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The Effect of Oral Motor Intervention on Oral Feeding Readiness and Feeding Progression in Preterm Infants

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ABSTRACT

Background: Advances in neonatal intensive care have markedly improved survival in preterm infants. These babies need hospitalization due to the immaturity of the respiratory and digestive systems. The timing for the initiation of proper feeding in premature infants admitted to neonatal intensive care units (NICUs) is an important challenge for physicians, parents, and nurses. Therefore, this study aimed to investigate the effect of oral motor intervention (OMI) on the early onset of oral feeding in preterm infants.

Methods: This clinical trial was carried out on 40 premature infants who were admitted to the NICU of Ali-ibn Abi Talib Hospital, Zahedan, Iran, in 2012 with the gestational age of 28-32 weeks. The subjects were randomly allocated to two equal groups of intervention and control. In the intervention group, 5-minute oral stimulations were performed based on premature infant OMI (PIOMI) by the researcher on a daily basis 15 minutes before gavage for seven days. On the other hand, the control group received routine care. Then, the groups were compared using the premature oral feeding readiness assessment scale in terms of timing, initiation of oral feeding, and hospitalization duration.

Results: The intervention group achieved independent feeding significantly earlier than the control group (P=0.034). In addition, the duration of hospitalization was shorter in the intervention group, compared to that of the control group (P=0.027).

Conclusion: The utilization of PIOMI method to stimulate oral movements is beneficial in the early onset of oral feeding and reduces the duration of hospitalization. Therefore, this method can be effective in treating premature infants and reducing treatment costs.

Keywords: Feeding behavior, Non-nutritive sucking, Oral feeding, Oral massage, Oral stimulation, Preterm infant

Introduction

The leading causes of neonatal mortality are low birth weight due to prematurity, intrauterine growth retardation, or multiple gestations (1). The global preterm birth rate continues to rise, and a reduction in their mortality is an indication of the improvements in health care services (2). During the past 10 years, the survival rate of newborns with very low birth weight hrough pre- and postnatal care has increased exponentially, and one of the final requirements in their care prior to discharge is successful initiation of oral feeding (3).

Since the digestive, respiratory, and central nervous systems of preterm infants are under-developed, they need to be admitted to the neonatal intensive care unit (NICU) for a few days to several months to learn how to coordinate sucking, swallowing, and breathing to attain safe and effective oral feedings (4). Feeding behaviors are developed before birth. At week 11, the fetus starts jaw movements followed by swallowing and sucking at week 13. The breathing, sucking, and swallowing patterns become more complete with an increase in fetal age until week 34. Therefore, infants with higher gestational age will have better sucking skills. The feeding problems of infants born before 37 weeks of gestation include hypotonia, weakness, and lack of coordination in movements, poor consciousness, irritability,

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unorganized motor behaviors, and physiological instability.

The primary barrier to oral feeding in infants with gestational age less than 34 weeks is the lack of coordination in sucking, swallowing, and breathing. Oral feeding in these infants can cause apnea, decreased pulse oximetry, transient bradycardia, and aspiration. Therefore, in neonates who do not reach the gestational age of 34 weeks, bottle or breastfeeding are not considered, and developmental transition from gavage to oral feeding in a 28-week-old infant may take 6 weeks or longer. Several studies have shown that oral motor intervention on infants less than 34 weeks results in decreased transition time from gavage to oral feeding (5).

The safest feeding protocols for NICU-admitted infants has been a controversial issue for physicians, parents, and nurses (3, 5). In 2008, the American Academy of Pediatrics stated that newborns could be discharged when they achieved effective oral feeding; however, the path from gavage to total oral feeding can be difficult for preterm infants.

Long-term gavage feedings can cause lack of tendency to breastfeeding (6). Infants who experience these problems often require long-term hospitalization, which can, in fact, lead to stress in the families, especially mothers, and increase financial burden (7). The promotion of breastfeeding with premature infants is also a challenge for neonatal nurses who are trying to prepare the newborns for hospital discharge (8). Since oral nutrition problems cause long-term hospitalization and high costs, some interventions are required to facilitate the development of oral motor skills, improve oral feeding in infants aged 34 weeks and lower, and reduce the costs and length of hospitalization (8).

In 2006, Rocha performed a study on the effects of oral and non-nutritive stimulation on the early onset of oral nutrition in 98 premature neonates born with a gestational age of 26-32 weeks. As a result of that intervention, the subjects obtained independent oral feeding, and they were discharged from the hospital earlier than the controls. Lessen (2011) employed an early oral stimulation program around and inside the oral cavity of premature infants born between 29 and 30 weeks' gestational age. Accordingly, premature infants achieved early independent oral feeding and were discharged from the hospital earlier. A three-day reduction in hospital stay saves about 2 billion dollars annually (8, 9).

