Effect of Oro-Motor Intervention on Sucking Behaviour and Feeding Skills among Preterm Neonates

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Abstract

Preterm neonates oral feeding has been one of the common problems worldwide. A premature infant who is born at less than 36 weeks of gestation, usually has a problem in feeding and requires the use of enteral feeding. This study aimed to evaluate the effectiveness of Oro-motor intervention on sucking behaviour and feeding skills among preterm neonates. The study was conducted at the neonatal intensive care unit (NICU) of Al-Galaa Military Hospital in Cairo, Egypt. A purposive sample of 59 preterm neonates was recruited from the NICU. Data were collected using an instrument of 4 parts: part one, a demographic data questionnaire about the preterm neonats characteristics, and part two. "Preterm infant oral feeding readiness assessment scale Chinese version"(PIOFRAS-CV), part three, sucking rate and sucking amount, and part four oral feeding process measures . The result, of the study, found statistically significant differences in preterm neonates' oral feeding and readiness for sucking before and after implementing the Oro -Motor intervention. After 14 days, there was a significant difference between the intervention and control group in the mean sucking rate and amount of sucking (14.3226±2.10) compared to the control group(11.9643±1.50).Conclusion: The study concluded that Oro-motor intervention positively impacted the sucking and feeding skills of premature neonates effectively promoting their feeding abilities. Recommendation: As a part of the standard of care for all preterm neonates, the study recommended reinforcing the significance of utilizing Oro-motor intervention programs on the transition to oral feeding and feeding readiness, which is a safe and effective non-invasive intervention.

Keywords: Oro-Motor Intervention, feeding skills, sucking behaviour, preterm neonate.

Introduction

Annually, an estimated 15 million preterm infants are born globally, which accounts for about 11% of global births **(Walani, 2020)**. Premature infants have underdeveloped mouth musculature, an inability to coordinate breathing, sucking, and swallowing which leads to oral feeding difficulty that negatively impacts their normal development and increases morbidity risk **(Howe et al.,2007; World Health Organization, WHO, 2021).**

Oral feeding in preterm neonates is a complex process, sucking and swallowing functions begin to develop during the fatal period, at 15 weeks of gestational age the non-nutritive sucking begins, followed by settled swallowing between 22 and 24 weeks. While from 32 to 34 weeks of sucking, swallowing, and more coordinated. At 37 weeks, these functions are working together smoothly **(Lau, 2015; Parker et al., 2021).**

Premature infants, often face several challenges including a weaker muscle tone around the mouth and less tongue strength, weak sucking reflex, and poor tongue coordination which hinder their ability to feed orally. As a result, these infants may experience growth retardation, inadequate nutrient intake, prolonged hospital stay, and risk for aspiration, preterm infants have immature brain development, respiratory disorders, immature sucking and swallowing, and reduced oral motor activity, which has effects on normal growth and development of infant **(Atay et al., 2023; Bryant -Waugh et al., 2010)**

To address these issues, many premature infants require admission to the Neonatal

Intensive Care Unit (NICU) and rely on tube feeding (gavage feeding) until they develop sufficient oral motor skills to feed independently. Oral Motor Stimulation (OMS) interventions have been developed and are based on sensory stimulation of the lip, jaw, gum, internal cheek, tongue, and soft palate (Rhooms et al., 2019). Research has demonstrated that OMS enhance the development of premature infants' oral motor skills such as sucking, swallowing, and tongue movement, enhances their feeding readiness, improves weight gain, promotes the transition from enteral to oral feeding, and reduces the length of stay in NICU **(Li et al., 2022; Mohamed & Shafik., 2016; Neiva et al., 2014).**

Oral motor intervention is sensorial stimulation of the lip, jaw, gum, tongue, soft palate, and internal cheek that affects oropharyngeal mechanisms physiology and improves feeding functions, to improve oral feeding skills in preterm, using oral motor stimulation as an early supplementary intervention strategy. **(Rhooms et al., 2019).** Carrying of oral motor stimulation before oral feeding has greater effects on the preterm feeding skills and improves their general physical condition. Preterm neonates who have oral feeding problems often have associated health problems which accompanied by delayed discharge from the hospital. The effective feeding process decreases hospital stays which decreases adverse outcomes **(Younesian et al., 2015).** Neonatal nurses play a vital role in improving oral feeding readiness among preterm infants. Their responsibilities include evaluating oral feeding readiness and implementing multidisciplinary stimulation, also they allocate efficient and effective nursing care to reinforce the oral feeding transition ability of preterm neonates **(Beissel et al., 2022).**

Significant of the study:

Neonates less than 34 weeks are not equipped to feed orally, they have need of enteral feeding because of their uncoordinated suck and immature oral motor functions. resent studies found that Oro-motor intervention improve the transition from enteral to oral feeding among preterm neonates, early oral sensory stimulation can improve sucking skills and feeding process in preterm infants. it also helps in the transition from tube feeding to oral feeding, improve amount of milk intake, and short stay in hospitals **(Doğan et al., 2023; Li et al., 2022).**

Definition of the variable

Oro-Motor Intervention: in this study, it is a technique used to stimulate the oral cavity by performing cheek massage, upper lip and lower lip massage, tongue massage, palate and gum massage and directional reflex stimulation, to increase their feeding skills of preterm neonates **(Atay et al.,2023).**

Aim of the Study

This study aimed to: Evaluate the effectiveness of Oro-Motor Intervention on Sucking Behaviour and feeding skills among Preterm Neonates.

