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# THE EFFECT OF MUSIC THERAPY ON BREAST MILK SECRETION IN MOTHERS WITH PREMATURE INFANTS

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**ABSTRACT**

Introduction: Mother breast milk is the best food for newborns, especially premature infants. Breast milk in mothers of premature infants has a higher amount of nutrients and energy than the breast milk in mothers of a full-term infant. Promoting breastfeeding is a simple and useful strategy to reduce infant mortality around the world. One of the common problems of mothers, especially mothers of premature infants, is the stress caused by milk deficiency. Many methods have been used to increase the breast milk of mothers. Since the non-pharmacological methods used to increase mother's milk are more simple and accessible, the aim of the present study was to investigate the effect of music therapy on the secretion of breast milk in premature infants. Materials and methods: This clinical trial study was conducted in two stages of 4 days on 35 mothers of newborns between 28 and 34 weeks after birth who were admitted to the intensive care unit. In the first stage, mothers for 4 consecutive days expressed the breast milk using breast milk pump every day while listening to instrumental music (15 minutes before milk expression and 15 minutes along with milk expression) and its quantity was measured in milliliters in two shifts in the morning and in the afternoon. After completion of the first stage, the same mothers in the second stage expressed their milk in 4 other consecutive days for 15 minutes in the morning and in the afternoon without listening to music and just by considering standard nursing care (quiet environment, appropriate room temperature, and comfortable chair). As in the first stage, the milk was measured in milliliters. Findings:The study data are analyzed using SPSS software (version 24). The result of the study shows that the average amount of secreted milk in the stage of music therapy is significantly higher than the non-music therapy stage. There is a statistically significant difference between these two stages ($p = 0.005$). Conclusion: Music therapy is an easy and accessible non-pharmacological approach that can increase the milk secretion of mothers of premature infants. This method can be used in the restroom of mothers who have a newborn infant in the intensive care unit.



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## Introduction

With the advancement of perinatology in the last decades, the possibility of the survival of high-risk infants including premature infants has increased (1). The premature birth rate is steadily increasing. Despite all efforts done to prevent early

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births and the birth of premature and low-weight babies, the birth rate of such infants is still high (2). The International Center for Health Statistics reports that the worldwide average birth rate of premature infants is 9.57 %( 3). In Iran, the birth rate of premature infants has been reported as 12.9% (4). These neonates need to be admitted to the neonatal intensive care units (NICU) in order to survive and continue the development of the central nervous system and other systems of the body. These infants encounter many issues during their hospitalization in the neonatal intensive care unit which triggers a series of provocations contrary to the requirements for their neuro-emotional development (5). Therefore, to deal with this vulnerable group, it is required that these infants be protected as far as possible from the harmful effects of the ectopic environment through developmental cares. The goal of developmental care is to provide an organized care environment that supports the developmental structure of the early infant or neonate in a critical condition. This care includes grouped interventions that consist of one or more components. Among these interventions, we can mention the control of external stimuli (vision, tactile, hearing, etc.), classification and stepping up the nursing care, positioning, and nutrition in premature infants (6). As mentioned, one of the key criteria in the developmental care of premature infants is the relationship that occurs between mother and baby during breastfeeding. This is one of the important factors in the attachment of mother and baby to each other. On the other hand, the importance of good nutrition is well- recognized for the growth and development of babies and it has been accepted as an important public health issue over the past decades. According to American Academy of Pediatrics, the mother breast milk is considered to be the best food for all babies, especially infants. The results of the study indicate that breast milk is effective in the infant health, safety, physical and mental development and it has many social and economic benefits. Mother breast milk is considered as a liquid life for the baby because it contains antibacterial, antiviral, antiseptic, anti-parasitic, as well as hormones, enzymes and specific growth factors in addition to food. Moreover, it can reduce the incidence of necrotizing enterocolitis (NEC). In these babies, mortality is high and breast milk can reduce their mortality. According to the World Health Organization, with the increasing proportion of lactation in the world, it will be possible to prevent deaths of more than 10% of children under 5 years of age (7).Several studies have shown that mothers of premature infants were not successful in breastfeeding because the birth of premature babies affects not only the health of the baby but also the well-being and health of family members, especially the mother (8). Mothers of premature infants experience more stress due to separation from their infant (9). In addition to reducing milk, stress also changes milk quality which can reduce the tendency of the baby to suck breast (10). Therefore, the protection of mothers who experience difficult and abnormal conditions is a fundamental and considerable issue. As such, there are methods to reduce stress in mothers such as being in a comfortable environment, watching a favorite film by mother, relaxing (meditation), smooth movements, and listening to mild music (11). As mentioned, one of the non-pharmacological methods in reducing stress is listening to music that is recognized as one of the effective strategies for coping with stress. According to the definition of the American Music Therapy Association, music therapy is the use of music to provide, maintain and improve physical and mental health (12). Gevasco's study (2005) showed the effectiveness of musical therapy program on anxiety, depression, and anger (13). According to Jayamala et al. (2015), music therapy has been shown to reduce stress, cortisol secretion in saliva and increase milk secretion in mothers of premature infants (15). In another study by Keith et al. (2012), aiming at evaluation of listening to music and its effect on the secretion of milk, fat, and calories, it was concluded that music therapy is a suitable method for increasing the quality and quantity of milk (15). Considering the importance of breastfeeding in the overall development of premature infants and the positive effect of successful breastfeeding in mothers of these infants, the use of non-pharmacological and uncomplicated methods such as music can be an effective way to promote lactation and development of premature infants. Therefore, the present study aimed to investigate the effect of music therapy on the secretion of breast milk in premature infants by determining the effect of music therapy on the mean of breast milk secretion in the two stages with and without music.

