

ROLE OF PIOMI TO ACHIEVE BETTER BREAST FEEDING BEHAVIOR IN PRETERM BORN AT GESTATIONAL AGE 29-32 WEEKS-RANDOMISED CONTROL TRIAL

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DOI: 10.5281/zenodo.11367380

Abstract

Background: Preterm <32 weeks have difficulty in independent oral feeding due to underdeveloped oral motor skills. Oromotor stimulation when applied to preterm infants during gavage feeding can improve sucking abilities. PIOMI is oral motor intervention to activate contraction of muscle in the oral cavity. In the present study, we tested the hypothesis of oromotor stimulation in improving the effectiveness of breastfeeding. **Objectives:** To compare the effect of Premature Infant Oro motor Intervention (PIOMI) and routine oromotor stimulation (OMS) on oral feeding readiness among the Preterm Infants **Methods:** A Randomised Control trial was conducted among 30 preterm infants admitted at Neonatal intensive care unit of Tertiary Care Hospital, Chennai. The preterm infants were aged between 29 0/7-32 0/7 weeks, randomized in to two groups, – Intervention (receiving PIOMI with standard care group) and Control group (receiving Standard care without PIOMI), each group contained 15 preterm infants. Intervention was given for 14 consecutive days after randomization. Preterm Infant Breast Feeding Behavior Scale (PIBBS) scoring was used to assess the premature infant breast feeding behavior after 14 days of randomization in both groups. Descriptive variables were analyzed in Frequency and Proportion and Continuous variables as mean \pm SD. Independent t test was done to compare the mean difference in PIBBS scores and other mean score differences in two groups, p value < 0.05 was considered statistically significant. **Results:** Both the Intervention group and the Control group had statistically similar group of participants (p value> 0.05). The mean PIBBS score after 14 days of recruitment was higher among Intervention group compared to Control group, 13.7 \pm 0.84 versus 13.1 \pm 0.69, but was statistically insignificant with p value > 0.05. There was a significant increase in PIBBS score in Intervention group compared to Control group during the discharge, 16.8 \pm 0.65 versus 15.10 \pm 0.61, p value 0.001(<0.05). The duration of hospitalization was significantly lesser among Intervention group compared to Control group, 30.86 \pm 14.1 days versus 49.4 \pm 22.3 days, p value <0.05. The weight at Post Menstrual Age of 3 months was higher among Intervention group compared to control group but it was statistically insignificant (p value > 0.05) **Conclusion:** Direct feeding Readiness at discharge is higher among preterm <32 weeks undergoing PIOMI in addition to the standard care compared to preterm with standard care alone. Hence providing PIOMI to preterm infants 29-32 weeks could have favourable outcome.

Keywords: PIOMI, Breastfeeding Behavior, PIBBS, Oromotor Stimulation, Preterm, Direct Feeding Readiness.

INTRODUCTION

The number of preterm birth is growing exponentially to a level of approximately 15 million annually ¹ such preterm infants, admitted at neonatal intensive care unit (NICU), encounter many challenges across various physiological systems ². Preterm babies with low birth weight have a twenty times higher risk of death, long-term growth

delays, and other dysfunctions than those with normal weight and also more prone for neurological developmental delays³

Premature or preterm babies are also at higher risk of nutrition deficiencies due to inadequate suction reflexes and inability of the digestive tract to absorb nutrients leading to feeding delays and this feeding delays continues until 2 years of age in around 23% of the pre-term infants⁴

Thus, it becomes highly crucial to enhance sucking skills in order to accelerate the transition from tube to full oral feeding in preterm babies. The efforts to stimulate the growth and development process can be done by optimizing feeding and stimulating coordination of sucking, breathing, and swallowing reflexes⁴

Preterm Infants Oral Motor Intervention (PIOMI) is one of the methods of stimulating the baby's sucking reflex, which was developed from the BOMI Beckman Oral Motor Intervention (PIOMI)⁵.

PIOMI involves, a method conducted by touch and pressure on the baby's lips, oral cavity, and cheeks to improve oral motor development to improve the suction reflex in premature infants^{6,7} With the above background, study was planned with the following objectives

OBJECTIVES

Primary Objective: To compare the effect of Premature Infant Oral motor Intervention (PIOMI) and routine oromotor stimulation (OMS) on PIBBS (Preterm Infant Breast feeding Behavior scale) score among preterm infants.

