

Physiological differences between breast-feeding and bottle-feeding in pre-term infants

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Background: Infants who breastfeed must have the ability to coordinate their sucking, swallowing, and breathing to achieve their nutritional and hydration needs while protecting their airways. The need for new non-invasive approaches to get objective physiological parameters of suck-swallow-breathe coordination is considerable because the gold standard, videofluoroscopy (VFSS) cannot evaluate breast feeding and FEES cannot evaluate suck-swallow physiology.

Objectives: The objectives of the study were to obtain physiological parameters of the suck-swallow-breathe coordination in a cohort of premature milk-sucking infants; describe the physiological differences between breast and bottle feeding in premature infants; and determine the associations of the selected demographic factors with the physiological measures of suck- swallow-breathe coordination in premature infants.

Methods: This observational cross-sectional study used a purposive sampling method to recruit sixty-two (n=62) premature (≤ 37 weeks) infants from birth to 12 months who are breastfeeding and/or bottle-fed. One-two minute video recordings of breast-feeding/ bottle-feeding capturing sucking and swallowing movements were obtained. A set of objective physiological parameters of suck-swallow-breathe coordination were measured by analysing the video recordings.

Results: Excellent inter-rater reliability was reported for all the physiological parameters used in this study (ICC= .89-.98, 95% CI [.86-.1.00], $p < .001$). When means were compared, a significant difference was reported in the feed duration between breast-feeding and bottle-feeding ($t = 3.667$, $df = 39.765$, $P = .001$). Further, significant differences were reported in the number of pauses ($t = 4.011$, $df = 54.813$, $P < 0.001$), changes in levels of oxygen saturation during feeding ($t = 2.456$, $df = 59.919$, $P = .017$), changes in heart rate during feeding ($t = 2.441$, $df = 55.919$, $P = .018$), milk intake per minute ($t = 6.542$, $df = 44.636$, $P < 0.001$), suck frequency ($t = 4.093$, $df = 52.175$, $P < 0.001$) and swallow frequency ($t = 4.339$, $df = 50.867$, $P < 0.001$) between breast-feeding and bottle-feeding in premature infants. In the Pearson correlation test, duration of feeding decreased as the gestational age of infant increased ($r(61) = -.252$, $P = .048$). Similarly, feeding duration was significantly shorter in infants with a higher gestational week at birth ($r(61) = -0.309$, $P = 0.015$). Furthermore, with an increased chronological age of the infants, the number of pauses during feeding decreased significantly ($r(61) = -0.308$, $P = 0.015$). Further, in infants with higher gestational weeks at birth ($r(61) = 0.351$, $P = 0.005$) and infants with increased weight ($r(61) = .273$, $P = 0.032$), milk intake per

minute increased significantly. Also, milk intake per minute showed a significant increase in premature infants with increased gestational age at birth ($r(61) = .351$ $P = .005$) and with the current weight of the premature infants ($r(61) = .273$ $P = .032$).

Conclusion: This research showed that bottle feeding, and breastfeeding have been associated with significant physiological changes in premature infants, which is supported by the reviewed research. By providing objectivity to its findings and its interpretation, this study provides a reliable and feasible method for improving the accuracy and reliability of clinical feeding assessments of infants. This unique method is a safe and effective way to gather objective physiological parameters of coordinated suck-swallow-breathe for therapists who do not have access to instrumental swallowing assessment.

Key words: *Premature infants, Physiological parameters, Suck-swallow-breathe coordination, Objective assessment*