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Effectiveness of COVID-19 Prevention Training on the Stress of Mothers of Premature Infants Admitted to the Neonatal Intensive Care Unit

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ABSTRACT

Background: Delivery and assuming the parental role, especially for mothers, are often accompanied by anxiety and stress, conditions that are significantly aggravated by the birth of a premature infant. The aim of our study is to "determine the effect of COVID-19 prevention training on the stress levels of mothers with premature infants admitted to the NICU."

Methods: This is a quasi-experimental study. The sample consisted of 100 mothers (50 in the experimental group and 50 in the control group) of premature infants hospitalized in the Neonatal Intensive Care Unit (NICU). Participants were randomly assigned to the two groups. The experimental group received an educational program on preventing respiratory infection transmission, with a focus on the coronavirus, delivered through individual face-to-face sessions lasting between 45 to 90 minutes over three sessions. Data for both groups were collected in two phases, before and after the intervention, using a standard Parental Stress Scale questionnaire. Data were analysed using descriptive and analytical statistical tests and SPSS software.

Results: According to the findings of our study, the mean age of mothers in the control and intervention groups was 26.88 ± 0.32 and 27.10 ± 0.30 years, respectively (T=-3.482, d=9.98, P=0.527). Also, the mean age of infants in the control group was 34.90 ± 0.30 weeks and in the experimental group was 35.12 ± 0.52 weeks (T=-2.582, d=9.98, P=0.114). The overall stress score in the intervention group after the intervention (93.82 \pm 7.15) significantly decreased compared to before the intervention (135.98 \pm 0.51) (P<0.001), and this significant decrease was also observed in all stress subscales (P<0.001).

Conclusion: Finally, the findings of our study showed that mothers whose infants are hospitalized in the ICU experience high levels of stress. The COVID-19 prevention training leads to a significant reduction in mothers' stress.

Introduction

elivery and assuming the parental role, especially for mothers, often come with anxiety and stress, a situation that is significantly exacerbated by the

birth of a premature infant [1]. According to statistics, more than fourteen million babies born in a year are premature [2]. The WHO reported that more than 1 in 10 live births are preterm. This results in around 1 million neonatal deaths annually due to these premature births [3]. Premature infants face a high risk of diseases and

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developmental problems, with heavy reliance on their mothers and often requiring ICU admission [2]. Consequently, the admission of the infant to these units brings about significant stress and concern for families, particularly for mothers [4]. infants who need special care are admitted to the neonatal intensive care unit (NICU). This is where newborns with heart problems and other complications are often brought in for specialized care [5]. In some of these units, mothers are not allowed to hold their infants, breastfeed, or express their feelings towards their child, which leads to distress, stress, and anxiety for the mothers [6]. All of these factors, along with other external influences such as changes in parental roles, unexpected situations concerning the newborn, the noise of specialized equipment, fear of infection transmission, and more, significantly contribute to the stress of mothers of these infants. This stress should be addressed by the healthcare staff [7].

The global outbreak of severe acute respiratory syndrome (coronavirus) has been accompanied by mental health problems and disorders. The issues related to the coronavirus disease are well recognized, and its impact on individuals' psychological responses has been reported [8]. COVID-19 has heightened concerns regarding vulnerable groups in society, including pregnant women and infants [9]. Research in this area has shown that during the Coronavirus epidemic, the levels of stress among mothers concerning their own and their newborns' susceptibility to the disease increased [9-10]. The neonatal outcomes, including length of stay in the ward, the need for resuscitation immediately after birth and throughout the hospitalization, the requirement for intubation, and the need for chest tube placement, along with higher rates of neonatal mortality, asphyxia, and seizures during this period, were greater compared to before the COVID-19 pandemic [9]. This situation has intensified mothers' stress and, to some extent, reduced their interactions with their hospitalized infants.

