The Correlation between Gestational Age and Feeding Readiness in Late Preterm Infants

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Abstract

***Background**: To correlate gestational age and feeding readiness among healthy late preterm infants and to findout the appropriate time to introduce oral feeding*

***Methodology**: Analytical cross-sectional study conducted in Neonatal Intensive Care Unit of Government medical college hospital, Cuddalore. One hundred and thirty-five healthy late preterm infants born between 34 to 36 weeks gestation were enrolled. Feeding readiness is assessed using Premature Oral Feeding Readiness Scale (POFRAS) on day one of the infant's life and the correlation between gestational age and feeding readiness is statistically analyzed.*

***Results:** The mean gestational age of the study sample is 35 weeks. The mean POFRAS score at 34wks gestation is 23.83, at 35wks gestation it is 28.86 and at 36wks gestation it is 32.81. The comparison of POFRAS score with the gestational age gives a p-value <0.001, which imply a significant difference in PORAS score with advanced gestational age.*

***Conclusion:** The feeding readiness is higher in 36 weeks gestation, and it was found to be the appropriate time to introduce feeding in late preterm neonates.*

***Key words:** Gestational age; Feeding readiness; Late preterm infant*

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Introduction

The infants born before 37 weeks gestation is termed as preterm infants. The late preterm infants are those born between 34 weeks to 36.6 weeks gestation [20]. Feeding is the earliest known skill to develop in late preterm, which requires both physical maturity and neuro-muscular integrity. Generally, term infants have good feeding skills with good coordination between suck, swallow and respiration, hence they are fed orally. In contrast early preterm infants have under developed feeding skills with poor coordination between suck, swallow and respiration, hence they are not fed orally [2,3]. If the infant is fed orally before developing feeding skills, the infant may aspirate and develop complications [4].

The late preterm infants will be in the critical period of development of coordination between suck, swallow and respiration, hence they are assessed for feeding readiness before introducing oral feeding [5,6,7,8,9].

Infants generally develop skills as they mature physically with good neuro-muscular integrity. The physical maturity and neuro-muscular integrity depends on the gestational age of the infant. Infants with higher gestational age have good physical maturity and neuro-muscular integrity when compared to those with lower gestational age [1].

The variations seen in the feeding ability among late preterm infants is mainly due to the variation in their level of maturation [10]. There are limited number of studies done on finding out this variation among healthy late preterm infants. Hence this study aims at finding out the correlation in feeding readiness among healthy late preterm infants and to estimate the appropriate time to introduce oral feeding.

Methodology

One hundred and thirty-five (135) late preterm infants were selected after screening two hundred and forty-three (243) infants born during the period of 6 months between Dec 2020 to May 2021 in Government medical college hospital, Cuddalore, or referred to Government medical college hospital from nearby centres.

Infants with Congenital anomalies like cleft palate which affects feeding, medical instability requiring ventilator support or minimal handling, or genetic disorders like downs syndrome were excluded.

This analytical cross-sectional study was approved by IHEC (Institutional Human Ethical Committee) of RMMCH, Annamalai university. Reference number: IHEC/522/2019. Informed consent was obtained from the parent or guardian during routine new born screening.

The maternal characteristics (age, parity, relevant medical and obstetric history, and mode of delivery) and neonatal characteristics (gestational age, birth weight) for all the recruited newborn infants were recorded.

The Physiological parameters (Respiratory rate, heart rate and oxygen Saturation) were recorded before assessing the newborn. No scores were given for the physiological parameters.

The examination was performed in a quiet room with infants undressed on an open bed or under a radiant warmer. The principal investigator who is a pediatric physiotherapist trained in NICU assessed the infants. The examination was performed midway between two feeds, with infants settled, alert and comfortable. The standard NICU protocols were followed.

The neonates were assessed on day one after birth initially with the New Ballard score to find the gestational age in weeks and with the POFRAS to find out the feeding readiness. The Non-nutritive sucking is observed in infants for 1 minute by placing a gloved little finger in infants' mouth, this observation is done with the infant placed in lateral decubitus position.

Assessment tools

1. The new ballard score: Devised by Dr Jeanne L Ballard is used for gestational age assessment. The assessment assigns a score to various physical and neuromuscular criteria. The scoring relies on the intra-uterine changes that the fetus undergoes during its maturation. The neuromuscular criteria depends upon muscle tone and the physical criteria depends upon anatomical changes[19].