Hypothesis:

This study hypothesized that: Preterm neonates who receive Oro Motor Intervention will exhibit improvement in their sucking behaviour and feeding skills than preterm neonates who didn't receive it.

Methods

Study Design.

A quasi-experimental design was employed in this study with 2 groups (intervention group and control Group).

Setting.

This research was carried out at the Neonatal Intensive Care Unit (NICU) at AL Jalaa Military Hospital, Cairo, Egypt.

Participants.

From September 2023 to January 2024, a purposive sample of 59 preterm infants who met the following inclusion criteria were selected and randomly assigned into two groups using a numerical random table method. The intervention group (n=31) received OMI and a control group (n=28) received usual routine care without additional interventions.

The inclusion criteria for the study include gestational age less than 36 weeks as determined by physician clinical examination guided by

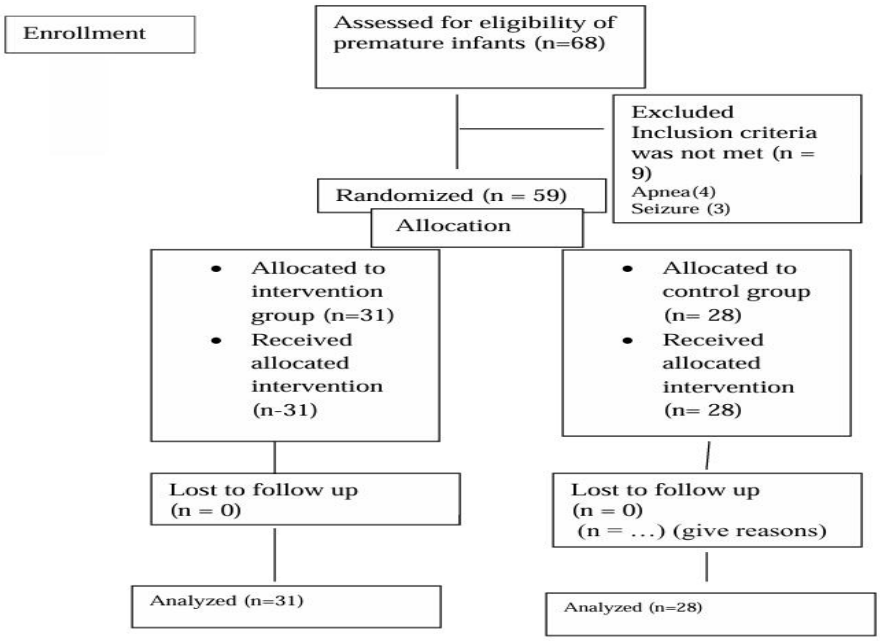
obstetric ultrasonogram , postnatal age of at least two days , hemodynamically stable, not requiring respiratory support, no episodes of apnea, and not on analgesic medication, sucking rate less than 10 per minute.

The exclusion criteria were: infants diagnosed with severe metabolic disorders, genetic syndromes, infections, neurological disorders, and oral-motor or cognitive defects.

Process of participant recruitment

The recruitment process for this study is shown in Figure 1

Figure 1: CONSORT diagram shows the flow of participants through each stage of the study



Instruments:

One instrument was used for data collection; it includes four parts.

Part one: Demographic data questionnaire It includes characteristics of the preterm infant such as gender, gestational age, and types of tube feeding.

Part two: "Preterm Infant Oral Feeding Readiness Assessment scale-Chinese version (PIOFRAS-CV). It was adopted from Fujinaga et al . (2007) and used to assess the oral motor ability of preterm neonates, it consists of five main items including the Behavioural organization of preterm neonates which includes questions about (behavioral state, global tone and global posture). Oral reflexes items include questions about (rooting, biting, sucking, and gag reflex). Oral posture includes questions about (lip posture, and tongue posture). Non-nutritive sucking items include questions about (Tongue movement, Jaw movement, tongue cupping, Sucking strain, Sucking and pause, rhythm of sucking, Maintenance of alert state, and 6 Stress signs). And corrected gestational age items, the scale consists of 18 items, each of which is scored from (0,1,2) for a total score of 36, a score of 0 indicates that the infant is not performing optimally, a score of 1 indicates that they take inconsistent or insufficient optimal action, a score of 2 indicates that the infant is performing optimally. The higher the score indicate better the oral motor ability. The assessment was done on the baseline day of the intervention, days 7, and days 14 after the intervention.

Part three: Sucking amount and sucking rate measurement. The sucking rate and amount of the intervention and control groups were measured using a standardized method adopted by **Li, et al. (2022).** The sucking amount was calculated by measuring the amount of remaining milk after feeding. The sucking rate was calculated by using a stopwatch to calculate the number of sucking per minute.