In order to reduce stress for mothers and considering the significant impact that interactions between the mother and premature infant in the early hours and days of birth have on brain development as well as behavioral and emotional-social development, it is essential to provide mothers with necessary training on various topics related to the conditions and circumstances of their newborns as soon as possible after birth. Additionally, given the low cost and effectiveness of these educational programs, it is recommended that they be utilized as part of care strategies in neonatal intensive care units [2, 11]. Research shows that providing information and education about care tips to parents allows them to gain greater decision-making power, self-control, and empowerment, allowing them to better accept the appearance and problems of their premature and weak baby and thus actively participate in their care. Educating these mothers will increase their level of knowledge and performance in performing maternal behaviors and caring for their babies, such as how to breastfeed, etc. Furthermore, it contributes to a reduction in negative behaviors towards infant [12]. The positive impact of educational programs on mothers with premature infants admitted to the NICU has also been reported in research. For example, Barekzaei et al. showed in a study that happiness-based education can reduce depression and anxiety in these mothers and help improve their physical and mental health. As a result, they recommended implementing educational programs alongside family-centered plans in health centers and emphasized the importance of including educational programs for mothers [13].

Given the ongoing presence of the coronavirus globally and the possibility of similar epidemics arising in the future, as well as extensive searches conducted by researchers, no studies in this area were found. Therefore, the aim of our study is to "determine the effect of COVID-19 prevention training on the stress levels of mothers with premature infants admitted to the NICU."

Methods

This is a quasi-experimental study. The sample consisted of 100 mothers (50 in the experimental group and 50 in the control group) of premature infants hospitalized in the Neonatal Intensive Care Unit (NICU). This study was conducted at Imam Khomeini Hospital in Tehran in 2021. To calculate the sample size using Cohen's formula, with a significance level of 0.05 and a power of 0.90, the number of participants was determined to be 85 mothers. However, to reduce the margin of error and increase the power of the study, a total of 100 people (50 in each group) were selected. For sampling, mothers were first selected using the convenience method and in the next stage, they were randomly assigned to two control groups (50 participants) and an experimental group (50 participants).

In this study, inclusion criteria included mothers who delivered at less than 37 weeks of gestation and delivered a premature infant, speaking Persian, not having a mental illness or taking medication, no previous NICU experience, infants hospitalized for more than one week in the NICU, and mothers who visited their infants more than once in the NICU setting. Exclusion criteria included a mother's request to withdraw from the study, psychological or physical problems during the infant's hospitalization, the infant's deterioration or development of sepsis, and incomplete questionnaire responses. Throughout the study, none of the participants were withdrawn.

After completing the questionnaires in both groups, coronavirus prevention training was provided to the target group (intervention group). This training program was conducted face-to-face, individually, and consisted of three sessions lasting 45 to 90 minutes for the mothers

in the intervention group. Subsequently, an educational booklet summarizing the training program was provided to them. The training program follows standard practices for infection prevention and control during the coronavirus epidemic and has been approved by the Ministry of Health. To ensure greater reliability, the validity of this educational program was evaluated and confirmed by five specialists in the field. Therefore, a behavioral-educational intervention based on two theories of self-regulation and control was developed for mothers, preparing them to understand the specific characteristics of this virus, as well as methods of transmission and prevention. Three days after completing the intervention, the Parenting Stress Questionnaire was filled out again by both groups. No training was provided to the control group by the researchers. After the post-test phase, in accordance with research ethics, the educational materials were also made available in written form to the control group.