**Method**

The present study is a semi-experimental clinical trial conducted with the aim of investigating the effect of music therapy on breast milk secretion in premature infants. 35 mothers, with a delivery on the 28th and the 34th gestational age whose infant admitted to the neonatal intensive care unit of Hazrat-e-Zeynab Hospital in Shiraz, Iran, participated in the study from January 2016 to May 2017. Hazrat-e-Zeynab Hospital was selected due to its easier access to samples. The sample size was determined based on the formula for estimating an average value with 5% error ($\alpha = 0.05$), the absolute error of 0.5 ($d = 0.5$) and the test power of 90 %.

$$\mathbf{n} = \frac{(\mathbf{Z}_{\mathbf{1}-\frac{\boldsymbol{\alpha}}{\mathbf{2}}} \times \boldsymbol{\sigma})^{\mathbf{2}}}{\mathbf{d}^{\mathbf{2}}}$$

The study inclusion criteria included the mothers' consent to participate in the study, mothers of infants aged 28 to 34 weeks, non-use of milk reducing or raising agents, absence of severe hearing impairment in mothers, mother's lack of substance abuse, no previous breast surgery, no nutrition of the baby through the mother's breast and no mental and psychological problems of the mother. The exclusion criteria of the study included mothers' reluctance to continue their collaboration in the study, discharge of the infant during the study, infant death during the study, problems with the mother's breast during the study, the use of a reducing or enhancer drug during the study, and severe maternal hearing problems during the study. Mothers' hearing condition was determined by the researcher through the interview before entering the study. The breast status of the mother

was investigated by the researcher in terms of the possibility of secretion of milk and absence of a problem in the breast. Samples were entered into the study after receiving the consent form. The demographic information form was obtained through interviews with mothers. Before the performance of the study, the mothers were trained by the researcher how to use an electric breast milk pump (Medela Freestyle brand). In order to unify the conditions of the study, all the mothers in the study used a shared breast milk pump. Measurements of breast milk quantity began on the third day after delivery. This study was performed in two stages of 4 days in two shifts in the morning and afternoon. In the first stage, mothers received standard nursing care (calm and appropriate room temperature, comfortable chair) with music in 4 consecutive days in two shifts in the morning (11-12 AM.) and afternoon (4 -5 PM. ) while expressing the breast milk with an electric breast milk pump. They listened to instrumental music (7 pieces of sitar by Zolfonun called Hazin, Jameh Daran, Ghate Zarbi, Bayat, Oshagh, Razavi, Isfahan) every 30 minutes through headphones (Sony brand) connected to audio output device(For 15 minutes before breast milk expression and 15 minutes at the same time with milk expression). Meanwhile, the volume of the music was adjusted by the mother. The milk was collected in each shift, measured with a plastic container based on milliliter and recorded in the related form. Immediately after the first stage, we entered the second stage so that the same mothers expressed their breast milk by an electric breast milk pump for four consecutive days in two shifts in the morning (11-12 AM.) and in the afternoon (4 -5 PM.) taking into account standard nursing care (quiet environment and appropriate room temperature, comfortable chairs) without music for 15 minutes. The milk was collected in each shift, measured with a plastic container based on milliliter and recorded in the related form.

