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IMPLEMENTATION OF PRETERM INFANT ORAL MOTOR STIMULATION INTERVENTION (PIOMI) ON VERY LOW BIRTH WEIGHT PRETERM BABY

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Abstract

Background: Very low birth weight is a condition of babies with a birth weight of less than 1500 grams. Premature or preterm babies are prone to nutrition deficiencies due to inadequate suction reflexes and inability of the digestive tract to absorb nutrients. Preterm Infant Oral Motor Intervention as known as PIOMI is an intervention used to stimulate the sucking reflex. The PIOMI intervention was carried out by massaging and stimulating the oral cavity, cheeks, and tongue before feeding once a day.

Objectives: This study aims to analyze the effect of administration of the PIOMI intervention on weight gain, increased intake and increasing LATCH on, Audible of swallowing, Type of nipple, Comfort level, Hold positioning as known as LATCH score.

Methods: This case study type experimental research design with nursing care approach. The population of this study consisted of very low birth preterm (<1200 grams) newborns. The study sample included 1 single case of very low birth weight preterm newborns, resulting from the strength analysis, who were treated in high risk neonatal unit university hospital. Data were collected using the Preterm Infant Chart Form and LATCH Breastfeeding Scale. PIOMI intervention was conducted for 7 consecutive days. Nutritional status evaluated each day and the sucking successes were evaluated at day 1 and day 7.

Results: The results indicated that after the intervention for 7 consecutive days the weight and diet increased. There was also an increase in the LATCH score before treatment until prior to discharge from the hospital (7-9).

Conclusion: Administration of PIOMI is expected to prevent delays in oral feeding, increasing LATCH score and overcome nutritional deficiencies in low birth weight infants.

Keywords: PIOMI, Preterm, sucking reflex

INTRODUCTION

Preterm or premature are babies born before 37 weeks of pregnancy, while low birth weight (LBW) babies are babies with a birth weight of less than 2500 grams (World Health Organization, 2014). In Indonesia, the incidence of preterm labor can be estimated from the incidence of low birth weight (LBW) babies. The incidence of LBW in Indonesia in 2015 was 13.03% and in 2018 it was 6.2% (Balitbangkes, 2018). LBW babies are classified based on their life expectancy as LBW (low birth weight), VLBW (very low birth weight), and ELBW (extremely low birth weight). VLBW are babies with a birth weight of 1000-1499 grams (Proverawati & Ismawati, 2014). Based on data from the Organization for Economic Co-operation and Development and WHO (2013), Indonesia ranks third as the country with the highest incidence of LBW (11.1%), next to India (27.6%) and South Africa (13.2%) (World Health Organization, 2014).

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. Another consequence of low birth weight includes developmental delays in the neurologic system which causes weak sucking muscle abilities and unstable oral capacity (da Costa et al., 2008). In addition, premature babies are prone to poor feeding, nutritional deficiencies, and growth retardation (Wandita, 2016). Roughly 23% of premature infants with gestational age ≤ 30 weeks experienced feeding delays until age 2 years (Crapnell et al., 2013). While the daily nutritional needs of preterm infants are controllable during feeding through a orogastric tube (tube inserted into the digestive tract in hospital, after being discharged providing the daily needs for the preterm infants) is challenging as baby cannot successfully suckle the mother's breast after the transition to oral feeding (Kaya & Aytakin, 2017). Several factors that contributing infants' failure to suckle to mother breast that is: decreased vital signs when breastfeeding, unable to maintain a

stable physical condition while breastfeeding, unable to maintain coordination of breathing-swallowing and sucking in infants, babies experience choking and stop breathing while breastfeeding, some babies are unable to maintain optimal postural tone while breastfeeding (Wahyuni et al., 2022). The failure in cannot successfully suckle the mother's breast after the transition to oral feeding can lead to poor weight gain, returning to tube feeding, and persistent vomiting in premature infants (Buldur et al., 2020; Kaya & Aytakin, 2017). Additionally, although their mother is willing and able to breastfeed, preterm babies cannot suckle adequately they are not properly stimulated (Buldur et al., 2020; Kaya & Aytakin, 2017). Premature infants who lack stimulation tended to stay longer in the hospital and have a lower success rate of breastfeeding indicated by a lower "LATCH" score than adequately stimulated babies (Kaya & Aytakin, 2017). Therefore, it is very crucial to enhance sucking skills and 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 reflexes in infants. Several studies discuss the methods of stimulating the baby's sucking reflex. One of the methods is the PIOMI (Preterm Infants Oral Motor Intervention) method, which was developed from the BOMI (Beckman Oral Motor Intervention) (Lessen et al., 2015). This method is 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 (Ghomi et al., 2019; Lessen Knoll et al., 2019). The PIOMI method is a safe and suitable method for use in premature infants who have a stable clinical condition, do not have respiratory problems or congenital abnormalities (Ghomi et al., 2019; Lessen Knoll et al., 2019). In previous research, oral motor intervention combined with non-nutritive sucking can significantly improve the

