EXPLORING TECHNIQUES TO HELP THE PREMATURE INFANT TRANSITION TO ORAL FEEDING

Honors Thesis

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Abstract

Premature infants are subject to experiencing many complications as they are underdeveloped and require special care. One issue they experience are feeding difficulties and often have to be started on tube feeding. This integrative review aimed to explore different techniques to help the premature infant transition from tube feeding to oral feeding and evaluated the effectiveness of those techniques. A literature search using the databases CINAHL and Medline were used and seventeen articles from 2018-2023 were examined. Two techniques were discussed: non-nutritive sucking (NNS) and oral motor stimulation (OMS) and various variables were assessed to determine how effective they were on the premature infants and their readiness to transition to oral feeding. Both techniques were shown effective and showed positive results on the different variables that were evaluated. The results demonstrate that new mothers and nurses can use these techniques; however, a limitation to the studies was that there were more randomized studies compared to longitudinal studies.

Keywords: *premature infant, feeding techniques, transition to oral feeding, non-nutritive sucking, oral motor stimulation*

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Introduction

According to the World Health Organization (WHO), approximately 15 million babies are born prematurely every year (Rodriguez, 2021) and the numbers are continuing to rise. When an infant is born prematurely, they are underdeveloped which puts them at risk for developing many health complications such as physical disabilities, pulmonary diseases, developmental neurological concerns, and difficulties in feeding (Alidad, 2021). Receiving nutrients is important for all infants but is especially important for premature infants as they are born too early and have not received all the adequate nutrients they were supposed to receive in utero. That is why one of the most important priorities in caring for the premature infant is addressing their feeding difficulties. If no interventions are made to address the feeding difficulties premature infants face, they may have issues transitioning to oral feeding which can further delay their growth and development. Consequently, this could lead to longer hospital stays, longer separation from their families, the development of more health complications, or even death.

