

Effect of non-nutritional sucking on the growth of premature infants admitted to Shariati and Children Hospitals in Bandar Abbas

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Original Article

Abstract

Introduction: Premature infants are born prior to the development of cardiovascular, respiratory, muscular, and central nervous systems. A significant number of these infants experience oral feeding problems. In this study, we investigated the effects of empty breast and pacifier sucking on the growth of preterm infants in Children and Shariati Hospitals of Bandar Abbas.

Methods: In this clinical trial, a total of 69 children were selected through the convenience sampling method and randomly divided into three groups. The first and second groups received oral stimulation with mothers' breast and pacifier, respectively, twice a day (morning and evening) each lasting 15 minutes. A third group was selected as the control group with no intervention. Head circumference and weight were measured on a weekly and a daily basis, respectively, by one person. The length of stay and the number of days to start oral feeding with a syringe and then breast were also evaluated. The data were analyzed with SPSS 16 through descriptive methods and statistical tests and $P < 0.05$ was considered significant.

Results: Of the 69 infants enrolled in the study, 4 children did not complete it due to deterioration of conditions. After matching of the 3 groups, the number of days elapsed to syringe feeding was 14.5, 16.5, and 12.2 days in the first, second, and third groups, respectively, with no statistically significant difference between them. The number of days elapsed to breast feeding was averagely 21.7, 22, and 20 days in the first, second, and third groups, respectively, with no statistically significant difference between them.

Conclusion: The results indicated that non-nutritional sucking through mother's breast and pacifier does not affect the growth of premature infants.

Key words: Sucking – Growth – Bandar Abbas

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Introduction:

Premature infants are born prior to the development of cardiovascular, respiratory, muscular, and central nervous systems. This

functional immaturity is inversely related to gestational age and birth weight; therefore, a significant number of these infants experience oral feeding problems. Feeding and swallowing

problems are obvious medical and behavioral complications which are faced in neonatal intensive care by premature infants and their families. In a study on 50 bottle-fed infants, no significant difference was observed in the ability to suck between infants with fetal weight of 26 and 29 weeks (swallowing). In this study, a significant correlation was observed between the development levels of sucking ability in preterm infants and the gestational age (1-3). Preterm infants are usually hospitalized in the intensive care unit after birth where they are fed through a nasal or oral tube. This feeding method reduces the ability of sucking and the process of motor development in preterm infants, leading to prolonged feeding problems (3,4). In addition, oral tube feeding increases the length of stay which *per se* increases the risk of hospital-acquired infections and the associated costs for families (5). Sensory and motor interventions may cause development of the ability of oral feeding in premature infants. Several studies have demonstrated that oral stimulation interventions aimed at improving the nutritional skills are useful in premature infants (6,7). Non-nutritional sucking is a safe intervention used to enhance the development of oral feeding in preterm infants and is directly associated with many benefits for achieving oral feeding. Non-nutritional sucking refers to feeding without food and stimulation of infant's mouth to actuate non-nutritional sucking pattern (5,8). In a study in 2002, Fucile *et al.* evaluated the effect of early oral stimulation in preterm infants who were enrolled in two groups of subjects and controls. The results showed that subjects achieved oral feeding a week earlier than the controls (9). In a similar study, Lawe *et al.* (2005) concluded that infants in the experimental group who were receiving oral stimulation achieved complete oral feeding sooner than infants in the control group (10). Given the importance of non-nutritional sucking for rapid evolution of premature infants as well as acceleration of their growth, we investigated the effect of sucking empty breast and pacifier, as two oral stimulation methods, on growth indices, such as height, weight, and head circumference, in premature infants admitted to Children and Shariati Hospitals of Bandar Abbas in 2012.

Methods:

In this clinical trial conducted in 2012-2013 in the newborn ward of Shariati and Children Hospitals in Bandar Abbas, all preterm infants aged 26-32 weeks (by LMP or first trimester ultrasound of mothers) and birth weight of less than 1500 grams were enrolled in the study after obtaining free and informed consent of their mothers. Infants with the following conditions were excluded from the study: malformations (chromosomal disorders, malformations of the head and face, or existence of multiple malformations), severe asphyxia (Apgar score of 5 in the fifth minute, convulsions in the first 24 hours of birth), intracranial hemorrhage grade 3 or 4 (according to ultrasound documentation), hospital-acquired infections at the start or during the study, and critical illness. Finally, a total of 69 infants were enrolled.