**Results**

Followed by data collection, data analysis conducted using a paired t-test and Spss software (version 24. In this study, 35 mothers were investigated. The age of mothers was under 25 years old (42.9%), between 26-30 years old (37.1%) and above 30 years old (20%). The percentage of mothers with normal delivery was 43 and percentage of mothers with cesarean section delivery was 57.1. The results of the study showed that there is a significant difference in the level of milk secretion between the two stages of music therapy and non-music therapy. The mean value of milk secretion in the stage of music reception (452.09) with a standard deviation of 37.06 and in the non-music stage (417.44) with a standard deviation of 20.54 showed a statistically significant difference between the two stages ($p = 0.005$)(table1). On the other hand, the mean amount of milk secretion in the first day of the musical therapy stage was 53.78 with a standard deviation of 5.56 and the mean of the secretion of milk in the first day without music therapy was 55.98 with a standard deviation of 6.65. There was no significant difference between two stages on the first day ($p = 0.066$). However, the mean value of milk secretion in the 4th day, as the last day of the study, in the music therapy stage (69.19) was with a standard deviation of 5.7 and in the non-music therapy (56.01) was with a standard deviation of 5.68. This indicated that the mean value of milk secretion changes according to the paired t-test was significantly higher on the final day of the study and at the stage of music reception ($p = 0.001$) (Table 2, Fig 1). The results of this study showed that there was no significant difference between the mean value of breast milk production in the music therapy and non-music therapy stages in the first two days (Table 2). However, in the last two days of the study, on the third and fourth day, the rate of milk secretion in the stage of music therapy was significantly higher than that of non-music therapy stage (Table 2). As shown in Fig. 1, this difference is evident in changes in milk secretion on the third and fourth day and it led to increased milk secretion in the music therapy method (Fig 1).

**Table 1.** Comparison of the average milk secretion of mothers in two stages with music and without music

| Variable | Group | Mean | SD | Mean Difference | Confidence interval | | P-value* | Significant level |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower limit | Higher limit | | |
| **Total amount of milk (Milliliter)** | With music therapy | 452.09 | 37.06 | 34.65 | 45.56 | 103.49 | 1.408 | 0.005 |
| | Without music therapy | 417.44 | 20.54 | | | | | |

SD: Standard Deviation; * paired t-test

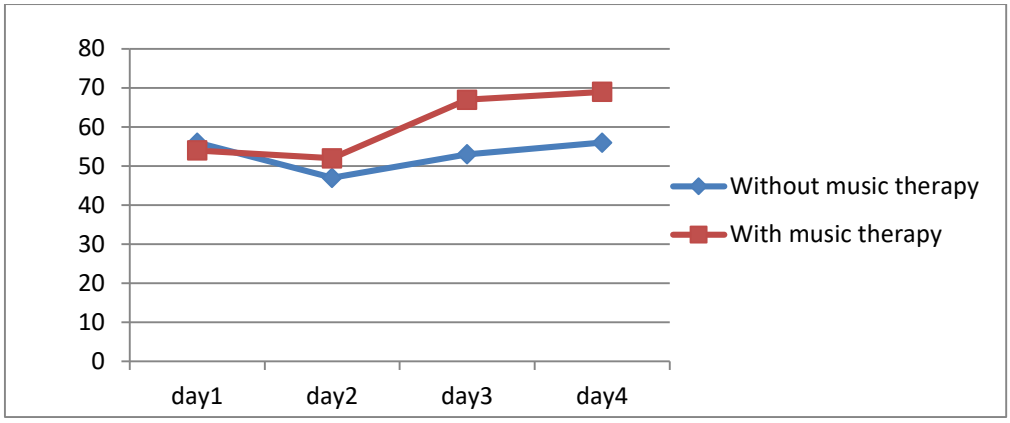


**Figure 1.** Comparison of the mean value of changes in the secretion of mother's breast milk in two stages with music therapy and without music therapy

**Table 2.** Comparison of the mean value of changes in the secretion of mother's breast milk in two stages with music therapy and without music therapy

| Study days | Without music therapy(ml) | SD | With music therapy(ml) | SD | P-value* |
|---|---|---|---|---|---|
| **First day** | 53.78 | 5.56 | 55.98 | 6.65 | 0.066 |
| **Second day** | 51.97 | 3.47 | 46.57 | 5.79 | 0.078 |
| **Third day** | 66.83 | 5.49 | 52.47 | 7.58 | 0.001 |
| **Fourth day** | 69.19 | 5.07 | 56.01 | 5.68 | 0.001 |