Data was collected using demographic questionnaires (mother's age, occupation and education, gestational age, infant's gender, infant's weight, type of delivery, multiple pregnancies, history of infant death) and a standardized parental stress assessment questionnaire consisting of 34 items. This questionnaire was designed to investigate stressors in parents of premature infants in the NICU. The dimensions of this questionnaire are: stressors in the ward environment (including 6 items), physical characteristics and behaviors of the child (including 17 items), the parent-child relationship and the role of the parent (11 items). The Likert scale is 0 to 5 for scoring. If the parent has not experienced the question in question, a score of zero is given. One indicates having no experience of stress. Two indicates having experienced very little stress. Three indicates having experienced moderate stress. Four indicates having experienced severe stress. And finally, a score of 5 is given for having experienced very severe stress. The lowest and highest scores on this questionnaire are zero and 170. The higher a person's score, the higher the level of stress they experience [14]. This tool has been used in several studies in Iran that were similar to our study. The internal consistency of this questionnaire was reported and confirmed to be 0.87 in a study by Taheri et al. [15]. The psychometric properties of this instrument (α = 91%) were also evaluated and confirmed by Shoghi et al. [1].

All relevant ethical codes were adhered to by the researchers in this study. All mothers participated in the study with awareness of the details and without coercion.

All mothers entered the study consciously and with their full consent. The research units assured participants that their personal information would remain confidential. Additionally, mothers had the right to refrain from participating. No financial costs were imposed on them. They were given the opportunity to ask the researcher any questions or express any concerns. The results of the research were made available to relevant authorities upon request. Adherence to the principles of ethical publishing (COPE) was also among the researchers' commitments in this study. SPSS version 22 software was used. A P<0.05 was the criterion. T-test and Chi-square statistical tests were used in this study.

Results

According to the findings of our study, the mean age of mothers in the control and intervention groups was 26.88 ± 0.32 and 27.10 ± 0.30 years, respectively (T=-3.482, d=9.98, P=0.527). Also, the mean age of infants in the control group was 34.90 ± 0.30 weeks and in the experimental group was 35.12 ± 0.52 weeks (T=-2.582, d=9.98, P=0.114) (Table 1).

The difference between the mean stress score and all its subscales (environmental stress, infant appearance and behavior, parental relationship and role) in the intervention group was significant after implementing COVID-19 prevention education (P<0.001), while it was not significant at the beginning of the study and before implementing the education (P>0.05) (Table 2).

The overall stress score in the intervention group after the intervention (93.82 \pm 7.15) significantly decreased compared to before the intervention (135.98 \pm 0.51) (P<0.001), and this significant decrease was also observed in all stress subscales (P<0.001). The results of this study in the control group showed that the overall stress score and two subscales (infant appearance and behavior, parental relationship and role) were not significant in the pre-intervention and post-intervention stages (Table 2).

Discussion

Based on the findings of the present study, stress scores and its subscales were significantly high in both groups of mothers before the intervention, indicating high maternal stress.

Table 1- Demographic characteristics of mothers

Variable		Intervention		Control		Statistical	P
		(F*)	(%**)	(F)	(%)	Test	value
Education of Mother	Undergraduate	18	36	10	28	$\chi^2=4.409$, df=2	0.110
	Diploma	21	42	31	52		

Variable		Intervention		Control		Statistical	P
		(F*)	(%**)	(F)	(%)	Test	value
	University	11	22	9	20		
Mother's Job	Housewife	42	84	36	78	Fisher's test	0.114
	Employed	8	16	14	22		
Type of Delivery	Cesarean	7	14	12	26	Fisher's test	0.105
	Natural	43	86	73	74		
Sex of the Baby	Girl	31	62	22	44	Fisher's test	0.054
•	Boy	19	38	28	56		
Weight of the	Under 1	4	8	8	16	$\chi^2 = 4.743$,	0.093
Baby (kg)						df=2	
	1-2	28	56	33	66		
	More than 2	18	36	9	18		
Previous History	Yes	2	4	0	0	Fisher's test	0.247
of Child Death	No	48	96	50	100		
Multiple	Singlets	0	0	1	1	Fisher's test	0.500
Pregnancies	Multiples	50	100	49	99		