Preterm infants were randomly divided into three groups in hospitalization order: 1- pacifier, 2- empty breast, and 3- controls. Mothers were responsible for the intervention, and they were trained and supervised by the researcher in the hospitalized ward in order to standardize the intervention for all infants. The newborns were stimulated with empty breast or pacifier twice a day, 15 minutes each, until beginning of oral feeding during a period of at least 10 days. The controls had the similar conditions, except for the lack of stimulation with empty breast and pacifier. Oral feeding was started when the hemodynamic conditions of the subjects were clinically stable and good, identified by a neonatal sub-specialist as the research fellow. Oral feeding regimen increased based on the acceptance rate of the infants by 20 mL/kg/day.

Head circumference and weight were measured at baseline. The measurement was then repeated on a weekly basis using a plastic tape measure with an accuracy of 1 cm from the frontal area to the occipital prominence. The infants were weighed naked on a daily basis by the researcher using a scale (RASA) calibrated according to the manufacturer's standards. Infants' head circumference and weight were also recorded at discharge. In addition, the length of stay, time to achieve feeding through syringe and breast, and feeding type at discharge were also assessed. Mothers in all three groups were completely free to

attend in the ward and had an equal chance for breast massage, expressing milk, return to the hospital, and access to tips for feeding infants through breast.

Information on each infant was recorded daily in the prepared checklists by the researcher, and the data obtained after their completion were analyzed using SPSS 16 through descriptive statistics (frequency, mean and standard deviation) as well as Chi-Square and t-test.

Results:

The research objectives to study included whether non-nutritional sucking can reduce time to achieve oral feeding and the length of stay, improve weight gain, and affect infant's feeding type at discharge. The obtained results will be discussed below.

In this study, aiming at comparing the effects of sucking empty breast and pacifier on the growth of admitted infants in Children and Shariati Hospitals of Bandar Abbas in 2012, a total of 69 infants were evaluated in 3 groups. Four subjects were excluded due to deteriorated conditions (3 cases of sepsis and 1 suspected to necrotizing enterocolitis). There were 21 and 22 infants in the first group receiving feeding stimulation by mothers' breast and the second group with receiving oral stimulation by pacifier, respectively. Twenty two infants were also selected as the third group (control group). To match the studied groups, the involving parameters including gender, gestational age, head circumference, and birth weight were analyzed among the three groups. In terms of gender, of 65 subjects studied, 30 were male (46.2%) and 35 were female (53.8%), and no significant difference existed between the 3 groups in terms of gender according to the analysis ($P < 0.05$). The mean birth weight and mean gestational age were also evaluated among the three groups and no significant difference was found ($P < 0.05$) (Table 1).

Head circumference was also measured at baseline and no significant difference was observed between the 3 groups ($P < 0.05$).

Table 1. Matching the studied groups

Groups	Gender		Mean gestational age	Mean birth weight
	Boy	Girl		
Mothers' breast	12	9	29.9	1281
Pacifier	9	13	30	1242
Control	9	13	30.18	1299

After matching of the 3 groups, the results of interventions (days to achieve oral feeding and breast-feeding, head circumference, weight, and length of stay) were studied. Days to achieve syringe feeding were 14.5, 16.5, and 12.2 in the first (breast stimulation), second (pacifier stimulation), and third (control) groups, respectively, with no statistical significance difference between them ($P < 0.05$); while the days to achieve breast feeding were averagely 21.7 in the first group, 22 in the second group, and 20 in the third group, where no statistical difference was also found between the 3 groups ($P < 0.05$).

The mean increase in head circumference of newborns was 1.12, 1.26, and 1.1 cm in the first, second, and third groups, respectively, with no statistically significant difference ($P < 0.05$). In terms of average change in weight, there was 53.9 g weight gain in the first group, 41.3 g in the second group, and 48.7 g in the third group, and no statistically significant difference existed ($P < 0.05$). The groups were also compared in terms of length of stay, and the mean days of hospitalization were 23.1 in the first group, 22.6 in the second group, and 20.9 in the third group, with no significant difference ($P < 0.05$).

Finally, the feeding type at discharge was investigated between the 3 groups, where 39 infants were breast fed and 26 were bottle fed. The number of breast fed infants at discharge in the first, second, and third groups was 14, 14, and 11, respectively.