Part four: The oral feeding process measurement. The oral feeding process was measured by using a standardized method adopted from **Li et al. (2022).** It is used to assess weeks of complete oral feeding, oral feeding efficiency, and premature infant weight gain. The weeks of complete oral feeding are calculated by using this formula (corrected gestational age of complete oral feeding subtract corrected gestational age at the beginning of oral feeding). Feeding efficiency was determined by calculating the average amount of milk consumed per minute during oral feeding. Weight gain was measured using the chart for daily weight of preterm neonates.

Data collection instrument validity and reliability

To ensure the validity of all the data collection instruments, a panel of experts in the fields of pediatrics and nursing, consisting of one professor of pediatrics and two professors of paediatric nursing revised the data collection instruments.

Data collection instrument reliability

Cronbach's co-efficiency alpha for the questionnaire to measure the internal consistency reliability of the questionnaires was calculated and were, 0.89 indicating good questionnaire reliability.

Pilot Study

A pilot study with 10 neonates was conducted to test the instrument and the procedures and the results were not included in the analysis.

Ethical consideration

The study was approved by Menoufia University Faculty of Nursing's scientific research ethical committee (19/7/2023). A verbal description of the study objectives and procedures is discussed with the preterm infants' parents before asking them to sign the study's informed consent. Parents were informed of the study's objectives, procedures, voluntary nature, and the right to withdraw from the study at any time without any consequences. All the study materials were securely stored in a safe cabinet and only authorized researchers had access to the data.

Procedures

Before Interventions

- The researchers had a training on how to do the intervention guided by online audiovisual material and the intervention technique was performed in the presence of neonatal nurses and neonatologists.
- Before initiating the Oro-motor intervention program, the researcher observed the premature infant's vital signs, respiratory efforts, and oxygen saturation, level of arousal, posture, sedation any external devices such as incubator, oxygen masks, and naso-or orogastric tubes. The intervention is candled in case of observing any un instability.
- The duration of the intervention is10-12 minutes.
- The researcher assessed (preterm neonates oral feeding readiness, sucking rate, sucking amount and feeding process) on the first day of the intervention (baseline), day7 , and days 14 after the intervention
- If the newborn does not initiate rooting, the intervention begins with stimulating the rooting reflex by gently stroking the infant's cheek to elicit a rooting response toward the stimulus. Once the rooting reflex is triggered the perioral and intraoral stimulation can be initiated.
- The interventions were initiated 20 minutes before the routine feeding schedule.

Technique of Oro-Moter intervention.

Perioral stimulation:

- The researcher massaged the perioral buccinators in an anticlockwise and clockwise direction.

- Cheek: compression from the ear to the corner of the mouth in right and left cheeks, upper lip from the base of the nose to the corner of the lips (1 minute). and lower lip from the base of the chin to the corner of the lower lip(1minute).
- Upper and Lower Lip: the researcher compressed the tissue around the premature lip with her index finger. Circularly move the finger away from the corner of the mouth toward the center and then to the opposite corner.

Intraoral stimulation

- For upper and lower gum: stimulation of the premature infants' upper and lower gum was done by placing the index finger in the centre of the gum and slowly moving it toward the back of the mouth, returning to the mouth's center.
- And then do the opposite side.
- Internal check: stimulation of the internal check was done by placing the index at the inner corner of the premature infant's lips and compressing the tissue then moving back toward the molars and returning to the corner of the lip and repeating for the other side.
- Tongue: stimulation of the premature infant tongue was done by ("placing the finger at the level of the molar between the side borders blade of the tongue and the lower gum"). After that move the finger toward the midline, then push the tongue towards the opposite direction. Followed by moving the finger into the cheek and stretching it.
- In addition, the researcher placed her index figure in the center of the infant's mouth and placed continuous pressure on the hard palate. Then move the finger to contact the center of the mouth at the hard palate.

Non-nutritive sucking

- Non-nutritive sucking stimulation was done by placing the research figure at the midline, centre of the palate, a suck gently pressing the palate to obtain a suck Also, put a pacifier in the infant's mouth.

Feeding the neonate.

Feeding preterm neonate was done every 3 hours, the feeding time was around (8 - 10 min) and the milk volume was between (3 -5 mL/time), the remaining milk was fed through the nasogastric tube.

Note: Control group:

- The control group received standard care according to the NICU standard policy without any additional oral interventions.
- The researcher assessed preterm neonates oral feeding readiness, sucking rate, sucking amount and feeding process at day one , day 7 and days 14 of usual routine care.

Data analysis

Data were statistically analysed, and tabulated using (SPSS) version 22. Shapiro-Wilk normality test was used to detect the normal distributed of data. Quantitative data were presented in the form of (mean, standard deviation, SD). Qualitative data were presented in the form of numbers and percentages. Chi-squared ($\chi 2$) was used for qualitative variables.. An Independent t-test was used to compare the mean of the intervention and control group. The significance level was set at $p \leq 0.05$

Results

Table 1: describes the demographic characteristics of the preterm infants in the intervention and control groups. In terms of gender, the intervention group had a slightly higher number of males (61.3%) compared to the control group, which had an equal distribution of females and males (50% each). All premature infants in both groups were on tube feeding either nasogastric or orogastric (100%). Both groups were not significantly different concerning baseline gestational age (32.6452±1.81, 33.0357±1.815, p= 0.45) and weight (2.0106±526.9, 1.8611±412.3, p= 0.53)

Figure 2 shows the corrected gestational age of the intervention and control groups. As illustrated nearly half of the study and control group had more than 34 weeks of gestational age.