In studies conducted in Iran, 10-minute interventions were performed on a daily basis for 10 day. However, in this study, 5-minute interventions were implemented per day for only 7 days. Before oral feeding initiation, the newborns were evaluated using premature oral feeding readiness assessment scale (POFRAS). According to the scores obtained from this scale, the scores ≥ 30 indicate readiness for oral feeding. This study aimed to evaluate the effect of oral motor intervention on the early onset of oral feeding in preterm newborns.

Methods

This clinical trial was conducted after obtaining permission from parents of neonates. The infants were randomly assigned to intervention and control groups using a random number table. This study included 40 premature infants with the gestational age of 28-32 weeks who were born at Ali-ibn Abi Talib Hospital, Zahedan, Iran, in 2012 and then admitted to the NICU. The sampling was performed over a period of 4 months in 2012. All infants were randomly assigned to the intervention or control groups in blocks of 2 to ensure randomization.

In case of sample attrition, the infants were replaced by assigning the next enrolled subject to that group to maintain the equal numbers. A card on each infant's bed identified him or her as being a subject in the study; however, group assignments were blinded to the nursing, medical staff, and parents by pulling a curtain around the infant's bed for both the control and intervention groups. Infants with 28 to 32 weeks' gestation based on the first-trimester ultrasound findings were fed with at least 10CC/KG food by gavage. The inclusion criterion was lack of any disorders, such as cleft palate, cleft lip, and congenital disorder according to the records.

On the other hand, the newborns with a gestational age of 28-32 weeks who suffered from sepsis, heart disease, necrotizing enterocolitis, severe asphyxia, and grade 3 and 4 intraventricular hemorrhage diagnosed by ultrasound findings, which was routinely performed in the first week, were excluded from the study (8,9,11-13).

Infants were attached to the pulmonary-cardiac monitoring and pulse oximetry before, during, and after the intervention; in addition, their status was monitored for any signs of intolerance. Head and neck were placed in a given line and direction. Moreover, the duration of infants' stay in the hospital from the time of admission until the day of discharge was calculated in this study.

Premature Oral Feeding Readiness Assessment Scale

Total scores on the POFRAS range from zero to 38, and the scores <28, between 28 and 30, and >30 suggest non-nutritive sucking on a gloved finger, strong sucking, and readiness for oral feeding, respectively.

In order to determine the reliability of this scale, the researcher first received training via the Internet from Cristina Fujinaga, who is the designer of premature oral feeding readiness assessment tool. The researcher used the tool several times under the supervision of one of the neonatology professors in the form of a pilot study.

Furthermore, the researcher along with another person who had received the necessary training by the researcher, observed and assessed oral feeding readiness in 10 preterm infants in order to establish the reliability of this tool. The inter-rater correlation coefficient was obtained at 78% (P=0.008) using the Pearson correlation (10).

The simultaneous rating method was performed by the researcher and a co-researcher on 10 nominated infants to assess the reliability of the feeding readiness assessment tool used in Iran. The standard care included developmentally supportive interventions, swaddling, reducing the light of the room, nest, kangaroo care, and mother's presence in the NICU which were similar in both groups. However, the control group did not receive any intervention in this study.

The intervention was performed using the premature infant oral motor intervention (PIOMI) based on the following order: 1) stimulation of the cheeks (twice for 30 seconds), 2) Stimulation of the lips (once every 30 seconds), 3) Pursing the lips (once for 30 seconds), 4) Gums stimulation, (twice for 30 seconds), 5) Stimulating the lateral sides of the tongue and cheek, (twice for 15 seconds), 6) stimulation of medial septum of tongue and palate (twice for 30 seconds), and 7) Non-nutritive sucking with a pacifier (two minutes) (8).

The POFRAS was completed seven days after the intervention. This instrument is a 6-item scale to indirectly measure feeding readiness by exploring factors associated with modified gestational age, assessment of neonatal behaviors with respect to wakefulness and body status, tonicity, evaluation of lips and mouth status, oral reflexes, non-nutritive sucking, and signs of neonatal stress (9, 10).

The oral feeding protocol was performed when a neonate gained a score of 30 and above out of 38 and tolerated the volume of gavage feeding as follows: The gavage feeding volume was administered using a 5-cc syringe. On the following days, the frequency of oral feeding was increased once a day until the infant could get full oral feeding. Subsequently, the length of the neonate stay in hospital was calculated in this study.