Table 2. General Conditions of Infants at Discharge

Intervention type	Head circumference	Weight	Starting day of syringe feeding	Starting day of breast feeding	Length of stay	Feeding type at discharge	
						Breast	Bottle
Breast	1.12	53.9	14	21.7	23.1	14	7
Pacifier	1.26	41.3	16.5	22	22.6	14	8
Control	1.1	48.7	12.2	20	20.9	11	11
P-value	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	

These figures were 7, 8, and 11 in the first, second, and third groups for bottle fed infants, respectively. Statistical analysis showed no significant difference between feeding type at discharge between the 3 groups ($P < 0.05$) (Table 2).

The mentioned variables (head circumference, weight, starting day of syringe feeding and breast feeding, length of stay, and feeding type at discharge) were also examined according to the infants' gender, resulting in no significant difference in this regard. At discharge, there were 17 breast fed and 13 bottle fed infants in the boys group, and 22 breast fed and 13 bottle fed in the girls group, and no significant difference existed between the two groups ($P < 0.05$)

Conclusion:

Seemingly simple instinctive activity of feeding is in fact one of the most complex sensory-motor processes for newborns. Immediately after birth, a normal infant uses sucking to feed and maintain his life. However, in premature newborns sucking from the breast or bottle will be hard since there is no proper oral-motor coordination (9-11). Nutritional problems in premature infants prevent them from achieving an independent oral feeding, leading to their admittance after birth in a neonatal intensive care unit in the majority of cases, where they are fed through a nasal or oral tube. This may reduce sucking activity and motor development in these infants and result in long-term nutritional problems (3,12). In order to determine the effect of oral stimulation on achievement of independent oral feeding by premature infants, a total of 69 premature infants less than 1500 g were examined in this study. No significant difference was found among the three groups in terms of evolution of breast feeding. This result was also obtained in a similar study performed by Delaney *et al.* who

showed that stimulatory program had no impact on the performance of infants' sucking (13). However, Boiron *et al.* found a significant difference between the two groups of receiving oral stimulation and control (without oral stimulation) in terms of ability for oral feeding (14). This difference in the ability of breast feeding in accordance with oral stimulation was also confirmed in other studies (15-17). Difference in the results can arise from the method of determining the strength of sucking in the studied groups. For example, Boiron *et al.* determined the strength of sucking of infants with a pacifier connected to a catheter and measuring the pressure on the pacifier by a transducer. In a study by Rocha *et al.*, development of sucking skills was measured by speech therapists that were performing the stimulation process (14,18). But in our study, the infants sucking strength was determine clinically according to the physician.

There was no significant difference in the rate of weight gain between the groups in our study. This finding was also confirmed in the study of Pinnelli *et al.* (16). While, Schwartz *et al.* showed that non-nutritional sucking increased weight gain in preterm infants (17). This difference can be justified by the difference in the stimulation programs in other studies, such as Fucile *et al.* and Rocha *et al.* (18,19); so that the stimulation program in the study of Fucile was applied twice a day, each for 15 minutes, and included initially the stimulation of gums and tongue for 5 minutes, and then cheeks, lips, and jaw area for 7 minutes. Finally, non-nutritional sucking and stimulation with pacifier was performed for 3 minutes. However, in our study, the intervention was performed twice a day for 15 minutes only through sucking of empty breast or pacifier, and the other mentioned oral stimulations were not done.

The mean length of stay was 23.1 days for breast stimulation, 22.6 days for pacifier stimulation, and 20.9 for the control group, and no

significant difference existed between the three groups in this regard. This issue was examined in a study by Pinnelli *et al.* and a significant relationship was observed between oral stimulation and discharge time of the infants (16). In a meta-analysis study, Schwartz *et al.* found also a significant relationship between oral stimulation of preterm infants and time of discharge; so that oral stimulation can significantly reduce the length of stay in hospital (17). In the study of Fucile *et al.*, non-nutritional sucking reduced also the length of stay to one week (9). This result was also confirmed in other studies (3,14,19). It should be noted that in studies with reduced length of stay, the inclusion criteria was only the prematurity of neonates, while in our study, in addition to prematurity, birth weight was than 1500 g. As a result, in our study, weight was below 1500 g, but other studies examined higher weights.

In this interventional study, the effect of non-nutritional sucking to achieve oral feeding was studied in three groups of preterm infants; and no significant difference was found between the three groups in terms of head circumference, weight gain, starting day of syringe feeding, starting day of breast feeding, length of stay, and feeding type at discharge ($P < 0.05$). These variables (head circumference, weight gain, *etc.*) were also examined based on gender and no relationship was found between them and.

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