Table 2: shows a comparison of the behavioral organization of preterm neonates

between both groups measured as baseline, 7 days, and 14 days. Regarding behavioral state, initially, 32.3% of the preterm neonates in the intervention group were categorized as "sleepy" compared to 17.9% in the control group. By day 7, the proportion of "sleepy" neonates dropped to 0% in the intervention group, while it remained at 7.1% in the control group with a significance level of (p=0.023). By day 14 7.1% of the control group was still sleepy, while none of the intervention group were sleepy. In terms of global posture, both groups exhibited a partially flexed position (51.6%, 50%) at baseline. After the intervention, significant numbers of the control group (60.7%) maintained a "flexed" position compared to 83.9% in the intervention group.

Table 3: shows a comparison of preterm oral posture between the intervention and control groups. As indicated in the table, there was a statistically significant difference between the intervention and control groups after 14 days of intervention regarding lip and tongue posture.

Table 4 clarifies the comparison of preterm neonate's oral reflexes between the intervention and control groups: the finding revealed that the majority of preterm infants in the intervention group had the presence of rooting, sucking biting, and gage reflexes after 14 days of intervention instead of the control group. So there was a statistically significant difference between the intervention and control groups (p<.001).

Table 5 shows a Comparison of Preterm neonate non-nutritive sucking between the intervention and Control Groups. This study shows that the majority of the preterm neonates (87.1%) in the intervention group had normal tongue movement after 14 days of intervention compared to(64.35) in the control group, also there was a significant increase in tongue cupping, jaw movement, sucking strain. Maintains rhythm for the intervention group after 14 days of intervention than the control group, there was a statistically significant difference between intervention and control groups (p<.001). also, in the study group, the stress sign was absent in 80.6% of the intervention group instead of 32.1 in the control group

Table 6 shows a comparison of the mean weight of the preterm neonates between intervention and control groups. As indicated there was a highly statistically significant difference in the mean weight of preterm neonates between intervention and control group after 14 days of the intervention. (p<0.001).

Table 7 illustrates the total mean change of PIOFRAS-CV scale between intervention and control. On the baseline day of the intervention, there was no significant difference in the PIOFRAS-CV scores between the study and control groups (p > 0.05), instead, after 7 and 14 days of intervention, there was a statistically significant difference between the study and control groups (p<.001)

Table 8 displays a comparison of the total mean sucking amount of the preterm neonates between intervention and control groups, this table illustrated that there is no noticeable change in the meant sucking amount at baseline day between the intervention and control group, while there were highly statistical significance difference in sucking amount after 14 days of intervention between intervention and control groups (p<.001).

Table 9 shows a comparison of the total mean sucking rate of the preterm infant between intervention and control groups As indicated that there was a highly statistically significant difference in the mean sucking rate of preterm neonates between intervention and control group after 14 days of the intervention. (p<0.001)

Table 10 shows a correlation between the total mean change of PIOFRAS-CV and total mean weight after 14 days of intervention for the intervention group, as illustrated in the table there was an appositive correlation between total PIOFRAS-CV and total mean weight.

Table 11 shows a comparison of the total mean of the oral feeding process of the preterm neonates between the study and control groups after 14 days. As illustrated in the table. After 14 days of intervention, a remarkable increase in the oral feeding efficiency was observed in the intervention group compared to the control group (p < 0.001), and there was a marked decrease in weeks of oral feeding in the intervention group than in the control group (p < 0.001).

Table (1): Characteristics of studied preterm neonates in the intervention and control groups.

Characteristic	Intervention group (n=31)		Control group (n=28)	
	No	%	No	%
Sex Male	19	61.3%	14	50%
Female	12	38.7%	14	50%
Tube feeding	31	100%	25	91.3
yes				
No	0	0%	3	9.7
If yes Naso gastric	31	100%	28	100
orogastric	0	0%	0	0%
Corrected gestational age: Less than 32week:	6	19.4%	2	7.1%
Between 32 and 34	10	32.3%	10	35.7%
More than 34	12	48.4%	16	52.5%
Gestational age	32.6452±1.81		33.0357±1.815	
Weight at baseline	2.0106±526.9		1.8611±412.3	

