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Original Article

THE EFFECT OF ORAL STIMULATION ON THE SUCTION REFLEXES OF LOW BIRTH WEIGHT INFANTS

Lilis Fatmawati[1)]*, Yuanita Syaiful[2)], Mei-Ling Tsai[3)]
[1)] Faculty of Health Sciences, University of Gresik, Indonesia
[2)] College of Health Science Adi Husada, Indonesia
[3)] Department of Physiology, National Cheng Kung University, Tainan, Taiwan
*Corresponding Author, E-mail: lilisfatmawati13@gmail.com

ABSTRACT

Background. Low Birth Weight Infants (LBWIs) often experience oral feeding difficulties due to organ immaturity, which can hinder their overall care and increase mortality risk. One intervention to address weak suction reflexes is early oral stimulation, involving gentle massage around the mouth to activate muscle tissue. This study aimed to examine the effect of oral stimulation on the suction reflexes of LBWIs.
Research Method. A pre-experimental one-group pretest-posttest design was used. The study involved 28 LBWIs selected through purposive sampling from a population of 30 infants. The independent variable was oral stimulation, and the dependent variable was the infants' suction reflexes. Oral stimulation was administered once daily for 15 minutes over seven consecutive days. Data were collected using a standard oral stimulation procedure and observation sheets to assess suction reflexes.
Findings. Before the intervention, 15 infants (54%) showed poor suction reflexes. After the seven-day stimulation, 18 infants (64%) demonstrated improved suction reflexes. Statistical analysis using the Wilcoxon Signed Rank Test showed a significant effect ($p = 0.000$), indicating that oral stimulation positively influenced the development of suction reflexes in LBWIs.
Conclusion. oral stimulation is effective in enhancing suction reflexes among LBWIs. Nurses are encouraged to implement this simple, non-invasive intervention to promote faster recovery, shorten treatment duration, and reduce healthcare costs.

Keywords: Low Birth Weight Infant, Oral Stimulation, Suction Reflex.

BACKGROUND

Low Birth Weight Infants (LBWIs) are defined as newborns weighing less than 2,500 grams at birth [1]. These infants are highly susceptible to a range of complications including hypothermia, respiratory distress syndrome, intracranial hemorrhage, hyperbilirubinemia, and hypoglycemia, largely due to poor sucking ability that results in inadequate nutritional intake. LBWIs significantly contribute to the high infant mortality rate in Indonesia [2]. Globally, approximately 20 million LBWIs are born each year [3]. Oral feeding difficulties in LBWIs are commonly linked to organ immaturity, which hampers their overall treatment outcomes [4].

Data from the neonatal intensive care in a public hospital that among LBWI cases, 40% presented with asphyxia, 30% with respiratory distress syndrome, 20% with sepsis, and 10% with hypothermia. Of these cases, 70%—including 15 LBWIs—also exhibited weak sucking reflexes. Nursing interventions to date have involved collaboration with physiotherapists. However, a promising independent nursing intervention is early oral stimulation, involving gentle massage around the perioral muscles. This method has been shown to enhance blood circulation, improve muscle function, and stimulate the suction reflex, thereby supporting the development of other vital bodily functions [5]. Nevertheless, empirical evidence on the efficacy of oral stimulation in improving sucking reflexes in LBWIs remains limited.

According to a 2015 survey by the Nutrition and Health Surveillance System (NSS) in collaboration with Indonesia's Ministry of Health Research and Development Agency (Balitbangkes), the national infant mortality rate stood at 35 per 1,000 live births. LBWIs accounted for approximately 20% of all live births and contributed to 29% of neonatal deaths [6]. In East Java alone, the LBWI birth rate reached 18.78% in 2016. At a public hospital in Gresik and Surabaya, 300 neonatal admissions were recorded in 2016, including 250 LBWIs, 40 very low birth weight infants (VLBWIs), and 10 extremely low birth weight infants (ELBWIs), with 30 deaths among LBWIs. From January to March 2017, 100 neonatal cases were admitted—78 LBWIs, 19 VLBWIs, and 3 ELBWIs—resulting in 20 infant deaths (20%) [7].