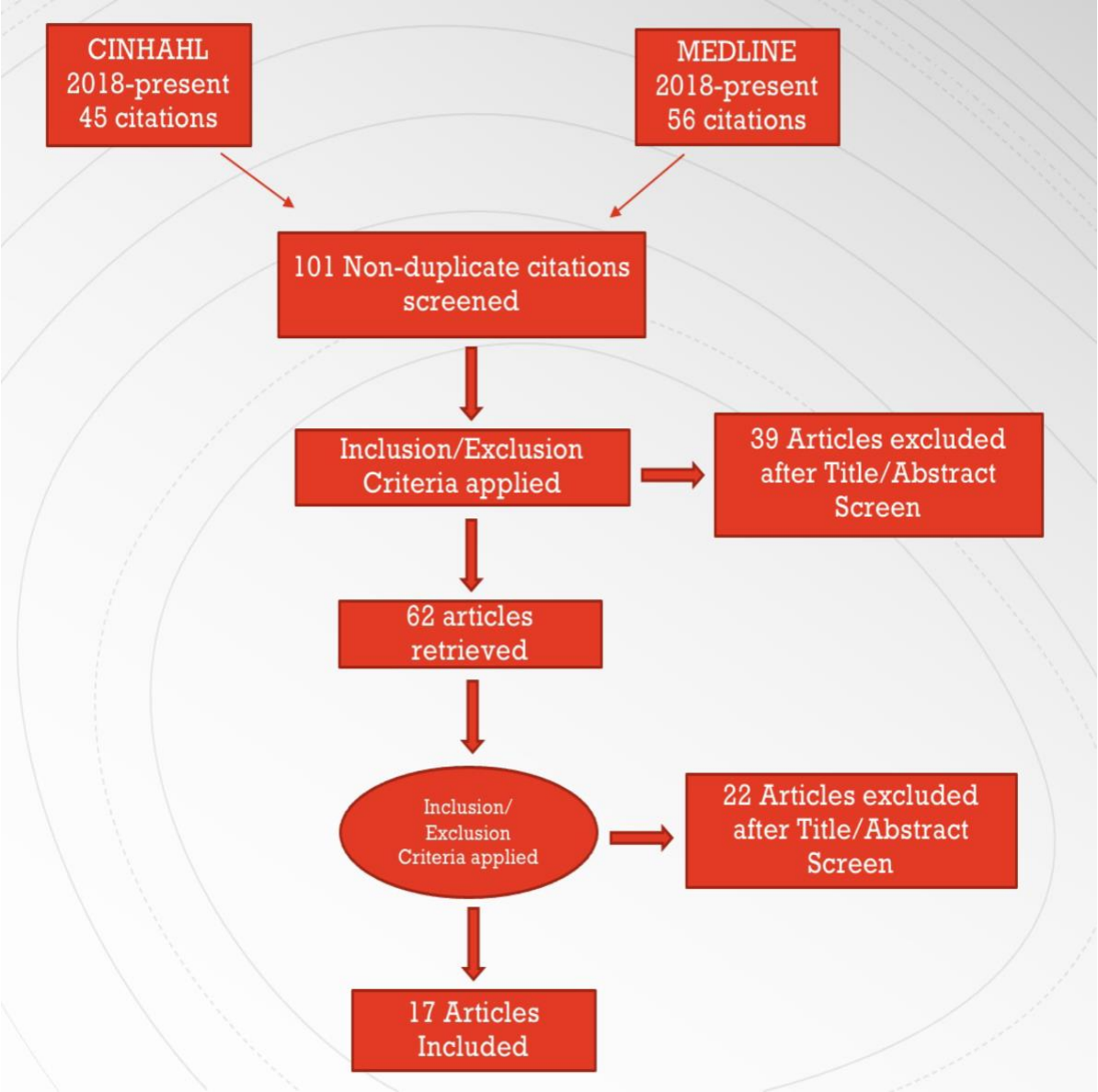
Background

The ability for the premature infant to feed is vital because it allows them to gain adequate nutrition to be a healthy weight so they can continue to develop. A premature infant (PI) is defined as an infant born before 37 weeks (about 8 and a half months) gestation (Alidad, 2021). Because premature infants have underdeveloped gastrointestinal systems and have not had enough time to practice sucking and swallowing in utero, they cannot be fed orally and must be fed through a feeding tube. Eventually, the goal is to get the premature infant to transition from a feeding tube to oral feeding either through breastfeeding or bottle feeding as soon as possible. The transition can be challenging for premature infants as approximately 30% to 40% of preterm babies experience oral feeding problems during this period (Çelik et al., 2022). That is why techniques that allow premature infants to get used to oral feeding may be beneficial as they transition from tube feeding to oral feeding. The early initialization of these techniques can most likely shorten the transition time that would take the infant to switch which can possibly delay any further complications and shorten hospital discharge times. These techniques should also aid in the premature infant's ability to nutritively suck, meaning that they can help the infant practice coordination of breathing while sucking and swallowing and strengthening those muscles. If they can do that, it should allow them to feed orally safely, especially to avoid the risk of aspiration. The techniques explored to aid in the transition for premature infants were non-nutritive sucking (NNS) and oral motor stimulation (OMS).

Methods

For this research, Whittemore and Knafl's structure of an integrative literature review was used. An integrative review includes problem identification, a literature search, data evaluation, data analysis, and presentation from different methodologies (Whittemore & Knafl, 2005). The purpose of an integrative review is to, "contribute to the presentation of varied perspectives on a phenomenon of concern and has been advocated as important to nursing science and nursing practice" (Kirkevold 1997, Estabrooks 1998, Evans & Pearson 2001). To complete the literature search, the databases CINAHL and Medline were used through the Salem State University Library Advanced Search. A Boolean search was done using the keywords such as "premature infant," "transition to oral feeding," "feeding techniques," "non-nutritive sucking," "nutrition," "feeding difficulties," "swallowing techniques," and "oral motor stimulation." The search was also filtered to contain articles from 2018-2023 to ensure the research was recent and peer reviewed. The inclusion criteria in these research articles are infants born before 37 weeks (about 8 and a half months) gestation. The exclusion criteria are infants born after 37 weeks (about 8 and a half months) gestation as they are considered full-term. Premature infants with congenital anomalies such as cleft lip was also not included as those anomalies have a direct effect on the ability to feed orally. Evaluation of the effectiveness of these feeding techniques will be through evidence that the premature infant was able to gain weight through improved feeding performance, maintain physiological stability during feedings, and show readiness to transition from tube feeding to oral feeding.