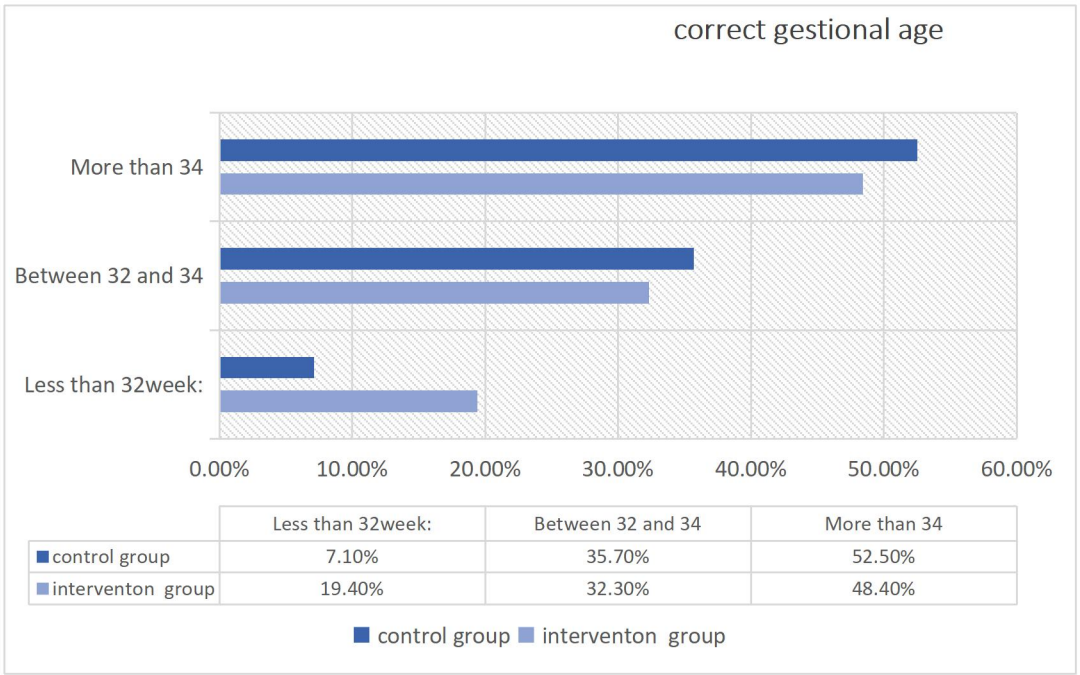


Figure (2): Correct gestational age of intervention and control groups.

Table (2): Comparison of Preterm neonate Behavioural Organization between Intervention and Control Groups at Baseline, 7 and 14 Days (N=59)

Items	Baseline day		X^2	After 7 days		X^2	After 14 days		X^2
	intervention N=31 %	Control N=28 %		intervention N=31 %	Control N=28 %		intervention N=31 %	Control N=28 %	
Behavioral organization									
Behavioral state									
• Sleepy	32 .3%	5 17.9%	5.03	0 0.0%	2 7.1%	7.45	0 0.0%	2 7.1%	9.995
• Drowsy	12 38.7%	19 67.7%	p	12 38.7%	18 64.3%	P	4 12.9%	12 42.9%	p.007**
• Alert	9 38.7%	4 14.3%	08ns	19 61.3%	8 28.6%	.023*	27 87.%	14 50.0%	
Global posture									
• Extended	12 38.7%	6 21.4%		0 0.0%	1 3.6%		0 0.0%	0 0.0%	
• partly flexed	16 51.6%	14 50.0%	4.26	9 29.0%	16 57.1%	6.49	5 16.1 %	11 39.3%	3.99
• flexed	3 9.7%	8 . 28 .6%	p.11ns	22 71.0%	11 39.3	.03*	26 83.9%	17 60.7%	.04*
Global tons									
• Hypotonia	9 20.0%	4 14.3%		1 3.2%	1 3.6%		0 0.0%	0 0.0%	
• Hypertonia	16 51.6%	15 53.9%	2.40	9 20.0%	17 60.7%	6.22	6 19.0%	13 46.4%	4.93
• normotonic	6 19.4%	9 32.1%	.30	21 67.6%	10 35.7%	.04*	25 80.6%	15 50.0%	.02*
			ns						

Note: ns: not significant ns(p>0.05). S: significant* **(p<0.05).** HS: High significance ** **(p<0.001).**

Table (3): Comparison Of Preterm Neonate for Oral Posture Between The Intervention And Control Groups at baseline,7 and 14 days (N=59)

Items	Baseline		X^2	After 7 days		X^2	After 14 days		X^2
	intervention N=31 %	Control N=28 %		intervention N=31 %	Control N=28 %		intervention N=31 %	Control N=28 %	
Oral posture									
Lips posture									
• Open	4 12.9 %	4 13.3%	.401	0 0.0%	2 7.1%		0 0.0%	0 0.0%	6.679
• Half-open	18 58.1%	14 50.0%	P	14 45.2%	13 46.4%	2.42	4 12.9%	12 42.9%	P
• closed	9 20.0%	10 35.7%	.81ns	17 54.8%	13 46.4%	p.29ns	27 87.1%	16 57.1 %	.010*
Tongue posture									
• Protruded	4 12.9%	5 17.9%		0 0.0%	1 3.6%		0 0.0%	1 3.6%	8.02
• Retracted	21 67.7%	16 57.1%	.713	18 58.1%	18 64.3%	1.579	5 16.1%	13 46.4%	P
• flat	6 19.4%	7 25.0%	p.70ns	13 41.9%	9 32.1%	P	26 83.9%	14 50.0%	.018*
						.45ns			

Note: ns: not significant ns(p>0.05). S: significant* **(p<0.05).** HS: High significance ** **(p<0.001).**

Table (4): Comparison Of Preterm neonates for Oral Reflexes Between the intervention and Control Groups at baseline,7 and 14 days (N=59)