Data were analyzed in SPP software (version 19) through descriptive and inferential statistics. Independent t-test was used to compare the two groups in terms of the time of beginning oral feeding and the length of hospital stay. A significant difference was observed between the two groups regarding the length of hospital stay (P=0.027). In other words, the intervention group obtained reduced length of stay in hospital.

Results

The intervention and control groups were not significantly different with respect to demographic information, including birth weight ag and gender (Table 1). In addition, there was no significant difference between the two groups in terms of birth weight (P=0.39). Considering the normal distribution of variables, independent t-test was used to compare the two groups in terms of the time of beginning oral feeding (P=0.034, Figure 1).

The mean time of oral feeding initiation in the intervention group was 9.55±1.70 days, whereas it was 11.5±2.77 days in the control group, showing that oral feeding started earlier in the intervention group (Figure 2). Furthermore, the independent t-test was used to compare the length of hospital stay between the groups, which reflected a significant difference (P=0.027). The mean length of hospital stay in the intervention and control groups were 16.5±3.91 and 19.4± 4.08

Table1. Demographic characteristics of participants

Gender	Group			
	Intervention		Control	
	Number	Frequency (%)	Number	Frequency (%)
male	8	40	11	55
female	12	60	9	45
Total	20	100	20	100
Df	1			
χ^2	0.9			
P-value	0.34			

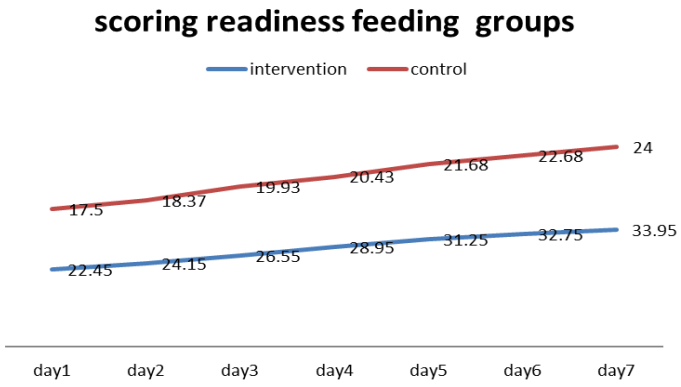

Figure 1. The scores of premature oral feeding readiness assessment scale in the intervention and control groups

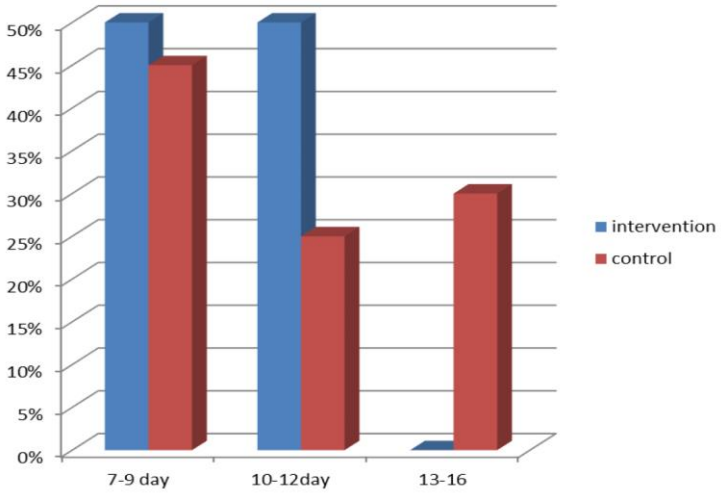

Figure 2. Oral feeding onset in the intervention and control groups

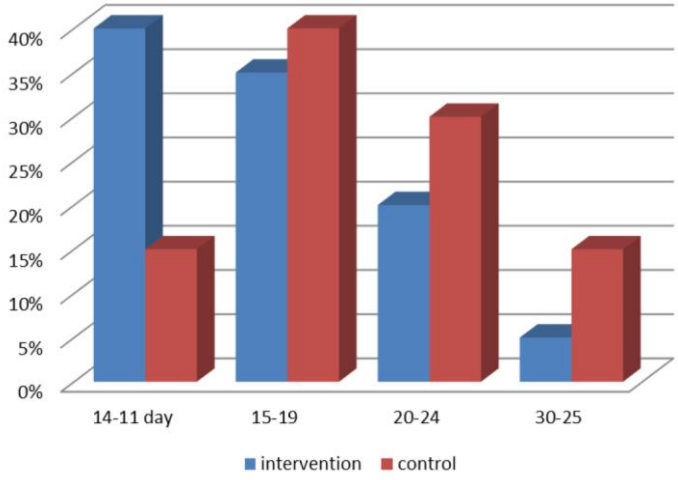

Figure 3. Hospitalization duration in the intervention and control groups

days, respectively, revealing that the length of stay was significantly shorter in the intervention group (Figure 3).