oral motor skills of premature newborns, improve the oral feeding process, improve oral feeding outcomes, and reduce the occurrence of side effects of transition to oral feeding including apnea, abdominal distension, and decreased blood oxygen saturation other than vomiting, compared to non-nutritive sucking alone (Li et al., 2022). In addition, the PIOMI method can be taught to primary caregivers (mothers) by trained nurses to increase bonding between them (John et al., 2018). Besides, oral motor interventions given to preterm infants may improve feeding performance. This reduced transition time to oral feeding, duration of hospital stay and parenteral care in infants receiving the intervention when compared with infants receiving standard care (Greene et al., 2016).

Several earlier studies examined the implementation of PIOMI in premature infants including the study of Ghomi et al., (2019) which was conducted on infants at 26-29 weeks' gestation. The results of the six measurements for both groups clearly showed that the PIOMI group started oral feeding at a lower gestational age, and achieve independent oral feeding in a shorter time. In addition, examination of weight gain indicated a similar trend in both groups in terms of weight gain from birth to discharge from the hospital (Ghomi et al., 2019). In addition, Lessen (2015) administered PIOMI to preterm babies in the NICU at a gestational age of 26-34 weeks and his study revealed that the average volume of oral feeding (percentage of prescribed feedings) was higher in the intervention group than in the group that only received standard care in the NICU in all groups at measurement day (day 1, 3, 5 of treatment). The aim of this study was to apply and analyze of the PIOMI (preterm infant oral motor intervention) on weight gain, diet and LATCH on, Audible of swallowing, Type of nipple, Comfort level, Hold positioning (LATCH) scores in very low birth weight newborn.

METHODS

Study Design

This study used experimental case study design with a nursing care approach on a single patient case.

Setting

The study was conducted in the High-Risk Neonatal Room at the Dr. Kariadi Hospital of Semarang in November 2021

Research Subject

Inclusion criteria involved birth weight below 1500 grams and gestational age less than 37 weeks. Exclusion criteria for this study were infants with respiratory problems, using Continuous positive airway pressure (CPAP) therapy or mechanical ventilators, infants with digestive disorders, and post-major surgery infants

Instruments

Outcomes measured in this study was breastfeeding ability using LATCH Score. Instrument used in this research was LATCH Breastfeeding Score.

LATCH Breastfeeding Score was originally developed by Jensen et, all (1994) to systematically asses and documenting breastfeeding process. LATCH is a breastfeeding charting system that provides a systematic method for gathering information about individual breastfeeding sessions. The system assigns a numerical score, 0, 1, or 2, to five key components of breastfeeding. Each letter of the acronym LATCH denotes an area of assessment. 'L' is for how well the infant LATCHes onto the breast. "A" is for the amount of audible swallowing noted. "T" is for the mother's nipple type. "C" is for the mother's level of comfort. "H" Is for the amount of help the mother needs to hold her infant to the breast (Jensen et al., 1994). The LATCH Breastfeeding Score Observation Sheet is filled in while author observing the baby being breastfed by the mother. LATCH measured before the intervention and at the seventh day.

Nutritional status was measured every day in 7 consecutive day every morning after wiping the baby. Variables measured include body weight, nutritional intake, frequencies of defecation, residue in OGT, vomiting, and flatulence which are recorded in the Preterm Infant Chart Form.

Data Analysis

The data were analyzed quantitatively by observing the increase in nutritional status by charting weight gain and nutritional intake in infants. While breastfeeding ability was analyzed narratively by observing the increase of 5 key components on the LATCH score.

