 2009 to 2019, using the keywords ‘mother’, ‘neonatal intensive care’, ‘program’, ‘intervention education,’ and ‘empowerment’. In general, 275 articles were retrieved and a total of 12 studies was retained for appraisal, after screening the titles, abstracts, and full-text reviews. Finally, the qualitative module validity and face validity were determined, using the opinions of 11 experts and 10 mothers of premature infants, respectively.

Results: Eight themes were identified based on thematic analysis, including orientation with the NICU, characteristics of premature infants, premature infants’ problems, needs of premature infants, preparation of premature infant’s environment, behavioral symptoms of premature infants, the positioning of premature infants, and preparation for discharge and measures were developed after the discharge of the premature infant. Considering all acquired interventions for all items, a content validity ratio of 0.59 and content validity index of 0.79 based on the opinions of experts at two levels of specialists and mothers.

Conclusion: Due to the lack of enough nursing staff and a high workload in the NICU, this review offers nurses to spend less time educating mothers and focusing more on premature infants. Moreover, supporting mothers can help to provide better care. The educational module can help nurses and mothers have more effective care for premature infants.

Keywords: Educational module, Mother, Premature infant, Pediatrics, Neonatal Intensive Care Unit, Iran

Introduction

Around 15 million premature babies are born every year in the world (1). Iran is also one of the regions where the prevalence of preterm labor is high, where 5,000 children are born every day, with about 12% being preterm (2). Premature infants need proper psychological and physiological care to survive due to the early transition to the ectopic environment and facing challenges such as general health as well as physical and mental problems. To do so, they should be admitted and hospitalized in the intensive care unit with a highly complex environment called neonatal intensive care unit (NICU). The parents of all premature infants are usually faced with specific problems (3) such as the absence of awareness of the NICU and equipment, as well as the lack of knowledge about caring for and interacting with premature infants (4, 5). The parents of infants entering the NICU suffer from insufficiency, fear, shock, worry, guilt, grief, anxiety, and depression (6). This psychological status and the environmental obstacles of the NICU may affect the performance of maternal professions such as breastfeeding or the management of their babies (4).

Studies have shown that infants' appearances and behaviors and changes within the parental role are the sources of parental stress in the NICU, and long-term care may affect the solidarity between the mother and the child. Communication problems with the baby could delay his/her development. As a result, the family is active in setting goals and special needs and provides timely interventions as a valuable component in delivering services to infants. Empowering parents to participate in the delivery of care is one of the effective methods of preventing the harm associated with hospitalization for parents and post-discharge consequences (7, 8).

In an environment with advanced technologies such as neonatology, it is essential to recognize the needs of the mother. Parents are always looking for information about their baby's progress in neonatal care to ease feelings of shock, disbelief, and uncertainty. There are different educational concepts about the need for a mother to take care of a premature child. Using all available facilities and opportunities, these concepts should be passed on to mothers while their babies are kept in the NICU to engage them in this process. Many of their questions remain partially or completely unanswered, preventing parents from participating in infant care (9). Despite interest shown by mothers admitted by NICU in learning about the care of premature infants, there are not enough tools to facilitate their education. The goal of educating mothers is to make them the best caretakers for their preterm babies. It emphasizes the importance of education. The development of educational module is essential due to the high levels of stress in NICUs,

poor communication of parents with their neonates and healthcare providers, diversity of their needs, and inability of mothers to produce neonatal care, and cope with the emerging environment (10). This study aimed to develop and evaluate the educational module for the mothers of premature infants admitted to the NICU in Iran.

Materials and methods

Seven online databases including SID, Magiran, Scholar Google, Science Direct, PubMed, Elsevier, and Scopus were assessed between September 1st, 2009 and December 30th, 2019 in both English or Persian languages. The keywords were 'mother', 'neonatal intensive care', 'program,' 'intervention education,' and 'empowerment'. The inclusion criteria included Iranian articles, with at least an educational step, and interventions with a comprehensive explanation of the educational content. In addition, the exclusion criteria were articles published up to 2008 and interventions that had no educational content. Randomized control trials (RCTs) and other controlled trials have been included in the review. The five-step scoping review protocol was used to determine relevant documentation, select studies, record data, and finally, compile, summarize, and report on findings (11).