Discussion

The results of this study showed that oral motor therapy applied as a pre-feeding therapy

had positive effects on the readiness of oral feeding in preterm infants, as well as the progression to full oral feeding. These results revealed a shorter length of stay and were consistent with those of other similar studies using oral motor intervention. A study conducted by Rocha et al. (2006) showed that the time of oral feeding onset and discharge in the intervention group were 8.2 and 10.4 days earlier than those in the control group. However, the gestational age did not significantly impact the time of starting sucking in each group, but the weight was higher in the control group.

In the aforementioned study, the sensory-motor stimulation of the oral cavity and non-nutritive sucking in preterm infants resulted in an earlier independent oral feeding and shorter length of hospital stay. The results of that study are consistent with findings obtained from the present study. In a study conducted by Rocha, the duration of intervention was 15 minutes for 10 days, and the weight of the newborns was not homogeneous in the two groups(14). On the other hand, in this study, the duration of the intervention was only 7 days with a similar positive effect, and the neonates' weight was homogeneous in the two groups.

Unnecessary days of prolonged hospitalization is a risk factor for vulnerable newborns since it increases the possibility of infection and other complications in addition to imposing higher costs on the patient and the health care system. Therefore, the promotion of effective strategies for reducing the length of hospital stay can help reduce both risks and costs. Due to swallowing problems resulting from a lack of development of digestive and respiratory systems, preterm infants need assistance to develop and function properly. One of the best strategies in this regard is the use of oral stimulation. In the present study, the PIOMI method was used for oral stimulation, the results of which showed that in these infants, oral feeding started earlier which led to the reduction of the hospital stay duration.

The findings of the present study are consistent with results of studies performed by Lessen in 2011 using PIOMI and Rocha in 2006 on preterm infants. The present study is similar to a study performed by Lessen in 2011 with regards to the onset and duration of intervention. However, the studies by Fucile in 2002 and Rocha in 2007 were different from our study in terms of the aforementioned variable. They performed the intervention at a later postmenstrual age (PMA) and for a longer duration (i.e., 15 minutes) and longer frequency (i.e., 15 days).

Although there was a difference between the present study and the other two studies in terms of the intervention onset and duration, the results regarding the onset of oral feeding were similar probably due to the similarity of treatment methods. In the present study, the intervention onset and duration were less than those in the aforementioned studies. Therefore, the interventions of less than 15 minutes and less than 10 days can also be effective in the onset of oral feeding in preterm infants.

In 1996, Gaebler and Redditi examined the effect of oral stimulation on the nutritional behaviors of NPO infants (15) with a gestational age of 30 to 34 weeks. The parents in the experimental group received oral stroking protocol training, and they were asked to perform the protocol for two minutes 2-3 times a day during a week. Subsequently, the feeding behaviors of the infants were assessed using Neonatal Orol-Motor Assessment Scale (NOMAS). The preterm infants were discharged 24 hours after oral feeding.

The results showed that the experimental group tolerated greater volumes of milk (fed through bottle) and had higher NOMAS scores than the controls. The researchers concluded that oral stimulation increased oral feeding skills. In that study with a small sample size of 18 infants, the parents and nurses were aware of neonates in the two groups and were not fully blinded. Furthermore, although the intervention method should be the same in terms of time and frequency in all subjects, the oral stimulation program varied from 1 to 3 times a day.

On the other hand, in this study, nurses and parents were blinded and the sample size was 40, and oral stimulations were performed for one week. The onset of oral feeding was initially evaluated by a researcher, and then feeding was performed. Nonetheless, in the study conducted by Gaebler and Redditi, mothers or nurses fed the infants without researcher supervision, whereas in our study the neonates were first evaluated, and then oral feeding was performed by the researcher (15).

Conclusion

Based on the obtained results, the PIOMI improved oral feeding skills, enhanced feeding readiness, and increased effectiveness of oral feedings. Subsequently, the improvements in oral feedings led to a reduced hospital stay. When a

healthy neonate can feed through the mouth, that is, s/he can meet his/her needs through the mouth, s/he will tolerate oral feeding and will be discharged from hospital earlier. Therefore, these interventions could be performed for all stable preterm infants admitted to NICUs to enhance feeding skills. This finding can be a turning point in improving the feeding status of infants, thereby preventing the complications of growth and development of preterm infants in NICUs' tense environment.

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Conflicts of interests

There is no conflict of interest regarding the publication of the study.

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