The neuromuscular criteria assessed are posture, square window, Arm recoil, Popliteal angle, Scarf sign and Heel To ear. The physical criteria assessed are Skin, Ear/eye, Lanugo hair, Plantar surface, Breast bud and Genitals. Each of the criteria are scored from -1 through 5. The total score ranges from -10 to 50, with the corresponding gestational ages between 20 to 44 weeks. Maturity Rating: Score/weeks: (-10/20), (-5/22), (0/24), (5/26), (10/28), (15/30), (20/32), (25/34), (30/36), (35/38), (40/40), (45/42), (50/44).

2. Premature Oral Feeding Readiness Scale (POFRAS): Comprised of five main categories with a total of 18 items that consist of: 1) corrected gestational age; 2) behavioral organization (behavioral state, global posture and global tonus); 3) oral posture (lips and tongue posture); 4) oral reflexes (rooting, sucking, biting and gag reflexes) and 5) non-nutritive sucking (tongue movement, tongue cupping, jaw movement, sucking strain, sucking and pause, maintenance of sucking/pause, maintenance of alert state and stress signs). The preterm infant's performance in each item is assessed from 0 to 2, with total score ranging from 0 to 36. "Feeding readiness" is defined as a score of 30 out of 36 obtained from POFRAS[11].

Data analysis and Results

The study samples comprises 60.7% male and 39.3% female. Among them 52.6% were low birth weight infants. 62.2% were born through LSCS. 66.7 were born at 36 week gestation, 15.6% were born at 35 week gestation and 17.8% were born at 34 week gestation. The mean gestational age is 35 weeks. The distribution of newborns by Selected Maternal and Neonatal Variables are given in Table 1.

Table 1. Distribution of newborns by Selected Maternal and Neonatal Variables

Maternal and Neonatal Variables	Number N	Percentage %
SEX:		
Male	82	60.7
Female	53	39.3
Gestational age in Weeks:		
34	24	17.8

35	21	15.6
36	90	66.7
Birth weight in Kg:		
1.10 – 2.49	71	52.6
2.50 – 4.00	64	47.4
Delivery type:		
Normal	48	35.6
LSCS	84	62.2
Forceps	3	2.2

Distribution of selected neonatal complications and maternal complications were given in Table 2 & 3.

Table 2: Distribution of newborns by selected Neonatal complications

Neonatal complications	Number N	Percentage %
RD	24	18
HD	1	0.7
CF	2	1.5
ERB	1	0.7
No complication	107	79

CF- Club foot; RD- Respiratory distress; ERB- Erb's palsy; HD- Hip dislocation

From the above table it is inferred that Respiratory distress is the common neonatal complication found in 18% of infants, and 79% of neonates didn't develop any complications.

Table 3: Distribution of newborns by selected Maternal complications

Maternal complications	Number N	Percentage %
PIH	11	8.1
PIH, OL	2	1.5
PIH, OL, AN	1	0.7
PIH, AN	3	2.2
PIH, AN, GD,	1	0.7
PIH, GD	4	3.0
EC	4	3.0
OL	6	4.4
OL, AN	1	0.7
AN	22	16.3
AN, AP	2	1.5
GD	5	3.7
APH	1	0.7
POLY	2	1.5

No complication	70	52

PIH- Pregnancy induced hypertension; OL- Oligohydramnios; AN- Anemia; GD- Gestational diabetes; POLY- polyhydramnios; EC- Eclampsia; AP- Abruption placenta; APH- Antepartum hemorrhage

From the above table it is inferred that Anemia is the common pregnancy complication found in 22% of mothers, and respectively 52% mothers didn't develop any complication.

Distribution of subjects by POFRAS score is given in Table 4.

Table 4: Distribution of newborns by POFRAS score

POFRAS score	Number N	Percentage %	M	SD
20 – 29	40	30	30.6	3.91
30 – 36	95	70		

M- Mean; SD- Standard deviation

From the above table it is inferred that the POFRAS score was between 20 - 29 in 30% infants and between 30 - 36 in 70% infants. The mean POFRAS score is 30.6 and the standard deviation is 3.91.

The Kruskal-Wallis Test comparison of POFRAS score with the gestational age was analyzed in table 5.

Table 5: Kruskal-Wallis Test for POFRAS & Gestational age:

Gestation	Number N	Mean M	SD	Kruskal-Wallis test value	Kruskal-Wallis P-value
34	24	23.83	2.099	83.824	< 0.001
35	21	28.86	2.265		
36	90	32.81	1.655		
Total	135	30.60	3.912		

SD- Standard deviation

From the above table the mean POFRAS score at 34wks gestation is 23.83 with Standard deviation 2.099, at 35wks gestation it is 28.86 with Standard deviation 2.265, and at 36wks gestation it is 32.81 with Standard deviation 1.655. The Kruskal-Wallis Test value is 83.824 and the p-value is <0.001, This denotes that there exists a significant difference in PORAS score with advanced gestational age.