Secondary Objective: To compare weight gain during various time periods, period of hospitalization between the Intervention and Control group

METHODOLOGY

This Randomised control trial (with 1:1 Allocation ratio and two arms Intervention and Control group) was conducted among preterm infants admitted at Neonatal intensive care unit of Saveetha Medical College Hospital, Chennai. The preterm infants were aged between 29 0/7-32 0/7 weeks.

A sample size (n) of 30 (15 in each group) was considered adequate for the study, calculated by using the formula $n=2[(a+b)^2 \sigma^2]/((\mu_1-\mu_2)^2)$ at alpha significance level of 0.05, power 80%, $(\mu_1-\mu_2) = 0.5^1\sigma = 0.5$; a is Conventional multiplier of alpha at 0.05=1.96; b is Conventional multiplier of β at 0.20=0.842. The participants were selected based on inclusion and exclusion criteria.

Inclusion criteria included inborn babies, born at gestational age 29-32 weeks, with or without noninvasive ventilation, hemodynamically stable and after 48hrs of extubation. Babies with congenital anomalies including cleft lip, cleft palate and chromosomal anomalies were excluded from the study.

The study was done for duration of 18 months. Consent was obtained from the mother for participation in the research. Infants with congenital malformations. 40 preterm infants assessed for eligibility to take part in the study, 10 were excluded as they were not fulfilling the inclusion criteria. Hence 30 participants were randomised into Intervention and Control group using Random number sequencing method.

Single blinding method was followed as the analyser alone does not know which group they belong to. The Intervention group received PIOMI and standard care (Kangaroo Mother care and Nonnutritive sucking). The Control group received standard care alone. The principal investigator underwent online training from the founder of PIOMI Dr Brenda Lesson Knoll.

PIOMI was given 3 times a day for 14 consecutive days by same investigator. PIBBS scoring was done by well-trained occupational therapist who was blinded to the study. The PIBBS scoring was done once per day for 3 consecutive days i.e on day 15,16,17 of enrolment. The mean PIBBS score was calculated using these 3 scores.

The outcome measures included, comparison of PIBBS score, Weight gain during various time period, CGA during various time period and various feeding behavior, period of hospitalization between the Intervention and Control group. Weight was checked at 3months of postnatal age after calling them for review from home.

Descriptive variables were analyzed in Frequency and Proportion and Continuous variables as mean \pm SD. Independent t test was done to compare the mean difference in PIBBS scores and other mean score differences in two groups, p vale < 0.05 was considered statistically significant. Pearson correlation was done between PIBBS and CGA at initiation of breastfeeding, p value < 0.05 was considered statistically significant.