Studies at The National Cheng Kung University Hospital (NCKUH) in Tainan, Taiwan, involving 19 low birth weight infants (seven males and twelve females; birth weights 520–2,342 g; gestational ages 32–40 weeks) demonstrated an average weight gain of 284 g over one week following oral stimulation [7]. At Dr. Soebandi Regional Hospital in Jember, all 30 infants exhibited weak suction reflexes prior to oral physiotherapy, whereas 73.3% (n = 22) displayed robust reflexes post-intervention [6]. Suck–swallow coordination in preterm neonates emerges around 32–34 weeks of gestation and reaches functional maturity by 36–37 weeks [2]. Insufficient neural development and orofacial musculature underdevelopment in these infants often manifest as delayed feeding, poor weight gain, and dehydration during the early postnatal period [8].

Weak suction reflexes not only impede the transition to autonomous oral feeding and prolong hospitalization but also disrupt mother–infant bonding and may predispose to later feeding disorders. To address these challenges, early orofacial interventions have been explored and found that combined perioral and intraoral stimulation, administered

15 minutes daily for seven days, significantly enhanced suction proficiency, improved gastrointestinal function, and shortened length of stay. Furthermore, maternal-administered tactile stimulation fosters emotional attachment and contributes to the infant's long-term psychosocial development [5]. Based on these findings, the present study seeks to further evaluate the efficacy of oral stimulation in enhancing the suction reflex of low birth weight infants.

RESEARCH METHOD

The study employed a pre-experimental, one-group pretest–posttest design. It was conducted in the government hospital in Gresik and Surabaya between September 1 and November 31, 2024, and received institutional approval under protocol No. 070/493/437.71/2024. The target population comprised 30 low birth weight infants, of whom 28 were enrolled via purposive sampling. The independent variable was oral stimulation, administered once daily for 15 minutes over seven consecutive days, while the dependent variable was the infants' suction reflex, quantified by both the total daily volume of breast milk or formula ingested and the number of feeding sessions relative to prescribed fluid requirements.

Suction proficiency was assessed daily by comparing baseline and follow-up data using two indicators: (1) average daily intake volume (mL) and (2) feeding frequency. Reflex efficacy was classified as "good" (≥ 80% of daily fluid needs), "adequate" (50–79%), or "poor" (< 49%) [9]. To determine the impact of oral stimulation on suction reflexes, pre- and post-intervention ordinal data were compared using the Wilcoxon signed-rank test, with statistical significance set at $\alpha < 0.05$.

FINDINGS

Table 1. Pre-Intervention Characterization of the Suction Reflex in Low Birth Weight Infants

Suction Reflex	f	%
Good	1	3
Normal	12	43
Poor	15	54
Total	28	100

Table 1 presents the baseline suction reflex among low birth weight infants (LBWIs) prior to oral stimulation. A majority of the cohort (n = 15; 54 percent) exhibited a poor

suction reflex, while only a single infant (n = 1; 3 percent) demonstrated a strong reflex. Immaturity of the suck–swallow mechanism in preterm neonates manifests as oral feeding difficulties, leading to delayed breastfeeding initiation, inadequate weight gain, and dehydration during the early postnatal period.

Table 2. Post-Stimulation Suction Reflex in Low-Birth-Weight Infants

Suction Reflex	**f**	**%**
Good	6	21
Normal	18	64
Poor	4	14
Total	28	100
Wilcoxon Signed Rank Test	Before	After
Mean	105.66	211.32
Z-value	-3.258	
p-value	0.001	

Table 2 illustrates the post-intervention suction reflex profile in low birth weight infants: the majority (n = 18; 64 percent) achieved an adequate reflex, while a smaller subset (n = 4; 14 percent) continued to exhibit a deficient response. Infants who receive daily 15-minute sessions of oral stimulation demonstrate a 20 – 47 percent greater improvement in suction efficacy compared to unstimulated controls—a finding supported by Field and Scafidi's work with preterm neonates. In their protocol, infants aged 0–1 month underwent seven consecutive days of once-daily, 15-minute sensory stimulation, resulting in robust suction reflexes.