The level of significance was analyzed using Dunn's multiple comparison, this was given in table 6.

Table 6: Dunn's multiple comparison test for POFRAS & Gestational age:

Dunn's multiple comparison test value	Dunn's multiple comparison test p-value
34 vs 35	0.0259
34 vs 36	< 0.001
35 vs 36	< 0.001

From the above table it is inferred that the level of significance was high in 34 vs 36, & 35 vs 36wks gestation, when compared with 34 vs 35wks gestation.

The Comparison of POFRAS score with neonatal complications were analyzed using the Kruskal-Wallis test, this was given in table 7.

Table 7: Kruskal-Wallis Test for POFRAS & Neonatal complications:

Neonatal complications	Number N	Mean M	SD	Kruskal-Wallis test value	Kruskal-Wallis P-value
Nil	107	31.22	3.64	16.25	<0.001
RD	24	28.17	4.07		
Others	4	28.50	4.43		

SD- Standard deviation; RD- Respiratory distress

From the above table, Comparing the POFRAS score with Neonatal complications the Kruskal-Wallis test value is 16.25 and the P-value is <0.001, This denotes that there exists a significant difference in PORAS score with neonatal complications.

Respiratory distress which was found to be the major Neonatal complication was compared with other Neonatal complications with Dunn's multiple comparison, this was given in table 8.

Table 8: Dunn's multiple comparison test for POFRAS & Neonatal complications:

Dunn's multiple comparison test	Dunn's multiple comparison test p-value
Nil vs RD	0.0002
Nil vs Others	0.0843
RD vs Others	0.9596

RD- Respiratory distress

From the above table it is inferred that, there exist a significant difference in POFRAS score in infants with respiratory distress.

The Comparison of POFRAS score with pregnancy complications was analyzed using Kruskal-Wallis test, this was given in table 9.

Table 9: Kruskal-Wallis Test for POFRAS & Pregnancy complications:

Pregnancy complications	Number N	Mean M	SD	Kruskal-Wallis test value	Kruskal-Wallis P-value
Nil	70	30.64	3.74	2.20	0.532
AN	29	29.86	4.30		
PIH	18	31.50	3.93		
Others	18	30.72	3.98		

SD- Standard deviation; AN- Anemia; PIH- Pregnancy induced hypertension

From the above table it is inferred that, the Kruskal-wallis test value is 2.20 and the P-value is 0.532. This denotes that there is no significant difference in PORAS score with pregnancy complications.

Discussion

In the present study the feeding assessment was done on day one of the healthy late preterm neonates. A good feeding readiness score is seen in infants born above 36 weeks gestation, with a mean score of 32.81. The mean score at 34wks gestation is 23.83 and at 35wks gestation it is 28.86, which is <30, the score below 30 denotes that they are not ready for oral feeding. This corelates with Amaizu et al study on maturation of oral feeding skills in preterm infants [12].

The neonates were assessed for feeding readiness only when they have normal respiratory function. The infants who had respiratory distress hours before feeding assessment are included in this study, if their respiratory function is normal at the time of assessment. Those neonates who had respiratory distress hours before feeding assessment, was found to have a mean feeding readiness score of 28.17, which is <30, this correlates with Perlman's study on premature graduates of intensive care [13]. This indicates that a previous respiratory distress can influence the feeding readiness. As the feeding readiness is assessed on the same day of respiratory distress i.e., on day one of the infant's life, they have reflected to have poor feeding ability. Meanwhile this study didn't find any correlation between pregnancy complications and feeding readiness.

In this study feeding assessment was done only once on day one of the infant's life. This study is done only on healthy late preterm neonates, no comparison is made with the term or neurologically impaired infants. They were the limitations of this study.

Conclusion

The feeding readiness is higher in 36 weeks gestation when compared with 34- & 35-weeks gestation, feeding readiness has increased with advanced gestational age. 36 weeks gestation was found to be the appropriate gestational age to introduce feeding in late preterm neonates.

Another factor which was found to affect feeding readiness is respiratory distress. The initiation of oral feeding should be undertaken after careful, individualized assessment. The decision to initiate oral feeding should not be solely based on an infant's gestational age.

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