Figure 1: Flowchart of conduct of RCT

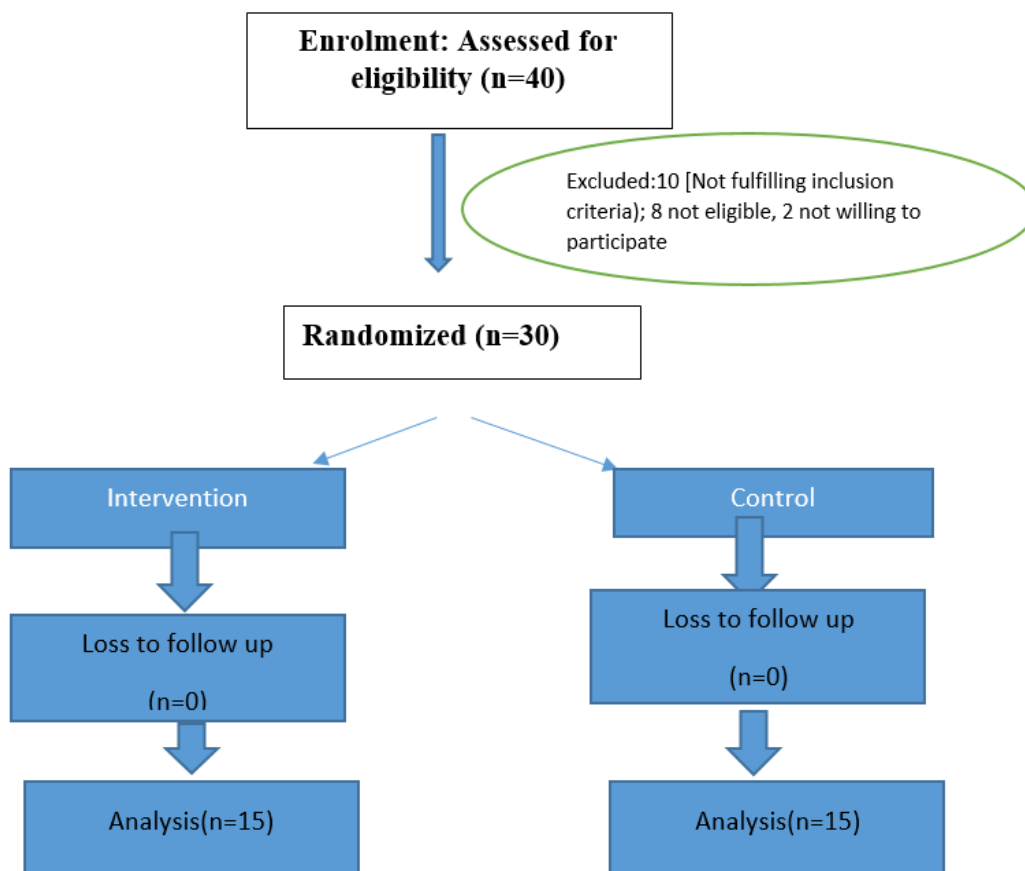


Table 1: PIBBS scoring

Scale items	Maturational steps	Score
Rooting	Did not root	0
	Showed some rooting behavior	1
	Showed obvious rooting behavior	2
Areolar grasp (how much of the breast was inside the baby's mouth)	None, the mouth only touched the nipple	0
	Part of the nipple	1
	The whole nipple, not the areola	2
Latched on and fixed to the breast	The nipple and some of the areola	3
	Did not latch on at all so the mother felt it	0
	Latched on for ≤5 min	1
Sucking	Latched on for 6-10 min	2
	Latched on for ≥11-15 min	3
	No sucking or licking	0
	Licking and tasting, but no sucking	1
Longest sucking burst	Single sucks, occasional short sucking bursts (2-9 sucks)	2
	Repeated short sucking bursts, occasional long bursts (≥10 sucks)	3
	Repeated (≥2) long sucking bursts	4
	1-5 consecutive sucks	1
	6-10 consecutive sucks	2
	11-15 consecutive sucks	3
	16-20 consecutive sucks	4
	21-25 consecutive sucks	5
	≥26-30 consecutive sucks	6
	Swallowing	Swallowing was not noticed
Occasional swallowing was noticed		1
Repeated swallowing was noticed		2

Note. Adapted from: Nyqvist, K.H., Sjöden, P., & Ewald, U. (1999). The development of preterm infants' breastfeeding behavior. *Early Human Development*, 55, 247-264

Table 2: PIOMI procedure

8 Steps	Technique	Purpose	Frequency	Duration
Cheek C - Stretch	1. Place a finger inside the cheek, and one on the outer cheek. Slide and stretch front to back (toward the ear), then down, then back to front (C pattern). 2. Repeat for other side.	Improve range of motion and strength of cheeks, and improve lip seal.	2X each cheek	30 sec
Lip Roll	1. Place a finger on the inside and thumb on outside of upper lip. 2. Move finger in horizontal direction while moving thumb in opposite direction (rolling lip between fingers). 3. Do on the left side of lip, then repeat on right side (2 placements). 4. Repeat on lower lip.	Improve lip range of motion and seal.	1X each lip	30 sec
Lip Curl or Lip Stretch	1. Place a finger on outside of upper lip, and one on the inside. 2. Gently compress lip, and stretch downward towards midline, moving across lips. 3. Repeat on lower lip, stretching upward. Or (if lips are too small to grab for Lip Curl, replace with this Lip Stretch.) 1. Lay finger across upper lip, slightly compressing tissue. 2. Move tissue horizontally, stretching to one side, then the other. 3. Repeat for bottom lip.	Improve lip strength, range of motion, and seal.	1X each lip	30 sec
Gum Massage	1. Place finger on left side of the upper gum, with firm sustained pressure slowly move across the gum to the other side. 2. Move down the lower gum (to continue a circle), with firm sustained pressure slowly move across to other side.	Improve range of motion of tongue, stimulate swallow, and improve suck.	2X	30 sec
Lateral Borders of Tongue/ Cheek	1. Place finger at the level of the molar between the side blade of the tongue and the lower gum. 2. Move the finger toward midline, pushing the tongue towards the midline. 3. Then move the finger back and all the way into the cheek, stretching it.	Improve tongue range of motion and strength.	1X each side	15 sec
Midblade of Tongue/ Palate	1. Place finger at center of the mouth, give sustained pressure into the hard palate for 3 seconds. 2. Move the finger down to contact center blade of the tongue. 3. Displace the tongue downward with a firm pressure. 4. Move the finger back up to the center of the hard palate.	Improved tongue range of motion and strength, and improve suck.	2X	30 sec
Elicit a Suck	1. Place finger at the midline, center of the pallet, gently stroke the palate to elicit a suck.	Improve suck, and soft palate activation.	N/A	15 sec
Support for Non-Nutritive Sucking	1. Leave finger/pacifier in mouth (or place pacifier in mouth) and allow sucking.	Improve suck, and soft palate activation.	N/A	2 min