Items	Baseline day		X^2	After 7 days		X^2	After 14 days		X^2
	intervention N=31 %	Control N=28 %		intervention N=31 %	Control N=28 %		intervention N=31 %	Control N=28 %	
Oral Reflexes									
Rooting reflex									
• Absent	5 16.1%	3 13.6%	.840	2 6.5%	1 3.6%	.835	0 0.0	0 0.0%	3.91
• Weak	17 54.8%	14 50.0%	P.65ns	10 32.3%	12 42.9%	P.65ns	2 6.5%	7 2 5.0%	P.05*
• Present	9 29.0%	11 39.3%		19 61.3%	15 53.6%		29 93.5%	21 75.0%	
Sucking reflex									
• Absent	4 12.9%	5 17.9	1.242	1 3.2%	2 7.1%	5.987	0 0.0	0 0.0%	10.05
• Weak	22 71.0%	16 57.1%	P	7 22.6%	14 50.0%	P	3 9.7%	13 46.4%	P
• Present	5 16.1%	7 25.0%	.52ns	23 74.2%	12 42.9%	.05*	28 90.3%	15 53.6%	.002**
Biting reflex									
• Absent	6 19.4%	7 25.0%	1.320	0 0.0	2 7.1%	3.591	0 0.0	0 0.0%	3.833
• Weak	20 64.5%	14 50.0%	P	12 38.7%	14 50.0%	P	6 19.4%	12 42.9%	P
• Present	5 16.1%	7 25.0%	.51ns	19 61.3%	12 42.9%	.16ns	25 80.6%	16 57.1%	.04*
Gage reflex									
• Absent	8 25.8%	9 32.1%	.441	1 3.2%	3 10.7%	6.12	0 0.0	0 0.0%	4.647
• Weak	17 45.8%	13 46.4%	P .80ns	10 32.1%	13 64.9	P .04*	1 3.2%	5 1 7.9%	P
• Present	6 19.4%	6 21.4%		20 64.5%	12 42.9%		30 96.8%	23 82.1%	.03*

Note: ns: not significant ns(p>0.05). S: significant* **(p<0.05).** HS: High significance ** **(p<0.001).**

Table (5): Comparison Of Preterm neonates for nonnutritive sucking Between the intervention and Control Groups at baseline,7 and 14 days (N=59)

Nonnutritive sucking	Baseline day		X^2	After 7 days		X^2	After 14 days		X^2
	intervention N=31 %	Control N=28 %		intervention N=31 %	Control N=28 %		intervention N=31 %	Control N=28 %	
Tongue movement									
• Absent	4 12.9%	4 14.3%	.359 P.80ns	0 0.0%	0 0.0%	3.671 P .04*	0 0.0%	0 0.0%	4.230 p.03*
• Altered	20 64.5%	16 7.1%		9 29.0%	15 53.6%		4 12.9%	10 35.7%	
• normal	7 22.6%	8 28.6%		22 71.0%	13 46.4%		27 87.1%	18 64.3%	
Tongue cupping									
• Absent	20 64.5%	18 64.3%	4.59 p.45ns	8 25.8%	15 53.6%	8.123 .043*	3 9.7%	11 39.3%	7.35 p.026*
• present	11 35.5%	10 5.7%		23 4.2%	13 46.5%		28 90.3%	17 60.7%	
Jaw movement									
• Absent	3 9.7%	3 10.7%	.024 P .9ns	0 0.0%	2 7.1%	6.297 p.043	0 0.0%	1 3.6%	6.46 P .039*
Altered	21 67.7%	19 67.9%		12 38.7%	17 60.7%		7 22.6%	14 50.0%	
• Normal	7 22.6%	6 21.4%		19 61.3%	9 32.1%		24 77.4%	13 46.4%	
Sucking strain									
• absent	4 12.9%	6 21.4%	2.85' p.24ns	2 6.5%	3 10.7%	14.63 P .001	0 0.0%	0 0.0%	8.98 P .003%**
• Weak	17 54.8%	18 64.3%		5 16.1%	17 60.7%		6 19.4%	16 37.1%	
• Strain	10 32.3%	4 14.3%		24 77.4%	8 28.6%		25 80.6%	12 42.9%	
Sucking and pause:									
• <5	3 9.7%	3. 10.7%	1.28 P.52ns	0 0.0%	2 7.1%	3.43 p.17ns	0 0.0%	1 3.6%	6.94 .03*
• >8	12 38.7%	7 25.0%		10 32.3%	12 42.9%		4 12.9%	11 39.3%	
• 5-8	16 51.6%	18 64.3%		21 67.7%	14 50.7%		27 87.1%	16 57.1%	
Maintenance of rhythm									
• absent	3 9.7%	6 21.4%	1.709 P .42ns	0 0.0%	3 10.7%	7.771 p .021*	0 0.0%	2 7.1%	8.65 P .01*
• Arhythmic	19 61.3%	16 57.1%		10 32.3%	15 53.6%		6 14.4%	12 42.9%	
• Rhythmic	9 29.0%	6 21.4%		21 67.7%	10 35.7%		25 80.6%	15 53.7%	
Maintenance of alert state									
• No	4 12.9%	5 17.9%	.460 P .79ns	1 3.2%	2 7.1%	4.81 P.09ns	0 0.0%	2 7.1%	8.35 P .015*
• Partial	18 58.1%	14 50.0%		9 29.0%	15 53.6%		5 16.1%	12 42.9%	
• Yes	9 29.0%	9 %32.1		21 67.7%	11 39.3%		26 83.9%	14 50.0%	
Stress signs									
• Absent	8 25.8%	6 21.4%	.691 P .70ns	18 58.1%	9 32.1%	7.38 P .025*	25 80.6%	9 32.1%	14.4 P .001**
• 1-3	8 25.8%	10 35.7%		7 22.6%	16 57.1%		6 19.4%	18 64.3%	
More than 3	15 48.4%	12 42.9%		6 19.4%	3 10.7%		0 0.0%	1 3.6%	