Ethical Consideration

This study was approved by Dr. Kariadi hospital with official note permit number DL.00.01/IV.4/2021. The participants and health professionals who elected to participate in this study will be asked to take part in this a case study. All participants will be provided informed consent prior to data collection, after being informed about the nature of the study, the voluntary nature of participation, the right to refuse to participate in the study and to withdraw consent at any time without reprisal, the anticipated benefits and potential risks of the study, and the confidentiality of responses.

RESULTS

The assessment was performed on a baby of Mrs. S that was born in the hospital Dr. Kariadi on 2 November 2021, with a birth weight of 1200 grams with a gestational age of 30 weeks, multifetal birth, Appearance, Pulse, Grimace, Activity, and Respiration (APGAR) score of 8-9-9, and had intra uterine growth restriction (IUGR). In terms of Antenatal Care, Mrs. S received it once during her pregnancy in the 3rd trimester. At the time of assessment, the baby's condition was good, and consciousness was *compos mentis*, with breathing 43x/min, temperature 36,6°C, a pulse of 138x/min, oxygen saturation of 98%. The baby of Mrs. S had no breathing problems, while the baby's intake need was 34 ml/3 hours per orogastric

tube (OGT). The type of nutrition was breastmilk substitute, no infusion or oxygen is installed, and during physical examination, the suction reflex was weak. From the results of the anamnesis with Mrs. S, the baby sucked only briefly, the attachment was good and was not fussy after feeding, did not vomit, and defecated 3 times a day. LATCH score was 7 out of 10. Care issues that arose were nutritional deficit related to inability to digest food and to absorb nutrients, and ineffective breastfeeding due to inadequate milk supply, inhibition of neonates (prematurity), and multiple births.

The intervention to overcome the nutritional deficit was enteral feeding, while the intervention to treat ineffective breastfeeding was preterm infant oral motor intervention (PIOMI). The intervention was carried out for 7 consecutive days with a duration of 5 minutes before feeding. PIOMI is a procedure performed in the form of massage of the baby's lips and oral cavity to improve the sucking reflex and breastfeeding abilities of the baby. PIOMI was directly administered by the researcher for 5-10 minutes every day for 7 consecutive days. PIOMI was performed before feeding (afternoon or morning after wiping the baby). During the PIOMI intervention, the researchers saw and waited for the baby's reaction. If the baby showed signs of shortness of breath, vomiting, or other signs of refusal, the administration of PIOMI was postponed. In this study, the nursing issues are divided into nutritional deficiencies and ineffective breastfeeding.

Application of the PIOMI method to improve the baby's diet and nutritional status

Based on table 1, in 7 days of weight measurement there was an increase on every measurement day except the second day. The smallest weight gain was 0 grams and the largest was 130 grams. The average baby weight gain is 57.5 grams per day.

Table 1. Evaluation of Nutritional Status

Day	Nutritional Status
Day 1	The baby weighs 1385 grams, has 4x defecation, no bloated belly, no vomiting, no residue in the OGT, diet absorption of 34 ml every 3 hours
Day 2	The baby weighs 1440 grams, has 4x defecation, no bloated belly, no vomiting, no residue in the OGT, diet absorption of 34 ml every 3 hours
Day 3	The baby weighs 1440 grams, has 4x defecation, no bloated belly, no vomiting, no residue in the OGT, diet absorption of 34 ml every 3 hours
Day 4	The baby weighs 1485 grams, has 3x defecation, no bloated belly, no vomiting, no residue in the OGT, diet absorption of 36 ml every 3 hours
Day 5	The baby weighs 1530 grams, has 3x defecation, no bloated belly, no vomiting, no residue in the OGT, diet absorption of 38 ml every 3 hours
Day 6	The baby weighs 1660 grams, has 3x defecation, no bloated belly, no vomiting, no residue in the OGT, diet absorption of 40 ml every 3 hours
Day 7	The baby weighs 1730 grams, has 3x defecation, no bloated belly, no vomiting, no residue in the OGT, diet absorption of 42 ml every 3 hours

Source: Primary Data of Questionnaire, 2021

Table 1 presented the results of routine measurements that were carried out every day during the intervention. From the first day to the seventh day, the baby's weight tends to increase, except on the third day on which there was no increase both in the body weight and the diet.