Lessen, R.S. (2011). Effect of the Premature Infant Oral Motor Intervention (PIOMI) on Feeding Progression and Length of Stay in Preterm Infants. *Advances in Neonatal Care*, 11(2), pp129-139. Modified (06/2007) from Beckman, D.A. (1986, Rev 2005). *Oral Motor Assessment and Intervention*. Beckman and Associates, Inc. 1211 Palmetto Avenue, Winter Park, FL 32789. [update] www.beckmanoralmotor.com

RESULTS

The study participant's baseline characteristics, such as mother age, birth weight, parity, type of delivery and sex of the baby were found to be statistically insignificant having p value of > 0.05, thus makes it comparable for analysis[Table3]

The mean PIBBS score after enrollment and during discharge was higher among intervention group compared to control group, 13.67±0.97 vs 13.07±0.59 and 16.8±1.01 vs 15.07±0.59 respectively and it was found statistically significant with p value of < 0.05.[Table 4]

Though the days to regain body weight, average weight gain at the end of intervention was high among intervention group compared to control group, the difference was statistically insignificant (p value > 0.05)[Table 5]

The PMA at introduction of Oral feed, PMA at independent Oral feed and Hospital stay after enrolment was found to be significantly lower in Intervention group compared to Control group (p value < 0.05).However though, the weight at PMA of 3 months was higher among Intervention group compared to control group, it was statistically insignificant (p value > 0.05) [Table 6]

There is a moderate negative correlation between PIBBS Score at discharge and CGA at independent oral feeding and it was statistically significant.

Table 3: Comparison of Baseline characteristics of Intervention and Control group (n=30)

Parameters	Intervention (n=15)	Control (n=15)	P value
	Mean ± SD	Mean ± SD	
Mother age (years)	26.93±3.49	28.93±5.03	0.089
Birth weight (grams)	1334.67±292.54	1287.73±431.76	0.534
Post Menstrual age at enrollment	30.53±1.06	30.6±0.84	0.842
	<i>n (%)</i>	<i>n (%)</i>	
Parity			
Primi (n=16)	8(50%)	8(50%)	1.000
Multipara (n=14)	7(50%)	7(50%)	
Type of Delivery			
NVD(n=6)	3(50%)	3(50%)	0.169
LSCS(n=24)	12(50%)	12(50%)	
Gender of the baby			
Male(n=17)	9(53%)	8(47%)	0.929
Female(n=13)	6(46%)	7(54%)	

Table 4: Comparison of PIBBS in Intervention and Control group (n=30)

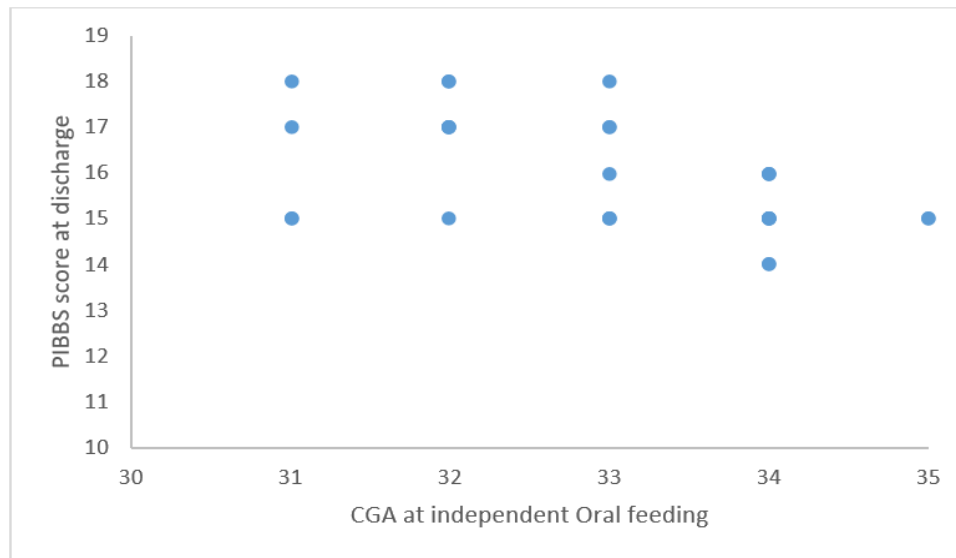
Parameters	Intervention (n=15)	Control (n=15)	P value
	mean±SD	mean±SD	
PIBBS after 14 days of enrollment	13.67±0.97	13.07±0.59	0.023
PIBBS at discharge	16.8±1.01	15.07±0.59	0.037