The search process resulted in 275 papers. Using an Excel spreadsheet, both first and second authors reviewed the papers independently and had several meetings with each other to finalize the selection of studies (Figure 1). A total of 20 papers was selected for data extraction and analysis. The review process began with reading and proofreading articles by first and second authors independently. Then, the findings were assessed to identify patterns of data to develop overarching themes, continued by several meetings to discuss the concepts and develop overarching themes based on the similarities and differences in the concepts, and agreement on any disagreements. Finally, the "Critical Review Form" (developed by the McMaster University's Occupational Therapy Evidence-Based Practice Research Group) was used to evaluate the quality of studies (12).

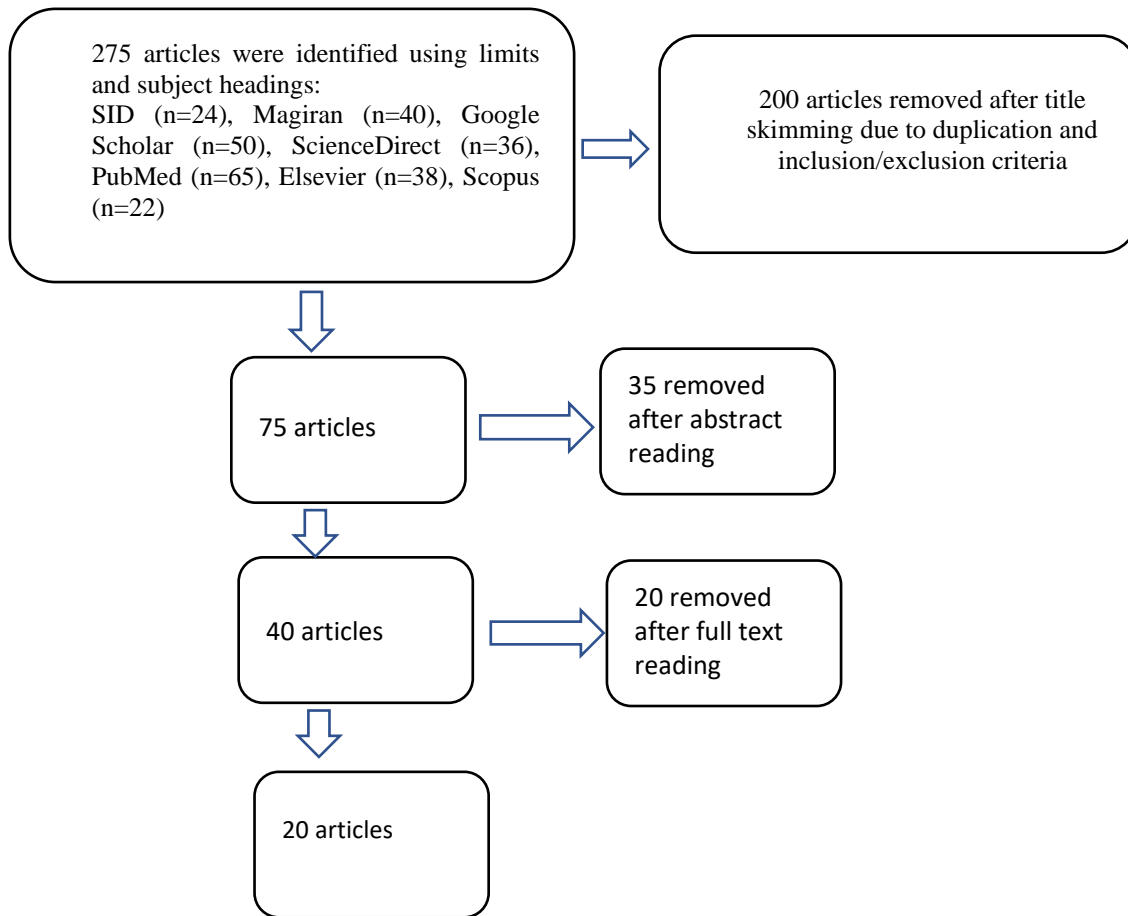


Figure 1. Search Strategy Flow Chart

Development of educational module

Educational objectives are set according to the study by Rasti and colleagues (13) and Jo Brett and colleagues (14). The educational module was developed based on the authoritative literature and related articles (3, 15-20). The qualitative content validity of the educational content was determined by consulting with pediatric experts, nurses, and faculty members (Table 1). The content validity checklist, based on the eight-part educational content titles, was forwarded to the experts for their professional advice. Formal validity was achieved based on the views of 10 mothers of preterm babies admitted to the NICU. The participated mothers had a gestational age of 28-37

weeks, a baby with birth weight of less than 2500 grams, no previous history of children (admitted to the NICU, no congenital anomalies and major physical illness, and no neurological defects), stayed in the NICU for 24 hours, and were educated.

The number of experts for assessing the relevance of each item was calculated based on content validity ratio (CVR) for the item-level. A three-point Likert-type scale (1 = unnecessary, 2 = unnecessary, but useful, 3 = necessary) was used. The formula of CVR is:

$$CVR = (Ne - N/2) / (N/2)$$

where Ne is the number of panelists indicating “essential” and N denotes the total number of panelists.

The Lawshe table was used to determine the numerical value of the CVR (15). For example, in this study, there were 11 panelists. Each item in the instrument with an acceptable level of significance was accepted if the CVR was greater than 0.59 (15).

After determining and calculating the CVR, the content validity index (CVI) was examined against the Waltz and Basel CVI (16). To compute the CVI, a