Note: ns: not significant ns(p>0.05). S: significant* **(p<0.05).** HS: High significance ** **(p<0.001).**

Table (6): Comparison of mean weight of the preterm neonates between intervention and control groups at baseline,7 and 14 days.

Weight	Intervention group	Control group	t-test	P -value
	X ± SD	X ± SD		
Baseline day	2.0106±526	1.8611±412	1.205	.233^{ns}
After 7 days	2.1774±433	1.9411±467	2.015	.049*
After 14 days	2.5290±336	2.1275±512	3.587	.001**

Note: ns: not significant ns(p>0.05). S: significant* **(p<0.05).** HS: High significance ****(p<0.001).**

Table (7): The Total mean Change of PIOFRAS-CV Scale between intervention and control groups at baseline,7 and 14 days.

PIOFRAS-CV	Intervention	Control	t-test	P - value
	X ± SD	X ± SD		
Baseline day	15.0323±4.7	15.678±5.5	485-	.630^{ns}
After 7 days	26.3226±5.3	23.0357±4.8	2.461	.017*
After 14 days	30.4516±4.5	25.8929±3.7	4.170	.000**

Note: ns: not significant ns(p>0.05). S: significant* **(p<0.05).** HS: High significance ****(p<0.001).**

Table (8): Comparison of total mean of sucking amount of the preterm neonates between intervention and control groups at baseline,7 and 14 days.

Total sucking amount	Intervention	Control	t-test	P -value
	X ± SD	X ± SD		
Baseline day	23.0±7.3	20.8±6.2	1.176	.244^{ns}
After 7 days	34.83±8.2	29.82±8.6	2.256	.02*
After 14 days	40.16±9.08	30.00±9.2	4.259	.001**

Note: ns: not significant ns(p>0.05). S: significant* **(p<0.05).** HS: High significance ****(p<0.001).**

Table (9): Comparison of total mean sucking rate of the preterm neonates between study and control groups at baseline,7 and 14 days.

Total sucking rate	Intervention	Control	t-test	P -value
	X ± SD	X ± SD		
Baseline day	2.08±.38	2.03±.79	.281	.780^{ns}
After 7 days	3.53±.99	2.500±.55	4.950	.001*
After 14 days	4.01±1.2	2.71±.46	5.085	.0001**

Note: ns: not significant ns(p>0.05). S: significant* **(p<0.05).** HS: High significance ****(p<0.001).**

Table (10): Correlation between the total mean change of PIOFRAS-CV and total mean weight after 14 days of intervention for the intervention group.

Item	Total PIOFRAS-CV		Total weight	
	R	P	R	P
Total PIOFRAS-CV	1.0	-	. 371	.04*
Total weight	.371	.04*	1.0	-

Note: ns: not significant ns(p>0.05). S: significant* **(p<0.05).** HS: High significance ****(p<0.001).**

Table (11): Comparison of total mean of oral feeding process of the preterm neonates between study and control groups after 14 days.

After 14 days	Intervention	Control	t-test	P -value
	X ± SD	X ± SD		
Weeks of oral feeding	2.0645±.249	2.6071±.497	5.210	0001**
Oral feeding efficiency	14.3226±2.10	11.9643±1.50	4.906	.0001**

Note: ns: not significant ns(p>0.05). S: significant* **(p<0.05).** HS: High significance ** **(p<0.001).**

Discussion

Preterm infants usually have immature sucking and swallowing, immature brain development, respiratory problems, and diminished oral motor ability, which affects their normal development. Oral feeding disorders have substantial adverse effects on an infant's well-being. Therefore, premature infants should have an early intervention to prevent feeding intolerance problems and decrease related gastrointestinal problems and growth retardation. Oral feeding is a daily nursing intervention provided in the neonatal intensive care unit **(Pineda et al.,2020)** Therefore, the study hypnotized that preterm neonates who receive Oro-motor intervention might exhibit improved sucking behaviour and feeding skills than preterm neonates who do not receive it.

Regarding the comparison of behavioral organization between the intervention and control groups. The current study revealed that the preterm neonates in the intervention group had significant improvement in behavior state alert 87.%, global posture 83.9% and global tone 80.6% after 7 and 14 days of intervention than in the control group. From the researcher's point of view, the oral motor intervention could improve sensory motor development which reflects the improvement in behavior state. This result com in agreement with **Wahyuni et al.(2022)**who found that a good alert behavioral state affected on feeding ability of the neonate while drowsy had a greater risk of being unable to feed orally. Also, **Mohamed Amin et al. (2021)** reported that two-thirds of the intervention group was alert and had good tone and good rooting more than the control group was drowsy, and had poor rooting and inadequate tone. Also, the study by **Griffith et al.(2017)** cleared That the effectiveness of oral feeding increased in the alert or crying state, while it decreased if the infant is mainly sleepy.