Table 5: Comparison of weight gain in Intervention and Control group (n=30)

Parameters	Intervention (n=15)	Control (n=15)	P value
	mean±SD	mean±SD	
Days to regain body weight	15.73±5.15	13.87±4.18	0.869
Average weight gain in grams at the end of Intervention	14.67±7.835	14.00±5.085	0.781
Weight in grams at PMA of 3 months	3248.3±670.3	2833.3±660.4	0.099

Table 6: Comparison of Post Menstrual Age (PMA) and duration of Hospital stay in Intervention and Control group (n=30)

Parameters	Intervention (n=15)	Control (n=15)	P value
	mean±SD	mean±SD	
PMA at introduction of palladia feed	31.47±0.834	32.40±0.828	0.005
PMA at independent direct breast feed	32.13±0.743	33.80±0.941	0.0001
Hospital stay after enrollment	30.27±5.02	49.40±5.57	0.001



*r=-0.521, p value=0.003

Figure 2: Correlation between PIBBS at discharge and CGA at independent breast feeding

DISCUSSION

The current study was done among 30 preterm infants to determine, whether premature oro motor intervention is effective in early initiation of breast feeding.

The participants in Intervention and Control group had almost similar baseline characteristics, with regard to mother age, birth weight, parity, type of delivery and sex of the baby and they were found to be statistically insignificant having p value of > 0.05. Study conducted by Bala P etal⁹ also had similar group of participants assessed by their baseline characteristics in Intervention and Control group

In the present study, the mean PIBBS score after 14 days of intervention and during discharge was higher among intervention group compared to control group, 13.67±0.97 vs 13.07±0.59 and 16.8±1.01 vs 15.07±0.59 respectively and it was found statistically significant with p value of < 0.05. In a previous research study conducted by Sasmal S etal¹⁰ similar finding of higher PIBBS score on full feeding and during discharge was seen in Intervention group compared to Control group, however, the PIBBS difference in discharge alone was statistically significant with p value of <0.01

In the present study, though the mean weight during introduction of palaadai feeds, independent DBF, days to regain body weight, average weight gain at the end of intervention was high among intervention group compared to control group, the difference was statistically insignificant (p value > 0.05) , this was supported by the

findings of Sasmal S et al ¹⁰ who also had insignificant findings with regard to weight gain comparison in Intervention and Control group

Fucile S et al ¹¹ Rocha AD et al ¹² reported that there is early attainment of oral feeding in the Intervention than Control group and it was statistically significant with the p value of < 0.05. Sasmal S et al ¹⁰ reported CGA at the introduction to oral feeding and independent feeding was statistically lower in Intervention group compared to Control group (p value < 0.05), this was similar to our present study findings, which showed PMA at introduction of Oral feed, PMA at independent Oral feed to be significantly lower in Intervention group compared to Control group (p value < 0.05).

The present study showed decrease duration of hospital stay in Intervention group compared to Control group having 30.27±5.02 vs 49.40±5.57 , p value 0.001, Arora K et al ¹³ also reported lesser duration of hospital stay among Intervention group compared to Control group, however it was statistically insignificant

CONCLUSION

Based on the current study findings, with higher PIBBS score, lesser PMA at introduction of oral feeding and independent oral feeding, decreased duration of hospitalisation in the Intervention group compared to Control group and also with the negative significant correlation between PIBBS score and PMA at independent oral feeding concludes that,

Premature Infant Oro Motor Intervention in addition to standard care achieves better breast feeding behaviour compared to standard care alone

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