questionnaire was sent to the 11 participated experts, and was asked to advise on the three criteria (relevance, simplicity, and clarity) using a four-point Likert-type scale (1: unrelated, 2: somewhat relevant, 3: relevant, and 4: completely relevant). In this study, the content validity indices were calculated using the CVI formula, with numbers of more than 0.79 acceptable (16).

Table 1. Demographic Information of the Experts

Participant	Scientific Degree	Number	Experience in NICU *
Doctor	Neonatal subspecialty	2	18 years
		2	4 years
Nurse	Master of nursing	4	15 years
	Bachelor of nursing	2	5 years
Faculty member	Professional Doctor of Nursing	1	10 years

*. NICU: Neonatal intensive care unit.

Results

The results of explaining the education module

Based on data in Table 2 and reviewing the educational content, the most important educational parameters include handwashing before contacting the infant, orientation with the environment of the NICU, the appearance and behavioral characteristics of the premature infant, and the difference between premature and mature infants. Other parameters were

care of the umbilical cord, the neonate's temperature taking, the positioning of neonates, breastfeeding, diaper changing, baby sucking practice with a pacifier or finger, and baby burping. Finally, infant touch and massage, bathing, stress symptoms in premature infants and their elimination methods, maternal embracing care (KMC), sleep and awakening patterns of premature infants, the required screening, vaccination, and discharge planning were other parameters.

Table 2. Summary of Studies

First Author and Year	Title	Study Design	Educational Material
Borimnejad (2019)(17)	The effect of the empowerment program on the chronic sorrow of the parents of premature newborns in neonatal intensive care units	Non-RCT #	The difference between premature and mature infants, orientation with the environment of the NICU®, the expected equipment, the infant's characteristics, behaviors, development, and specific details about the baby's condition and the best time to interact, and how to care
Sajadi (2018)(18)	The effect of the empowerment program on the participation of mothers with premature infants hospitalized in the neonatal intensive care unit	RCT	Appearance and behavioral characteristics of the premature infant, the differences between a preterm and a term infant, the environmental characteristics of NICU, information on the behavior and evolutionary growth of the infant, and information on discharge
Alaee Korahroudi (2018)(19)	The effect of empowering the mothers of infants hospitalized in the neonatal intensive care unit on their participation in neonatal care	Quasi-experimental	Proper holding of the neonate during breastfeeding, knowing the defecation time, diaper change, care of the umbilical cord, taking the neonate's temperature, positioning of neonates, mother's ability to talk with the neonate, making

