



Effects of non-nutritive sucking and oral stimulation on breastfeeding rates for preterm, low birth weight infants: a randomized clinical trial

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Abstract

Objective: To determine the influence of non-nutritive sucking and oral stimulation programs on breastfeeding rates at discharge, at 3 and at 6 months of corrected age in preterm infants with very low birth weight.

Methods: Preterm infants were randomized into experimental and control groups. Ninety-eight preterm infants were randomized and 96 remained in the study until reaching the corrected age of 6 months. The experimental group received sensory-motor-oral stimulation and non-nutritive sucking, while infants in the control group received a sham stimulation program. Both were administered from reaching enteral feeding (100 kcal/kg/day) until the beginning of oral feeding.

Results: Fifty-nine infants (61.5%) were breastfeeding at the time of hospital discharge, 31 (36.9%) at 3 months, and only 18 (20.5%) at 6 months of corrected age. At discharge, 46.9% of the control group and 76.5% of the experimental group were breastfeeding. There were statistically significant differences between rates of breastfeeding at discharge (47 vs. 76%), 3 months (18 vs. 47%) and 6 months after discharge (10 vs. 27%). The experimental group showed significantly higher rates of breastfeeding ($p < 0.05$).

Conclusion: Non-nutritive sucking, associated with oral stimulation programs, can contribute to the improvement of breastfeeding rates among preterm infants with very low birth weight.

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Introduction

Non-nutritive sucking has been shown to be beneficial for several important indicators during hospitalization (length of stay, transition from gavage to oral feeding and improvements in digestion). It also facilitates the development of sucking behavior, as reflected in the neurobehavioral organization and maturation of preterm infants.¹⁻³

In addition to non-nutritive sucking, oral stimulation programs are used in neonatal wards with the goal of providing

opportunities for sucking, resulting in improved oral feeding and promoting physiological stability.^{2,3} However, some allege that non-nutritive sucking may have a negative impact on breastfeeding rates.¹

Maintaining breastfeeding for preterm infants is a major challenge.⁴ Breastfeeding and its beneficial effects for the infant's and the mother's health are well-known in scientific literature, but breastfeeding for very low birth weight preterm infants remains low. Thus, strategies which facilitate

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breastfeeding opportunities for preterm infants should be stimulated.⁴

The goal of this study is determining the influence of non-nutritive sucking and oral stimulation programs on breastfeeding rates at discharge, at 3 and 6 month of corrected age in preterm infants with very low birth weight.

Methods

The influence of non-nutritive sucking and oral stimulation on breastfeeding was analyzed through a randomized double-blind clinical trial, which included a sample of 98 preterm infants with very low birth weights. The main outcome was admission time. Breastfeeding rate at discharge was one of the secondary outcomes of the original study.⁵

Sample size was calculated for the experimental group considering a 20% decrease in length of stay, ensuring a statistical power of 81.25% for the secondary outcome (rate of breastfeeding at discharge).

Double-blinding included the medical staff at the neonatal intensive care unit (ICU) and at the outpatient ward, the nursing staff which provided care to the infants, the speech therapist which assessed infant capacity to begin sucking and the mothers.

The study was performed at the neonatal ICU of Instituto Fernandes Figueira, Fundação Oswaldo Cruz (IFF-Fiocruz), Rio de Janeiro, Brazil, from October 2002 to October 2005. The criteria for including preterm patients in the study were: 1) gestational age between 26 weeks and 32 weeks and 6 days, as established by date of last menstruation, ultrasound scanning in the first trimester or Ballard score⁶; 2) adequate or small for gestational age, according to criteria from Alexander et al.⁷; and 3) birth weight < 1,500 g.

Infants were excluded from the study if they had malformations (chromosomal disorders, malformations of head and face and multiple malformations), severe asphyxia (Apgar score < 5 at fifth minute, convulsions in the first 24 hours), presence of third or fourth degree intracranial hemorrhage (documented by ultrasound scanning) or suffered from a hospital infection at the time of the study.

Infant randomization was done when they were clinically stable and being fed complete diets, receiving > 100 mL of milk per kilogram per day via orogastric tube and after obtaining free and informed consent. The process was done using sequential numbers, kept in sealed, opaque, non-translucent envelopes.

Preterm infants were randomly assigned to either the control or the experimental group. The group of preterms randomized to receive intervention was stimulated using the program proposed by Fucile et al.⁸ during gavage. The intervention providers (three speech therapists) underwent a training program to standardize the stimulation procedure and rigorously followed protocol. Stimulation was performed once

a day for 15 minutes until preterm infants started oral diets, for a period of at least 10 days, using a gloved finger for perioral and intraoral stimulation and a pacifier during gavage.