Regarding the comparison of oral reflexes among intervention and control groups, the current study clarified that there was a greater presence of neonatal reflexes including gage 96.8%,sucking90.3%, biting80.1%, and rooting93.5% reflex and there were statistically significant differences were found after 14 days between intervention and control group. This could be due to the effect of Oro- motor stimulation can arouse parasympathetic activity and have a positive effect on sensory-motor activity. This comes in the same line with **Nagaty et al. (2002)** who indicated that there was a significant improvement in the rooting, biting, gag, and sucking reflexes on the 3rd and 4th days of the intervention among the study group than the control group. Furthermore, the finding was consistent with **Suarni et al. (2024)** who cleared that The sucking reflex in low birth weight neonates at the beginning of the study was completely lacking (100%), while, The sucking reflex after oral stimulation was excellent for (100%) of the respondent, the study indicates that oral stimulation is effective on the improving sucking reflex in low birth weight.

About comparison of non-nutritive sucking between intervention and control group. The current study revealed that the majority of the preterm neonate (87.1%) in the intervention group compared to(64.35%) in the control group, also there was a significant increase in tongue cupping, jaw movement, and sucking strain. Maintains rhythmic for intervention group after 14 days of intervention than control group. This result comes in agreement with In the same line **Tsai et al.(2023)** who reported Oral motor intervention significantly enhances the non-nutritive sucking and oral motor ability of premature newborns, which, improves the

outcome of oral feeding, and reduces the occurrence of complications. And promote oral feeding proficiency in preterm infants.

Regarding the comparison of mean weight between the intervention and control groups on the 7 and 14 days, the current study revealed that their a marked increase in preterm weight among the intervention group (2.5290±336) more than the control group (2.1275±512) and was a highly statistically significant difference. This result is supported by **Thabet and Sayed (2021).** Who showed that oral motor intervention for premature infants was effective in improving preterm infant feeding readiness, and increasing their weight. Also, **Li et al. (2022).** reported after 14 days of intervention a considerable increase in body weight and oral feeding efficiency was seen in the intervention group compared to the control group.

Concerning the total mean change of PIOFRAS-cv between intervention and control groups**,** the current study found that**,** after 14 days of intervention, there was a significant improvement in total mean PIOFRAS-cv for the intervention group(30.4516±4.5) compared to(25.8929±3.7) of the control group, and there was a significant difference between study and control groups (p<.001). This mainly refers to the effect of carrying Oro- Intervention motor on the feeding readiness and enhancing the oral motor ability of premature newborns. This is consistent with **Çamur, and Çetinkaya. (2023).** who found that total feeding readiness scores were increased in the oral stimulation group, the feeding activity level was higher, and the transition to oral feeding was shorter. Also, **Ostadi et al. (2021)** reported that the mean score of POFRAS was significantly higher in oro-motor groups compared to the control group (P = 0.02 and P = 0.01, respectively). As well, **Li et al. (2020)** cleared that The PIOFRA score was higher in the oral stimulation group and increased with time. The oral stimulation group shows a higher feeding efficiency, and a shorter transition period from incomplete oral feeding to complete oral feeding.

Regarding comparison of the mean score of sucking between the intervention and control groups over the 7 and 14 days the current study revealed that after 14 days of intervention that there was a statistically significant difference in mean sucking rate and sucking amount of preterm neonates between the two study groups. This could be related to the fact that Oro - Moter intervention can arouse parasympathetic activity and have a positive effect on the sucking by enhancing time and sucking amount. This finding was in the same line with **Guler et.(2022)** who reported that the study group had a significant improvement in sucking rate, continuous sucking, sucking amount, and sucking time, also, the study group had a higher increase in weight (89%) and head circumference than control, and early transition to oral feeding than control group. On the same point **Li et al. (2022)** cleared that after the oral motor stimulation, the sucking amount and rate of the intervention group significantly increased compared to before the intervention.

Concerning the oral feeding process of the preterm neonates between intervention and control groups after 14 days. As illustrated in the study. After 14 days of intervention, a marked increase in the oral feeding efficiency was detected in the intervention group compared to the control group and there was an evident decrease in the weeks of oral feeding in the intervention group than in the control group ($p < 0.001$), this result assures the effectiveness of Oro-motor intervention in improving feeding process and feeding readiness among preterm neonates. This result is supported by **Comuk et al. (2023)** who conclude that the oro-motor exercises for preterm infants promote the transition to bottle feeding and improve the transition to normal breastfeeding. As well **Zhao et al. (2024)** showed that nonnutritive sucking intervention can enhance the oral motor ability of newborns, improve oral feeding efficiency, and effectively shorten the transition time of oral feeding.

Conclusion:

The study concluded that Oro-motor intervention positively impacted the sucking and feeding skills of premature neonates effectively promoting their feeding abilities.

Recommendation:

As a part of the standard of care for all preterm neonates, the study recommended reinforcing the significance of utilizing Oro-motor intervention programs on feeding readiness and transition to oral feeding, which

is a safe and effective non-invasive intervention.

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