Comparison of the suction reflex in low-birth-weight infants before and after the oral stimulation intervention. Prior to the stimulation, only 1 respondent demonstrated a strong suction reflex; this number increased to 6 respondents following the intervention. Conversely, 15 respondents initially showed a poor suction reflex, but this number decreased to 4 after oral stimulation was administered. The Wilcoxon Signed Rank Test yielded a significance value of $p= 0.001$, indicating a statistically significant difference. Since $p< 0.05$, the null hypothesis (H_0) is rejected. This confirms that oral stimulation has a significant effect on improving the suction reflex in low-birth-weight infants.

DISCUSSIONS

Oral stimulation through massage enhances blood flow to the muscles, leading to vasodilation of the active muscle groups. This results in increased delivery of oxygen and nutrients to the tissues, along with elevated cardiac output. Additionally, oral stimulation

activates the vagus nerve (cranial nerve X), which enhances the secretion of gastrin and insulin, thereby improving nutrient absorption and promoting faster weight gain in infants [5].

Heightened vagus nerve activity also increases the infant's sense of hunger, which stimulates the suction reflex and encourages more frequent breastfeeding. The suction process involves the coordination of various structures and functions within the oral cavity, including the lips, tongue, soft and hard palate, and jaw. The primary muscles involved are the tongue and pharyngeal muscles, alongside other facial muscles. Weakness in these muscle groups contributes significantly to ineffective suction reflexes [10]. Oral stimulation has also been found to support the immune system, enhance lymphatic circulation to eliminate harmful substances from the body, induce positive changes in brainwave patterns, improve blood circulation and respiratory function, and stimulate the digestive and excretory systems [9]. It contributes to better weight gain, reduces depression and physical tension, promotes restful sleep, alleviates pain, relieves bloating and colic, strengthens parent-infant bonding, enhances breast milk production, fosters communication, improves recognition of infant cues, and builds parental confidence. A psychological perspective, breastfeeding is beneficial for both infant and mother, as it reinforces emotional attachment between them [5]. Therefore, mothers are encouraged to continue breastfeeding even if their infants are in an incubator, by practicing kangaroo care and performing oral stimulation as guided by physiotherapists and nurses [11].

This feeding insufficiency is attributed to underdeveloped neuromuscular coordination and orofacial musculature, finding that infants under one week of age frequently experience feeding delays. Physiologically, the suction reflex typically emerges 20–30 minutes after birth, is absent in neonates delivered before 32 weeks' gestation, and remains immature in those born prior to 36 weeks, explaining the high prevalence of weak suction among preterm infants [12].

Demographic analysis indicated that nearly half of the infants (n = 7; 43 percent) were assessed at five days of age, whereas only one infant (n = 1; 4 percent) was nine days old. A clear positive correlation emerged between postnatal age and suction proficiency. Regarding gestational maturity, most infants were born preterm (n = 24; 86 percent), with the remainder delivered at term (n = 4; 14 percent), underscoring the influence of gestational age on reflex quality. Delivery mode distribution showed that 16 infants (57 percent) were delivered via cesarean section and 12 (43 percent) vaginally. Emotional bonding may be attenuated following cesarean delivery, as maternal attention often centers on postoperative recovery rather than immediate tactile interaction. Nonetheless, maternal-provided tactile stimulation holds profound psychosocial significance, fostering secure attachment and contributing to the infant's long-term positive personality development [13].

The intervention targets both perioral and intraoral structures: eight gentle presses to the cheeks and lips, followed by approximately five minutes of intraoral stimulation—four compressions per quadrant—on the buccal mucosa, upper and lower gums, and tongue using a pacifier [8]. The session concludes with pacifier placement against the hard palate to elicit the reflex. Over a seven-day period, nurses, in collaboration with researchers, observed marked enhancements in reflex strength among stimulated infants [14].

Nutritional intake—exclusive breast milk or supplemental formula when breastfeeding is not feasible—also influences gastrointestinal function in these infants. The adjunctive use of a pacifier during stimulation further reinforces suction proficiency. Moreover, educating mothers about the importance of their active participation in delivering oral stimulation not only optimizes the infant's feeding capability but also strengthens maternal–infant bonding, thereby promoting positive long-term psychosocial outcomes [15].