The control group received its diet via gavage and a simulated intervention from the speech therapists. The simulated intervention consisted of standing around the incubator for a period of time similar to that spent for the control group, adequately positioning preterm infants, providing diet via orogastric tube, not performing the stimulus and not using a pacifier during gavage (sham procedure). The staff was instructed not to use any other form of oral stimulation beyond that described in the present study.

Oral feeding began when the infant was clinically stable in terms of hemodynamics and had presented peristalsis according to criteria established by the caretaker staff. Oral diet progress depended on infant acceptance and was around 20 mL/kg/day.

In both groups, the change from orogastric tube to oral feeding was initiated when the preterm infant reached the gestational age of 34 weeks, regardless of weight, in compliance with institutional routine and depending on an assessment of its capacity to suck, swallow and breathe. A single, external speech therapist, double-blinded for the study, performed the clinical assessment of preterm infants' ability to initiate oral feeding.

Control and experimental groups received the same guidance regarding breast massage and pumping, financial support for return to the hospital, readmission of mother for breastfeeding and providing various breastfeeding guidelines before and after discharge. In addition, every time mothers from both groups were present at the neonatal ward, and infant conditions allowed for it, it was requested that they pump milk for direct administration. Mothers were given and took advantage of opportunities to remain in the hospital equally for both groups.

At discharge and at three and 6 months of corrected age, preterm infants were classified as breastfed (exclusively or not) and non-breastfed (using cups or bottles, no access to breast). Physicians prescribed formula for the non-breastfed.

Analysis was made by intention to treat and by complete cases⁹ and statistical significance was established at levels below 5%. The difference between both groups was verified through the following tests: Student's *t* test, Kruskal-Wallis test, Mantel-Haenszel chi-square test or Fischer exact test. The database was built in the EpiInfo environment, and all statistical analyses were performed using SPSS statistical package version 13.

The study was approved by the institution's research ethics committee, filed under number 063/07, and by the neonatal ward where it was performed. Free and informed consent for participation in the study was obtained from the people responsible for each infant who took part in it.

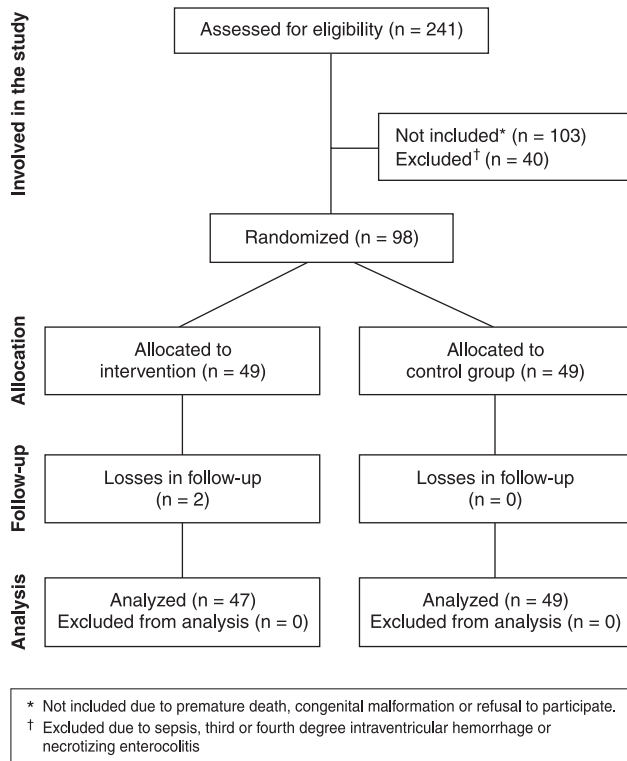


Figure 1 - CONSORT flowchart¹⁰

Results

During the period of the study, 241 preterm infants with birth weights below 1,500 g and gestational age below 33 complete weeks were admitted to the neonatal ward. Of these,

full and informed consent was given for 98 to participate in the randomization process. However, only 96 preterm infants remained in the study until the 6th month of corrected age (47 for the experimental group and 49 for the control group)¹⁰ (Figure 1).

The demographic characteristics for the randomized group (n = 98) were published in a previous study⁵ and the demographic characteristics for the group which completed the follow-up process (n = 96) are described in Table 1. No statistically significant differences were seen between groups for the following variables: birth weight, gestational age, days of life upon reaching clinical stability, gestational age upon reaching clinical stability and maternal variables which could influence breastfeeding rates.