			eye contact, gently touching and massaging the neonate's arms
Khazaei (2018)(20)	The effect of preterm infant care training on stress in the mothers of preterm infants admitted to neonatal intensive care units	RCT	Hand washing before contacting the infant, appropriate infant clothing, optimum environmental conditions for a preterm infant, feeding through a gastric tube, ideal weight gain criteria, bathing the infant, the importance of embracing and touching the infant, the applied equipment for the infant, and the infant's breathing pattern and appearance
Chehrzad (2018)(21)	The effect of family-based care on stress, anxiety, and depression of mothers with premature infants	Quasi-experimental	The initial care of the infant, the NU and its required equipment, and the necessary knowledge regarding the appearance, characteristics, and the behavior of premature infants, sleep and awakening patterns of premature infants, symptoms of stress in premature infants and how to treat them, issues such as the best time to interact with the infant, nutrition, keeping body temperature and proper clothing, diaper change, and umbilical cord care, required screening, vaccination, multivitamins with their correct dose and the method of administration, bathing, and methods of communication with infant centers in special circumstances
Azizzadeh Forouzi (2018)(22)	Study of the effect of the educational program on the stress of the parents of premature infants in neonatal intensive care units	Clinical trial	NU [§] : introduction, the staff, equipment that parents may observe in the unit (e.g., monitor, respiratory equipment, phototherapy lights, and the like), the connection of venous tubes, nasal-tube feeding, blood transfusions, baby's appearance, participation in baby care, breastfeeding
Moradi (2017)(23)	The effect of the empowerment program on maternal discharge preparation and neonatal length of hospital stay	RCT	Hand washing, breastfeeding, baby sucking practice with a pacifier or finger, milk storage, methods of burping, infant touch and massage, bathing, infection prevention, warning signs and infant resuscitation, diaper changing, the criteria for nutritional adequacy, touching and massaging the infant, maternal embracing care (KMC [*]), bathing, danger signs in the infant, and resuscitation of the infant during the hospital stay.
Ravanbakhsh (2017)(24)	Effect of family-centered intervention in the neonatal intensive care unit on the anxiety of parents	Clinical trial	Orientation with the NICU and its facilities such as incubators, ventilation, heating, suction and serum therapy devices, appearance and behavior of premature infants, therapy, suctioning, oxygen therapy, sampling, and phototherapy