Figure 1: PRISMA Diagram



Review of the Literature

Non-Nutritive Sucking

Non-nutritive sucking (NNS) is the action of sucking without the introduction of any fluid like milk. The goal of NNS is for the infant to practice sucking so that when fluid like milk is introduced to them eventually, they can suck on it successfully. NNS is regarded as a technique to help the PI transition because it helps them practice how to nutritively suck which would involve coordination between sucking and swallowing, while still being able to breathe involving the lips, tongue, cheek, jaw, larynx, and pharynx (Harding et al., 2018). NNS can be done in several ways, one being on an empty breast. Once the lactating mother empties the milk from her breast, she can introduce her nipple to the infant so they can suck on the breast. Because newborn infants often struggle with latching onto a nipple or maybe the mother is unable to empty her breast completely, NNS can also be done using a pacifier as an alternative. The infant would wrap their lips around the pacifier teat and suck on it as it can emulate a breast nipple which would be great practice for breastfeeding. The pacifier teat can also emulate a baby bottle nipple which would be great practice for bottle feeding.

The use of a pacifier versus breast for NNS has been a debate as pacifiers are seen as more of a concern for some parents. Clinical trials have been done to compare the differences between the two and see if there is a major benefit of using one over the other. In a block randomized study, thirty-two premature infants were randomly divided into two groups: one with NNS on an empty breast and one with NNS with a pacifier. Both interventions were given once a day for fifteen minutes for ten days before feedings. Mothers were given log sheets to record their infants' performance and noted any adverse

effects such as periods of apnea, bradycardia, and vomiting. The study looked at three outcome variables: the ability of the PI to receive greater than or equal to 50% of direct breastfeeds (exclusive breastfeeding acquisition), the transition time from tube feeding to complete oral feeding (time to achieve independent oral feeding), and the time of admission to discharge (length of hospitalization). At the end of the ten days, the results revealed that although there were more infants in the NNS on an empty breast group who were able to exclusively breastfeed compared to the other group, they were not able to transition faster than the infants in the NNS with a pacifier group. There was also no significant difference in discharge times. (S. Fucile et al., 2020). This study shows that NNS can be done either on an empty breast or a pacifier with no major differences regarding oral feeding establishment, transition times, or hospital discharges. Studies regarding NNS often use either a pacifier or an empty breast, but the research shows that both methods can be used while yielding the same results.

Many variables can be looked at to see whether NNS is effective or not. The previous study looked at three different ones throughout the time the PI was in the hospital up until the time they were discharged. Other variables that can be looked at are vital signs (heart rate, oxygen saturation, respiratory rate, and temperature) and overall feeding performance. Vital signs represent the physiological stability of the PI, making sure that their body is functioning properly during the intervention. Feeding performance can show if the NNS had any effect on the PI's feeding ability, either positive or negative. The goal would be for both vital signs and feeding performance to be improved with the introduction of NNS for it to be effective. An example of NNS being ineffective and potentially causing harm would be if a PI's oxygen saturation level decreased, meaning

that the PI may be struggling to breathe. One study from Dur and Gözen compared heart rates, oxygen saturation levels, and feeding performances before, during, and after feedings. There were two groups in the study: the experimental group and the control group. The experimental group was given NNS for three minutes one hour before feeding while the control group was given nothing. Both groups had their vital signs taken before, during, and after feeding. For NNS to be effective, it should have no detrimental effects on heart rates and oxygen saturation. The heart rate (normal range in PIs: 120-160 beats per minute) should be lower in the experimental group while feeding compared to the control group and the oxygen saturation (normal range in PIs: greater than or equal to 90%) should be higher in the experimental group compared to the control group. The evaluation of effective feeding performance would be that the experimental group would have a higher intake of orally fed food, have a shorter feeding period, and ingest a higher quantity of food per minute. As a result, for vital signs, the study found that the heart rate of the PIs in the experimental group after feeding was lower and the oxygen saturations in the experimental group during and after the feeding were statistically higher than the control group. For feeding performance, PIs in the experimental group consumed more during the first meal compared to the control group. Feeding efficiency rates in the experimental group were also higher compared to the control group (S. Dur & D. Gözen, 2021).

Another experiment from Thomas and Matthew had a similar study with a similar setup. The main difference is that their study included respiratory rate and temperature regarding vital signs in comparison to the earlier study which only included heart rate and oxygen saturation. The study also included other variables like the amount of food the PI

was able to tolerate as well as their weight by the time of discharge. The study showed that NNS was effective as the PIs vital signs improved, were able to gain weight, were able to transition to oral feeding faster, and had a shorter hospital stay (Thomas & Mathew, 2019). The connection between physiological stability and nutritional status can be a great indicator to evaluate if NNS can cause more good than harm. Ultimately, the intervention should help the PI transition to oral feeding safely and improve those variables for desirable outcomes.