Among the 96 preterm infants participating in this study, 59 (61.5%) were being breastfed at discharge, 31 (32.3%) were still being breastfed at 3 months and only 18 (18.75%) at 6 months of corrected age. The number needed to treat (NNT) to prevent an event (weaning at discharge) was 3.3 preterm infants. Breastfeeding frequencies for both groups are described in Table 2.

Considering the 96 preterm infants in the study, admission time for infants in the experimental group was significantly lower than for the control group, which was discharged 10.8 days later. There was no statistical difference between groups for permanence in the nursing quarters: 41 mothers from the control group (83.7%) and 39 from the experimental group (82.9%) remained in the hospital until discharge.

Discussion

Non-nutritive sucking has shown beneficial effects for preterm infants below 1,500 g. Feeding behavior has been associated to improved neurobehavioral development during the

Table 1 - Demographic characteristics of population (Instituto Fernandes Figueira, Fiocruz, Rio de Janeiro, Brazil, 2007)

Variables	Control group (n = 49)	Experimental group (n = 47)	p
Neonatal variables			
Birth weight (g)*	1,125±221	1,204±222	0.08
Gestational age at birth*	30.2±1.8	30.5±1.2	0.16
Days of life upon reaching clinical stability [†]	10 (4-21)	10 (5-32)	0.29
Gestational age upon reaching clinical stability [†]	32.4 (27.5-34.4)	32 (28.6-35.5)	0.10
Length of stay*	52.37±19.51	41.81±17.7	0.007
Maternal education ≥ 8 [‡]	32	38	0.28
Presence of partner (yes) [‡]	42	34	0.10
Other children in the household (yes) [‡]	16	23	0.19

* Average ± standard deviation, Student's t test.

[†] Median (min-max), Kruskal-Wallis test.

[‡] Fischer's exact test and chi-square test.

Table 2 - Breastfeeding frequency during the periods in the study: at discharge, 3 and 6 month of corrected age (Instituto Fernandes Figueira, Fiocruz, Rio de Janeiro, Brazil, 2007)

Breastfeeding frequency, n (%)*	Control group (n = 49)	Experimental group (n = 47)	p
At discharge	23 (47%)	36 (76%)	0.003
At 3 months	9 (18%)	22 (47%)	0.003
At 6 months	5 (10%)	13 (27%)	0.029

* Mantel-Haenszel chi-square test.

first year of life, making it an important research topic in recent years.¹¹

The results of the present study show that non-nutritive sucking and oral stimulation increase the probability of preterms being breastfed upon discharge, which can also be partly explained by the shorter admission time of the experimental group. A previous publication of the same study showed that the experimental group was able to receive breastfeeding 8.2 days earlier than the control group.⁵ Other studies, which used only non-nutritive sucking, have also shown similar results.^{1,2}

Gestational age at birth was similar for both groups; despite birth weight at these conditions being slightly higher for the experimental group, there were no significant statistical differences between the two. Other variables that might have been influenced by the two and, therefore, interfere with admission time, did not present differences between groups and were published in a previous article (weight loss percentage, time to begin enteral feeding and to reach full enteral feeding⁵). Regarding support for mothers, double-blinding the study allowed that it be the same for both groups (psychological support, guidelines for massage and pumping, financial support for returning to the hospital after discharge, opportunity for readmission during transition from tube to sucking, guidelines regarding how to hold the baby and what position to adopt, among others).

The benefits from breastfeeding for preterm infants are well-known, but breastfeeding rates for this group are still low.^{12,13} Breastfeeding in neonatal wards requires several factors involving the mother (physical availability, support network, favorable environment, adequate information, support from the healthcare staff and milk production, among others), as well the ability of the preterm infant to suck on the mother's breast.^{4,14} The development of said abilities may be favored via stimulation, and the health team must be attentive not to miss the ideal moment for the acquisition and maturation of sucking, swallowing and breathing.^{5,8}

Breastfeeding rates in this study are higher than those found in other Brazilian hospitals,⁴ but lower than Swedish rates.¹⁵ One factor which might have contributed to the results

is the methodology used by initiative Hospital Amigo da Criança ("Friend of Children Hospital", in Portuguese) to increase breastfeeding rates, which is known to influence breastfeeding rates for term and preterm infants and which was being implemented at the neonatal ward at the time of this study.¹⁶⁻¹⁹

One study limitation is that it was not designed, with breastfeeding as the primary outcome, despite the large sample size being sufficiently robust to explain such results. The outcome used was also not that of exclusive breastfeeding, but rather whether the preterm infant was breastfed at all or not.

In conclusion, the present study shows that non-nutritive sucking, associated with oral stimulation programs, can contribute to the improvement of breastfeeding rates among preterm infants with very low birth weight, and should therefore be included among interventions for mothers and children to promote breastfeeding for this age range.

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