Milan (2017)(25)	The effect of the family-centered care educational program on the anxiety of the mothers of premature infants hospitalized in the neonatal intensive care unit	Clinical trial	The necessary information about appearance, characteristics, and behavior, sleep and wake patterns, stress symptoms in premature infants, and ways to eliminate them, the role of the mother in caring for premature infants, the best time to interact with the baby, nutrition, bathing, maintaining body temperature and proper clothing, diaper change, umbilical cord care, transfer of the baby from the hospital to home and establishment of effective communication with the baby and an emphasis on the screening tests of vaccinations
Zahedpasha (2017)(26)	The effect of education on improving mothers' performance in caring for premature infants	Quasi-experimental	Skincare, umbilical cord, bathing, breastfeeding, diaper change and skin rash prevention, skin contact, maintaining and controlling of the infant's body temperature, infant massage
Keramat (2017)(27)	Development of a support system for the parents of premature infants	Systematic review	Breastfeeding, KMC, infant massage, discharge planning, and informational support
Heidarzadeh (2016)(28)	The effect of the neonatal intensive care unit orientation program on decreasing the anxiety of premature infants' mothers	Quasi-experimental	Nasopharyngeal tubes, respiratory tubes, introduction of the neonatal unit, information about the personnel, the equipment that parents might observe at the unit (e.g., monitor, respiratory equipment, phototherapy LED, and the like), care conditions (e.g., connected intravenous pipes, nasogastric tube feeding, transfusion, and the like), information about the infant's appearance, the emotions that mothers might experience, breastfeeding, and medical terminology
Mohammaddoost (2016)(29)	The effect of mothers' empowerment program on premature infants' weight gain and duration of hospitalization	Quasi-experimental	Necessary explanation about the physical environment of the NICU and equipment, the appearance, characteristics, and behaviors of premature infants, sleep-awake patterns of premature infants, signs of stress in premature infants and ways to relieve them, feeding, bathing, maintenance of body temperature and proper clothing, diaper replacement, umbilical cord care, screening tests, and vaccination
Momenizadeh (2015)(30)	Effects of maternal empowerment program on the length of hospitalization and readmission rate of premature infants	RCT	The behavior of premature infants, differences between preterm and term infants, and acquaintance with the environment of the NICU, involvement of new information about the behavioral and developmental patterns of the infants and suggestions for fulfilling the needs of infants, drowsiness, active consciousness, and the most effective time for mother-infant interaction, and the parental role in the growth and development of infants

Ghasemi (2014)(31)	The effect of the educational intervention based on the theory of planned behavior for improving the method of the care of the premature infant by the mother	Quasi-experimental	Hugging care, infant massage, bathing, breastfeeding with cups were part of training of mothers and KMC
Kermanshahi (2014)(32)	The effect of a supportive health promotion program on the quality of the life of mothers of premature newborns	Quasi-experimental	The concept of prematurity and its complications, and how to take care of the baby as it relates to breastfeeding, KMC, skincare, and bathing
Abdeyazdan (2014)(33)	A family support intervention to reduce stress among parents of preterm infants in the neonatal intensive care unit	Quasi-experimental	Information about the environment, equipment, and medical staff of the NICU, care procedures (e.g., venipuncture), characteristics of premature infants (e.g., appearance, behavior, and physical signs), and methods of participation in infant care (e.g., KMC)
Mianaei (2014)(34)	The effect of creating opportunities for the parent empowerment program on maternal stress, anxiety, and participation in the neonatal intensive care unit in Iran	RCT	Information about the physical and behavioral features of premature baby, the differences between mature and premature infants, and information about the environment of the NICU
Aliabadi (2011)(35)	Effect of mothers' participation in preterm infants' care in the neonatal intensive care unit	RCT	Infection control strategies, breathing, change of position, the importance of skin contact, feeding (gavage and breast), baby burping, milk storage, and methods of baby feeding and bathing
Karami (2009)(36)	The effect of educational-supportive interventions on the stress of mothers with premature infants and the length of hospital stay	Quasi-experimental	Baby nutrition teaching in various ways, touching with an emphasis on KMC and baby health care by the mother, ways of understanding the needs of baby according to appearance characteristics by mother

RCT: Randomized controlled trial; @: NICU: Neonatal Intensive Care Unit; * KMC: Kangaroo mother care; \$ NU: Neonatal unit.

Development of the education module

All parameters were selected after reviewing the selected studies and holding a panel of experts at two levels of mothers (engaging mothers because authoritative research partners will help in developing contents that are relevant and appropriate to the needs of mothers.) and specialists. CVR and CVI greater than 0.59 and 0.79 were obtained for all items, respectively. The results indicate that all parameters are relevant and necessary for educating the mothers of premature infants and the educational content is simple and clear (15, 16). Overarching themes were identified as well. The topics of this educational content supported the set of goals in Iranian and international studies, as an introduction to care department newborns, preterm infant characteristics, preterm infant problems, preterm infant needs, preterm infant environment preparation, preterm

infant behavioral symptoms, and preterm infant positioning, as well as preparation for discharge and preterm infant discharge measures (13, 27, 37), the details are provided in Table 3.