From this research as we use to know that Nurses are expected to provide more intensive health education to families and actively encourage mothers to perform regular oral stimulation for their infants. Future research is recommended to further explore the impact of oral stimulation on the suction reflex using larger sample sizes and employing alternative assessment tools, such as structured observations and interviews.

CONCLUSIONS

Oral stimulation has a significant impact on the suction reflex in infants. Prior to the intervention, the majority of infants exhibited a poor suction reflex. Following the administration of oral stimulation, most infants demonstrated an adequate level of suction reflex. Although a few respondents remained within the "poor" category, improvements in their suction reflex were observed compared to their initial condition at the beginning of care.

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Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

REFERENCES

[1] Sutini, T., & Hariyanto, R. (2021). Differences Effectiveness Premature Infant Oralmotor Intervention (PIOMI) And Oromotor Stimulation (OMS) To Readiness Oral Feeding. Jurnal Ilmiah Ilmu Keperawatan Indonesia, 11(01).

[2] Hasanah, N. F. (2021). Determinan Kejadian Berat Badan Lahir Rendah (BBLR) Di Indonesia:(Analisis Data SDKI 2017). Universitas Islam Negeri Sumatera Utara.

[3] Lau, C. (2016). Development of infant oral feeding skills: what do we know? The American journal of clinical nutrition, 103(2), 616S-621S

[4] Roesli, Utami (2015). Pedoman Pijat Bayi. Jakarta: Trubus Agrividya.

[5] Fika Kharisma (2016). Effect Of Prefeeding Oral Stimulation Of Feeding Performance Of Preterm Infant. Boyolali. Diakses tanggal 17 Agustus 2017. http//www. fikakharisma.blog.id

[6] Rini Dwi Retnowati (2013). The Indonesian Journal Of Health Science. Vol.3 Jember : Universitas Muhammadiyah Jember. http //www. UMJ.com/ Jurnal Ilmiah. Diakses tanggal 18 agustus 2017

[7] Hwang Shwu Yea (2010). Effects of Prefeeding Oral Stimulation on Feeding Performance of Preterm Infants. USA : Indian Journal Of Pediatrics. http//www. medical.nic.in.com. Diakses tanggal 28 Agustus 2017

[8] Netal Khalessi (2015). The Role Of Oral Stimulation And Non- Nutritive Sucking On Independent Oral Feeding Of Preterm Infants. Iran : Iran University. http //www. UN iranianjurnal.com. Diakses tanggal 28 Agustus 2017

[9] Lai, H L& Good M (2012) An Overview Of Stimulation Therapy. USA : Indian Journal Of Nursing. http //www. nursing.in.com.Diakses tanggal 28 Agustus 2017

[10] Tom Lissauer & Avroy Fanaroff (2016) At A Glance Neonatologi. Jakarta : EGC

[11] Noviana, R., & Kartini, F. (2023). Kangaroo Mother Care (KMC) Support in Low Birth Weight (LBW). Jurnal Kesehatan Pasak Bumi Kalimantan, 5(2), 121–132.

[12] Da Rosa Pereira, K., Levy, D. S., Procianoy, R. S., & Silveira, R. C. (2020). Impact of a pre-feeding oral stimulation program on first feed attempt in preterm infants: Double-blind controlled clinical trial. PloS one, 15(9), e0237915

[13] Alinda Nur Ramadhani (2016) Pengaruh Stimulasi Oral Terhadap Kemampuan Menghisap Pada Bayi Prematur di RSUD Dr. Moewardi Surakarta. Surakarta : Universitas Muhammadiyah Surakarta. http//www.ejournal ilmiah.umm.com. Diakses tanggal 16 Agustus 2017

[14] Standley, J.M (2011) Efficacy Of Oral Stimulation Therapy For Premature Infants In The Neonatal Intensive Care Unit. Australia: A meta analysis Arch Dis Child Fetal Neonatal.http//www. UN Australian jurnal.com. Diakses tanggal 28 Agustus 2017

[15] Wardani, S., & Novita, R. (2022). The Relationship Between Mother's Education Level With Exclusive Breastfeeding In Bae Village, Bae District, Kudus Regency. Jurnal

Profesi Bidan Indonesia, 2(01), 15–22.