^{*} Frequency, **percentage

Table 2- The mean stress scores and its subscales

Group		Intervention	Control	Statistical test* and P
variable	Step	Mean ± SD	Mean ± SD	value
Environmental stressors	Pre-test	26.04± 0.19	24.94± 0.23	T=25.00, p=0.363
	Post-	17.84 ± 0.73	26.04 ± 0.19	T=-75.84, p=0.007
	test			_
Paired t-test		t=76.70, p=0.000	t=-18.67,	
		_	P=0.000	
Appearance and behavior of the baby	Pre-test	61.98 ± 0.31	64.18±1.57	T=-9.68, p=0.151
	Post-	47.30±6.80	63.54 ± 2.42	T=-15.90, p=0.000
	test			
Paired t-test		t=15.22, p=0.000	t=1.53, P=0.130	
Parent-infant relationship and parental	Pre-test	47.96±0.19	49.02±0.31	T=-19.97, p=408
role	Post-	28.68±1.11	49.00±0.20	T= -126.83, p=0.000
	test			
Paired t-test		t=140.58,p=0.000	t=0.44, P=0.659	
Total stress score	Pre-test	135.98±0.51	138.14±1.69	T=-8.64, p=0.151
	Post-	93.82±7.15	138.58±2.46	T=-41.81, p=0.000
	test			
Paired t-test		t=41.86, p=0.000	t=1.07, P=0.290	

*Df=98

Multiple studies have shown that mothers of premature infants who are admitted to the NICU experience significant levels of stress [16-19], which aligns with our study. The high stress levels in mothers can be attributed to several factors. In our culture, the primary responsibility for the care and upbringing of a child rests on mothers [20]. Transferring a baby to the NICU immediately after birth does not meet mothers' expectations [21]. After enduring the challenges of pregnancy and while anticipating a typical experience similar to that of other mothers, they find themselves in the situation of having a child who differs significantly in weight and physical condition from healthy infants, along with a low likelihood of survival, which leads to considerable anxiety and stress for them [16]. Heidarzadeh et al. (2019) reported a high level of stress among this mothers. Contributing factors include mothers' unfamiliarity with the unit and its equipment, a lack of caregiving skills for their hospitalized premature

infants as well as post-discharge, and their non-participation in caring for their infants while in the unit. By addressing these issues, the stress levels of mothers can be significantly reduced [17]. In this regard, Beheshtipour et al. (2014) stated that while fathers' stress is less than mothers', both parents experience significant stress when faced with a premature infant. They require information about their child and the environment in which they are admitted, especially from the healthcare team, particularly nurses [18]. A primary reason for the elevated stress levels among mothers in this study may be the prevalence of the COVID-19 epidemic and its peak during the study period.

Therefore, the mean stress score (test group: 135.9 and control group: 138.1) in our study was higher than other Iranian studies that used this questionnaire (like our study). For example, the mean total stress score in Shoghi et al.'s study (in the intervention group; 120.9 and control; 116.2) [1] and in the study by Barzegar et al. (in the