SD: Standard Deviation; * paired t-test

**Discussion**

This study investigated the effect of music therapy on breast milk secretion of the mothers of premature infants. The results of this study showed that, in general, music therapy can increase the secretion of milk though this method did not have much effect on the secretion of breast milk in premature infants in the first few days. According to the above table, no significant difference was observed between the mean value of milk secretion in two stages with and without music therapy in the first two days of the study ($p > 0.05$). Therefore, on the first day, the level of milk secretion in the non-music therapy stage was slightly higher than that of music therapy stage which was not statistically significant ($p = 0.066$). However, on the second day, the rate of milk secretion increased in the stage of music therapy and was more than that of non-music therapy but its increase was not statistically significant ($p = 0.078$). With the continuation of this method after sometimes, from the third day, the level of milk secretion at the musical stage significantly increased and the mean value of milk secretion in the last two days at music therapy stage significantly increased ($p = 0.001$), as well. This means that the use of music therapy can be effective in increasing the secretion of milk over time with an effect on physiological factors. There are also many studies that show the physiological impact of music on the listener. In a study by Miller (2010), it was found that continuous listening to music improves endothelial function and dilates blood vessels (16). In another study by Nilsson (2009), it was concluded that music therapy can increase the oxytocin secretion in the body (17). The pituitary gland also secretes substances under the influence of music therapy. This gland receives a command from the thalamus gland and responds to the acoustic stimuli causing secretion and release of a sedative substance of endorphins. Over time, with the prolonged stimulation of the thalamic gland, the amount of endorphins in the blood increases which leads to pain relief and reduced stress (18). There are also some viewpoints based on psychological and neurological reasons for justifying the effect of the music on reducing pain and stress. According to some neuroscientists, music affects the secretion of dopamine and morphine substances in the brain and as a result, with increasing of these substances, pain and stress decrease over time. This effect is explained by reducing the stimuli of stress hormones and reducing the effects of sympathetic nerves actions. From the psychological point of view, the effect of relaxing music is justified through positive conditioning. This conditional condition requires a little time. Music controls the mind over time, distorts pain and replaces pain and stress with pleasure and joy (19). On the other hand, music promptly stimulates the brain's emotional system (the limbic system). Research suggests relaxation with music lowers blood pressure, heart rate and the amount of inhalation and exhalation. It reduces oxygen levels, lowers blood acid levels and reduces brain waves from stress and pressure at beta levels to waves to the lower waves at alpha level. The combination of these changes by music, which leads to a kind of weakness and leaky state in the physiological system will reduce stress and inner pressure (20). Therefore, given the importance of mothers' support in lactation and the benefits of using breast milk for infants and especially

premature infants, many studies have been conducted to determine the relationship between the supports of mothers of these infants and promotion of breastfeeding by non-pharmacological methods. In a study by Keith et al. (2012) on 162 mothers for 14 days, the mothers were divided into 4 groups; in one group, no method was used; in the other three groups, non-pharmacological methods such as declamation, music therapy and display of newborns' photos were used. They concluded that the level of milk secretion in the three experimental groups was significantly ($p < 0.012$) greater than the control group (15). Another study by Feher et al. (2010) was conducted on 124 mothers in the United States. They examined the effect of the relaxation method on the increased milk secretion of mothers. The results of the study showed that in the experimental group which used relaxation method, the level of milk secretion significantly increased compared to the control group (21). Jayamal et al. (2015) conducted a study on 30 mothers to investigate the effect of music therapy on the secretion of milk in mothers of premature infants. They concluded that music therapy significantly increased ($p = 0.033$) the rate of milk secretion in these mothers (14). Another study was conducted by Vianna et al. (2011) in Brazil on 94 mothers of premature infants with a weight of less than 1750 grams. They examined the effect of music therapy on the rate of breastfeeding of mothers and concluded that music therapy significantly increased the lactation of mothers of premature infants ($p = 0.03$) and also reduced the duration of admission of premature infants (22). In a study conducted by Arzani (2008) on 55 mothers of premature and underweight infants admitted to the intensive care unit, it was concluded that the support for mothers, counseling, and training based on their needs could significantly ($p = 0.031$) lead to the continuation of exclusive breastfeeding in the low-weight and premature infants (23). Martha et al. (2011) conducted a randomized controlled trial study to investigate the effects of music therapy on the nutritional process of premature infants fed with breast milk. The results showed that music therapy led to a significant increase in the milk of mothers of premature infants (24).

**Conclusion**

The results of this study showed that music therapy can have a positive effect on the milk secretion of mothers of premature infants admitted to the intensive care unit. Since this method can be effective as a simple, non-invasive and applicable non-pharmacological method with an approach to protect mothers of premature infants in lactation promotion, it is hoped that the results of this study will determine the scope of nursing activity in relation to support for mothers who have infants admitted to intensive care units and extend the quality of nursing care. Also, the results of this study can pave the way for further studies in this field and encourage the researchers to conduct studies on other aspects of this subject and similar issues.

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