PIOMI is a massage technique performed on the oral motor area to increase the ability and activate contraction muscle movements in preterm infants. This massage is performed before oral feeding. The PIOMI intervention improves functional response to pressure and control of the cheek, lip, jaw, and tongue. On the examination, Mrs. S' baby indicated weak

rooting reflex and inadequate suction reflex. This is because the sucking reflex component, which has started to form since week 28 of gestation takes time to synchronize until week 36. Thus, at week 30 the reflex has not been formed or remains irregular, and the baby is easily exhausted (Crapnell et al., 2013). In line with the maturation process, the more regular mechanism can start at 32-36 weeks of gestation (Ikatan Dokter Anak Indonesia, 2013)

In this study, the baby gained weight every day except on day 2 of intervention. The intervention was directly performed by the researcher. The baby's weight gain varies by 0-130 grams every day with an average weight gain of 57.5 grams. In John's research (2018) In the study by John (2018), that used PIOMI, the the weight gain of infants given the PIOMI intervention by therapist was 63 grams, but in our study, this was 57.5. It may be due to intervention duration that in our study was 7 days but in Lessen's study was 10. And also, the number of research subjects in the intervention group analyzed reached 10 people, while in this study there was only 1 research subject.

Lessen (2019) PIOMI can increase the average oral intake in preterm babies. This also has an impact on weight gain and shorter LOS in infants undergoing PIOMI compared to infants undergoing standard care (Lessen Knoll et al., 2019). This is in line with the results of the study which showed that oral feeding increased from the first day to the seventh day. On the seventh day, the baby had reached the weight of 1730 grams and was allowed to go home.

Application of the PIOMI method for effective breastfeeding

In this study, the LATCH score was measured on the first day before treatment and on the seventh day. Table 2 shows an increase in the attachment indicators and the baby's swallowing sound. While for indicators of nipple type, comfort level and hold positioning there is no difference between pre and post intervention.

Table 2. Comparison of LATCH score before and after intervention

Indicator	Pre-intervention	Post-intervention
L (<i>Latch on</i>)		
0= Poor Latching, weak sucking	1	2
1= Need stimulation to suck		
2= Good Latching, strong and Rhythmical sucking		
A (Audible swallowing)		
0= No sound	1	2
1= Few times		
2= Intermittent and frequent		
T (Type or shape of nipple)		
0= Inverted	2	2
1= Flat		
2= Normal		
C (Comfort level)		
0= Pain, cracked nipple, breast engorgement	2	2
1= Nipple blisters, Reddened		
2= No complaint		
H (Hold positioning)		
0= Full assist	1	1
1= Minimal assist		
2= No assist		
Total	7	9

Source: Primary Data of Questionnaire, 2021

Table 2 presented the result of the LATCH score assessment on the first day and the seventh day showed there was an increase from a total score of 7 to 9.

The LATCH score was assessed through observation during breastfeeding. From Table 2, the results of the LATCH score assessment on the first day and the seventh day showed there was an increase from a total score of 7 to 9. This increase was caused by increasing attachment indicators and swallowing sounds. Before the intervention, the attachment needed to be stimulated to improve the baby's suction power. After day 7, the baby's attachment was good and the suction was strong with a regular and rhythmic rhythm. Meanwhile, in the indicator of swallowing sound, before the intervention, the swallowing sound was rarely heard, and often the baby was overwhelmed in swallowing milk so that the milk dripped

through the attachment between the breast and the baby's lips. After the 7th day, the swallowing sounds can be heard frequently and regularly, there were no drops from the baby's lips, and the baby did not choke.

For effective breastfeeding, the baby must not only express milk from the breast but also coordinate swallowing and breathing to ensure milk bolus safely move from the oral cavity to the digestive system, while maintaining good cardiovascular stability (Briere et al., 2015). The tongue is a key structure for effective breastfeeding because during breastfeeding, the nipple will lengthen and an early sucking period occurs to trigger the milk ejection reflex (Geddes et al., 2012). The tongue lengthens the nipple and adapts to changes in milk flow during oral feeding. From the results of observations of the LATCH score in table 2, there was an increase in the baby's swallowing and sucking rhythm was found to be regular and strong. This is also in line with Liu (2013) that early oral motor management intervention in premature infants with very low birth weight improves feeding performance.