Table 3. Educational module content after experts' opinions

The Chapter of the Educational Booklet for the Mothers of Premature Infants	Proper Subset
Chapter 1: Introduction to Neonatal Intensive Care Unit	Observe hand hygiene Awareness of the applied devices used premature infants
Chapter 2: Characteristics of Premature Infants	Definition of a premature infant Characteristics of a premature infant
Chapter 3: Premature Infant Problems	Respiratory problems Anemia Temperature changes Nutritional problems Infection Vomit Icterus Hiccup
Chapter 4: Infant Needs	Premature infant's feeding Excretion of urine and feces of premature infants Sleep and awakening patterns
Chapter 5: Preparing the Environment Around the Infants	Ambient light Ambient sound Olfactory stimulant Enhancement of the sense of touch and taste Organization of touch and movement
Chapter 6: Behavioral Symptoms of Premature Infants	Symptoms of stress Signs of happiness The mother's reaction to the stressful symptoms of a premature infant The role of parents in pain management Non-pharmacological method of pain management
Chapter 7: Positioning Premature Infants	Back sleeping Sleeping on the stomach Sleeping on the side Positioning of the premature infant when moving KMC *
Chapter 8: Preparation for Discharge and Post-discharge Measures	Important points of caring for a premature infant at home Screening of premature infants Problems of preterm infants after discharge Controlling of the temperature of the premature infant Infant feeding after discharge Follow-ups after discharge

* KMC: Kangaroo mother care.

Discussion

Based on the examination of the results of the articles, with early intervention for the mothers of premature infants and the presentation of written information together with the booklet, mothers experienced less stress (38) and anxiety (21, 25, 28, 36, 38, 39, 40) during the educational period. This led to improvements in the awareness of mothers' performance (29, 34) and participation within the care of premature infants (22, 23, 35, 37) while decreasing the chronic sorrow of the parents of premature infants admitted to the NICU (19). It also reduced the number of readmissions (41) but increased the weight of premature infants (32). Parents experience high levels of emotional stress in addition to physical discomfort due to ambient noise, excessive light, and constant interactions with infants in the NICU (42).

Based on the results of a systematic review study, mother's needs in Iran were the same as those in other parts of the world, and mother's perspective instrumental and informational support were highly important (43, 44). The duration of the educational module for mothers of preterm babies admitted to the NICU, ranged from 20 to 90 minutes. There were also papers on the teaching of both parents (17, 24, 33).

Early involvement of mothers and obtaining written information from hospital staff had positive effects on their emotional status (9). Doctors and nurses in the NICU must be sensitive to the information needs of parents. Research has shown that there is not enough information support for mothers about the condition of their preterm baby and responsibilities during neonatal hospitalization (45). In recent years, healthcare organizations have found the benefits of cooperation between members of medical team and the family for qualified care. Parents can recognize the behaviors of their babies and care for them with constant affection and endless attention. Finally, their needs form the basis for designing care plans, so that qualified care can be delivered according to all preferences and priorities (46).

Based on the findings of this study, no complete educational module, including all the parameters of the education needs of the mothers of premature infants admitted to the NICU in Iran, has not been compiled yet. Consequently, the educational module was developed according to the needs of the mothers of premature infants admitted to the NICU. The difference between this educational content and other contents of different article interventions is within the complete expression of the educational subsets required by mothers to train them in the NICU (8, 47). The primary limitation of this review was that the body

of evidence was largely based on maternal training in the NICU.

Conclusion

This review provides an educational module for the mothers of preterm infants admitted to the NICU. It is suggested that researchers use this educational module to conduct various interventions. For the nurses working in the NICU, this module can save their time to provide the required information to the mothers of infants entering the NICU.

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Conflict of interest

The authors declare that they have no conflict of interest regarding the research, authorship, and/or publication of this article.

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