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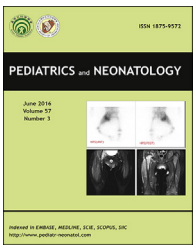

ORIGINAL ARTICLE

Effects of Breast Milk and Vanilla Odors on Premature Neonate's Heart Rate and Blood Oxygen Saturation During and After Venipuncture

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Key Words
blood oxygen saturation;
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heart rate;
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Background: Different studies have shown that the use of olfactory stimuli during painful medical procedures reduces infants' response to pain. The main purpose of the current study was to investigate the effect of breast milk odor and vanilla odor on premature infants' vital signs including heart rate and blood oxygen saturation during and after venipuncture.
Methods: A total of 135 preterm infants were randomly selected and divided into three groups of control, vanilla odor, and breast milk odor. Infants in the breast milk group and the vanilla group were exposed to breast milk odor and vanilla odor from 5 minutes prior to sampling until 30 seconds after sampling.
Results: The results showed that breast milk odor has a significant effect on the changes of neonatal heart rate and blood oxygen saturation during and after venipuncture and decreased the variability of premature infants' heart rate and blood oxygen saturation. Vanilla odor has no significant effect on premature infants' heart rate and blood oxygen saturation.

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Conclusion: Breast milk odor can decrease the variability of premature infants' heart rate and blood oxygen saturation during and after venipuncture.

1. Introduction

The previous general belief was that premature infants cannot feel and sense pain; but nowadays, there is proof that premature infants can feel pain during surgical procedures. Recent studies show that infants can feel pain after the 26th week of gestational age.[1–4] Premature infants are frequently exposed to painful procedures during the first days of their life in neonatal intensive care units (NICU); hence, proposing methods that calm newborn infants is necessary.[5,6]

There are some studies that focused on the methods of calming newborn infants during painful procedures. The calming methods for infants can be divided into two main groups: pharmaceutical and nonpharmaceutical methods.[7] Because of the absence of biological harm, nonpharmaceutical methods are frequently discussed by researchers. Different methods based on infants' sense of taste,[8–10] sense of smell,[11] sense of hearing,[12] sense of touch,[13,14] and sense of sight have been frequently used in the literature. Previously published studies showed that the sense of smell is more mature than the other senses at birth. Newborn infants can detect the odor of their mother's nipples and get breast milk within the first days of their life.[15] The effects of breast milk odor[11,15] and vanilla odor[3,16,17] on infants' calming were discussed previously. The cited studies used different situations such as the infants' gestational age, sampling methods, and pain measurement scales. Some studies have discussed the calming effects of different odors on term infants during painful procedures; however, there are no studies about preterm infants. Some researchers believe that premature infants cannot recognize maternal breast milk odor because they are not fed by their mother's milk, but nowadays mother's milk is used for premature infants' feeding in NICU in many countries.

One of the main studies on the calming effects of different odors on preterm infants was conducted by Goubet et al,[3] who studied the effects of familiar and nonfamiliar vanilla odor on response to pain in preterm infants during venipuncture and heel stick. The sample size used in their study was small, and each group consisted of eight or nine individuals. Crying time and grimacing quality were used for investigation of odor calming effects. Results showed that infants who were exposed to a familiar vanilla odor had no significant increase in crying and grimacing during venipuncture. Infants in nonfamiliar odor group and control group showed a significant increase in crying time during venipuncture. Badiee et al[11,18] focused on the effect of breast milk odor and formula milk odor on preterm infants' responses to pain during and after heel lancing. They used premature infant pain profile (PIPP) scale for pain score measurement. Results showed that after the heel lancing, the PIPP score was significantly lower in the breast milk group than in the formula milk group. PIPP is a scale for pain score measurement including seven indicators. Three indicators are for facial actions, two are for heart rate and blood oxygen saturation, one is for gestational age, and one is for behavioral states. There are other pain assessment tools for premature infants[19–21] that use different indicators for pain measurement. Even though using different parameters can lead to an accurate evaluation of the pain that infants suffer during painful procedures, it also leads to limited information about variation in vital signs. However, it should be noted that rapid variations in infants' vital signs may cause lower brain development.[22] Therefore, studying the effects of pain on infants' vital signs is necessary.

The main purpose of this study is to report the effectiveness of breast milk odor and familiar vanilla odor on premature infants' vital signs during and after venipuncture. Specifically, we focused on the infants' heart rate and blood oxygen saturation. It is hypothesized that smelling breast milk odor during and after sampling decreases variations in infants' heart rate and blood oxygen saturation. A similar hypothesis is considered for the effect of familiar vanilla odor.

2. Methods

The current study was conducted at the NICU of Al-Zahra Hospital, which is affiliated to Tabriz University of Medical Sciences, Tabriz, Iran. This study was approved by the Ethics Committee of Tabriz University of Medical Sciences, and parents' consent was obtained. Sample size was determined using the Pocock sample size formula. The level of statistical significance was set at 0.05. Blood oxygen saturation is considered as the main outcome of the study, and the difference between the estimated proportion of study outcome in the exposed and unexposed group is considered 1. As a result of the calculations, a sample size of 135 infants was required. The sample population was divided into three groups with 45 infants each. Infants who participated in the current study were premature infants with a gestational age of 28–34 weeks and postnatal age of 3–28 days. They were breast-fed and had no congenital or systemic abnormalities. They had a previous venipuncture experience and had physiological stability. Their Apgar scores were higher than 7 at 5 minutes after birth. Lack of intraventricular hemorrhage, lack of periventricular leukomalacia, no need for surgery, and not receiving analgesic were the other requirements. Infants who were eligible for inclusion in the study were randomly assigned into three groups using the Rand List software. Each group had 45 members, and the infants were not fed 30 minutes prior to venipuncture; their weights were measured prior to sampling. Infants in the breast milk group and the vanilla group were exposed to breast milk odor and familiar vanilla odor,