In this study, Mrs. S' baby was born with twins. The baby can suckle but the mother only breastfeeds on the first day of intervention because she needed to care for the baby's twin who had been discharged from hospital. Mrs. S did not visit from the second day to the seventh day so the diet was only given through a syringe pump and gavage tube. In fact, stimulating the suction reflex and the ability to suckle requires sucking exercises which are usually done directly during breastfeeding. Additional oral feeding cannot be measured due to a concern of nipple confusion if it was provided using a bottle. Therefore, the level of increase in oral feeding of Mrs. S' baby can only be measured on the seventh day. The role of the mother as the main caregiver is very crucial because according to research by John et al., (2018) which compared the giving of PIOMI by the therapist and by the baby's mother, babies who underwent PIOMI by their mothers present more adequate behavior and earlier breastfeeding behavior. Oral motor stimulation

carried out by the mother can facilitate the emotional attachment, because it involves intense interaction in recognizing and responding to the cues (John et al., 2018). This shows the importance of family-centered care, by teaching mothers to provide oral motor stimulation for their babies to improve feeding behavior. In addition, Fucile (2018) also says that increasing breastfeeding in twins has some challenges, including the lack of breast milk availability due to sharing with their twins.

DISCUSSION

PIOMI mechanism in increased breastfeeding and weight gain

In their study, Ghomi et al., (2019) examined the effect of administration of PIOMI on premature infants aged 26-19 weeks with six times of measurements for both groups. The result of their study showed that the intervention group started oral feeding at a lower gestational age, and achieve independent oral feeding early. This result indicates faster oral-motor development in the intervention group. The positive outcome of the intervention on the development of the baby's oral-motor skills ultimately leads to faster development and weight gain and results in shorter hospitalizations. PIOMI performed through touch and pressure will increase blood flow and cause active muscle vasodilation so that oxygen and other nutrients in the tissues increase and cardiac output will improve (Ghomi et al., 2019). In addition, oral stimulation of touch and pressure on vagal tone also will increase the absorption of gastrin and insulin, which in turn improves food absorption improved, and causes hunger more quickly which will eventually stimulate the sucking reflex (Sumarni et al., 2021).

PIOMI would be better be provided by primary caregiver or mother

In this study, PIOMI was given in just 7 days, whereas in the Lessen study it was given in 10 days (Lessen et al., 2015) or even more. Li research shows that giving oral motor intervention for 14 days shows good clinical

signs (Li et al., 2022). The administration of PIOMI in this study was given for 10 minutes, just before the baby suckles directly from the mother's breast. The heavy workload in the hospital means that health workers are sometimes unable to provide PIOMI at a precise time, so it is better to empower families, especially mothers, so that they can be trained to give PIOMI to infant before breastfeeding. Giving PIOMI by the mother can provide a sense of comfort to the baby and the baby will become calmer (John et al., 2018). In this study the indicator of hold positioning in mother S had not yet achieved a perfect score even though it had increased from before the intervention. Giving PIOMI may increase the bonding and help mothers to be more proficient in breastfeeding their babies so that they can increase the hold positioning indicator on the LATCH score. Although in John's research, there were no significant differences between the groups in the outcomes of weight gain per day, increase in head circumference, days to initiation of intervention, number of days to transition to complete feeds or length of hospital stay. Infant breastfeeding behavior of quiet alert state was significantly better in the intervention group whereas PIOMI given by mother (John et al., 2018).

CONCLUSION

After the intervention for 7 consecutive days, there was an increase in weight gain, diet provision, and sucking ability indicated by increase in the LATCH score. PIOMI would be better to be carried out in collaboration with the primary caregiver or mother

SUGGESTIONS

The limitations of this study are the small number of cases so that there is no comparison between the provision of PIOMI interventions for different infant conditions and the lack of the mother's role as the main caregiver in providing the intervention. Future studies with larger sample with different cases and interventions that involve families in providing

care may have resulted in evidence to substantially influence the clinical practice.

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The researcher declares that there was no conflict of interest in this research.

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AUTHOR CONTRIBUTION

Salsabila Izzaturrohmah: Design of study, analyze and develop theory-guided and/or evidence-based nursing model in the PIOMI intervention on very low birth infants.

Zubaidah Zubaidah: Analyze and develop theory-guided and/or evidence-based nursing model in the PIOMI intervention on very low birth infants.

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