Oral Motor Stimulation

Oral motor stimulation (OMS) is motor stimulation of the jaw, lips, tongue, and soft palate with the finger to activate the oropharyngeal mechanism (Atay et al., 2023). The finger can be used to tap or stroke the area to illicit a response. This technique addresses the problem of decreased muscle tone and movement that PIs have due to their underdevelopment. The goal of OMS would be for the muscles around the PI's mouth and tongue to strengthen to develop better motor control to orally feed. Two similar studies were looked at that used similar variables to evaluate the effectiveness of OMS. The variables of transition times from tube feeding to oral feeding were both used as this variable is one of the best indicators of whether the intervention of OMS is effective. Overall feeding performance and hospital discharge times were also looked at as well with the goal that OMS would shorten the length of the hospital stay for the PI. In a randomized controlled trial, one hundred two PIs were looked at over ten months. There were two groups, the experimental and control groups, where the experimental group received OMS for five minutes twice a day. The OMS was given fifteen minutes before

the PI's feeding schedule. As a result, feeding performance was better in the PIs in the experimental group as they had a higher overall intake and rate of milk transfer compared to the control group. They also had a shorter transition time to oral feeding and a shorter stay (Thakkar et al., 2018).

The other study also looked at those same variables and yielded the same results regarding outcomes, but also included a unique assessment tool called the LATCH Breastfeeding Assessment Tool developed by Jensen et al. (1994). This tool essentially looks at how well an infant can breastfeed, and, in this case, it would be after receiving the OMS. The LATCH tool consists of five evaluation criteria: L for latch on the breast (measuring how well the infant can latch onto a breast), A for audible swallowing, T for the type of nipple, C for comfort, and H for hold/help. Each item was rated either a 0, 1, or 2 with the lowest total score being 0 and the highest total score being 10. The experimental group had better LATCH scores with an average score of 8.37 ± 0.54 compared to the control group with an average score of 7.06 ± 0.83 (Celik et al., 2022). This shows that after OMS, the PI could have better breastfeeding outcomes and transition faster to oral feeding. When looking at the effectiveness of OMS, it is important to see results that the intervention helped the PI successfully transition to oral feeding, but it is also important to evaluate the effectiveness of their feed before discharge. LATCH, although only exclusive to breastfeeding, is another great variable that can be used to measure if the intervention of OMS had any effect on how well the PI could breastfeed in addition to the other earlier variables mentioned. To conclude, OMS showed improvement on all the variables for the PI to transition to oral feeding.

Discussion

The literature examined two types of techniques that were studied to determine the effects they had on the PI and their transition from tube feeding to oral feeding. NNS was looked at as a technique that can aid in the PIs' ability to suck either on a pacifier or breast. OMS was also looked at as another technique that involves stimulating the area of the oral cavity to increase muscle tone crucial for eating. The results show that both NNS and OMS are effective in helping the PI transition from tube feeding to oral feeding as both showed evidence of improved feeding performance, weight gain, and shorter hospital stays. This means that both techniques are safe to practice by mothers after giving birth or neonatal intensive care unit nurses who take care of PIs. It is important that although shown effective with minimal risks, a PI may not be able to tolerate the interventions and in that case, the intervention should be stopped right away. For example, if the PI's respiratory rate is drastically increased due to the intervention, it could be causing more harm than good, which in turn should be discontinued. It is also important to note that although readiness may be proved once, that does not mean that the PI is completely ready to transition, nor does it mean that they are fully ready to be discharged. A limitation is that some studies were limited to only one feeding period which is not a complete sign of full readiness, however, can show signs of readiness. Longitudinal studies are preferred as progression can be examined over a period, preferably from the time of birth to the time of discharge. Additionally, since both techniques target different areas of the ability to orally feed, they can be used together, and more studies can potentially be done to compare the effects of the two combined versus each intervention separately.

Conclusion

The difficulties in feeding that PIs face are very prevalent and can hinder their growth and development. The longer they must have a feeding tube in, the longer they must stay in the neonatal intensive care unit which makes it hard on families who are eager to bring their newborn home. One of the ways this difficult time can be cut down is by gradually seeing improvement in the PI's ability to feed on their own. Techniques that can help the PI transition to oral feeding can help them strengthen their muscles to be able to suck and swallow food which in turn can help them gain an adequate weight so they can be stable enough to be discharged. Based on these conclusions, NNS and OMS should be considered as interventions that can help the PI transition as they are both safe and of no cost. This also raises the topic of any other techniques that are out there that can potentially be as effective or even more effective than NNS and OMS.

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