intervention group; 93.8 and control; 97) [9] and also this mean in the study by Khoramirad et al. (81.6) were lower than in the present study [22]. According to the results of this study, in the control group, the average stress score regarding environmental stress factors in the section significantly increased over time (from the beginning to the end of the study, based on the results in (Table 2). In contrast, other similar studies did not show any change in this aspect, or they even reported a reduction [1, 9, 22]. It can be noted that during the time this study was conducted, the COVID-19 epidemic and peak infections were prevalent in Iran. Therefore, the increase in stress in this context may be attributed to the anxiety and concerns of mothers regarding the possibility of contracting COVID-19 themselves or having their newborns infected, especially due to the prolonged hospital stay. Bajani et al. (2024) conducted a study on mothers of premature infants who were admitted to the NICU during the COVID-19 pandemic. The results indicated significantly elevated stress levels in these mothers [19], aligning with the present study. The COVID-19 pandemic has presented numerous challenges to many healthcare systems, particularly in intensive care units, for both staff and patients, thereby threatening their health and well-being [23]. The results of the study by Aldini Ardakani et al. (2024) conducted a study on the coronavirus epidemic. The results indicated that the virus's prevalence caused significant psychological problems for individuals. Furthermore, the rate of depression was considerably higher in women than in men. This difference is related to psychological, social, and biological factors. Changes in gonadal hormones and pituitary-hypothalamic-ovarian axis pregnancy, childbirth, and breastfeeding in the onset of depression-specific syndromes in women. Therefore, considering the uncertainty regarding the end of the coronavirus epidemic, it is recommended to provide various forms of group education to enhance their quality of life and adapt to the altered and new lifestyle resulting from COVID-19 [24]. In this context, Barzgar et al. (2024) reported in a study titled "Maternal and Neonatal Outcomes Before and During the COVID-19 Pandemic" that the Apgar score of newborns decreased significantly, while neonatal mortality and asphyxia at birth notably increased during this time. Given that neonatal outcomes have worsened during the COVID-19 pandemic compared to pre-pandemic times, providing accurate prenatal care, essential education, and thorough fetal monitoring and care is crucial [9].

Our study results in the post-training phase showed a significant difference in total stress scores and its subscales between the two groups. In other words, it indicates the effective impact of COVID-19 prevention training on mothers. Due to the lack of similar studies, related research was used to develop the discussion in this study. A study by Shomaliahmadabadi et al. (2022) on mothers of premature infants revealed that an educational program significantly reduced maternal stress, which aligns with our findings. The researchers noted that the

lack of competencies and necessary skills to effectively cope with new and challenging situations intensified the mothers' stress. Indeed, part of the stress they experienced stemmed from a lack of correct knowledge and ineffective beliefs, while the other part resulted from not knowing the skills needed to handle stressful situations. Therefore, providing an educational package to mothers helped modify their attitudes towards circumstances, increased their awareness of stressinducing and stress-relieving factors, identified negative thoughts and cognitive distortions, and replaced negative thoughts with logical reasoning [16]. Heydarzadeh et al. (2019) reported in a study on mothers with premature babies that reducing mothers' stress by designing appropriate educational programs to familiarize them with the conditions and environment and involving mothers in caring for the infant not only alleviated parental stress but also reduced the risk of the infant being readmitted to the unit [17]. Begjani et al. (2024) reported in a study during the coronavirus epidemic that mothers of premature infants suffered from high stress. Practicing mindfulness exercises can be effective in reducing stress for mothers, so it was recommended to the managers of health centers to add interventions to the care program and consider classes for teaching and implementing mindfulness exercises to improve the mental state and reduce stress in mothers in intensive care units [19]. The results of other studies on the stress of mothers with premature infants who were hospitalized in the NICU for various reasons, such as the study by Khormirad et al., entitled "Developmental care combined with mindfulness on maternal stress" [22], Barzegar et al., entitled "Mother-infant visual communication as a guide to mother-colleague visual communication on maternal stress" and Shoghi et al. [1] showed that implementing educational programs significantly reduces maternal stress, which is consistent with the our study.

Strengths and Limitations

Given the ongoing coronavirus pandemic and the need for research in this field, conducting this study is a strength. A limitation of the present research was the poor cooperation of some participants due to the coronavirus situation and high stress levels. However, this limitation was overcome by selecting an appropriate time (early morning) for training sessions, providing sufficient information, and answering their questions, thereby obtaining informed consent, after which the participants cooperated as required.

Conclusion

Finally, the findings of our study showed that mothers whose infants are hospitalized in the ICU experience high levels of stress. Also, Corona prevention education significantly reduced mothers' stress. Therefore, implementing an educational program and planning for mothers' participation in caring for their infants is

recommended to improve their psychological state and reduce their stress. It is recommended that more research be conducted on mothers of premature infants in other regions of Iran and other countries. It is also recommended to conduct similar research on other stressors in parents (mothers and fathers).

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