Physiologic Stability of Newborns During Cup- and Bottle-feeding

Cynthia R. Howard, MD, MPH*; Elisabeth A. de Blieck, MPA*; Cynthia B. ten Hoopen, MS, PNP*; Fred M. Howard, MD‡; Bruce P. Lanphear, MD§; and Ruth A. Lawrence, MD*

Abstract. Background. To prevent breastfeeding problems, cup-feeding has been recommended as a method of providing medically necessary supplemental feedings to breastfed infants.

Objectives. To compare amounts ingested, administration time, and infant physiologic stability during cup-, bottle-, and breastfeeding.

Design/Methods. A total of 98 term, healthy newborns were randomized to either cup-feeding (n = 51) or bottle-feeding (n = 47). The heart (HR), respiratory (RR), and oxygen (O2) saturation rates were monitored on these infants and 25 breastfed newborns during 1 feeding. Differences in amounts ingested and administration times were evaluated with t tests and physiologic data with repeat measures analysis of variance.

Results. There were no significant differences in administration time, amounts ingested or overall HR, RR, and (O2) saturation rates, between cup and bottle groups. Breastfed infants had longer administration times and lower overall HR, RR, and higher O2 saturation as compared with cup- and bottle-fed infants.


ABBREVIATIONS. O2, oxygen saturation (rate); HR, heart rate; RR, respiratory rate; ANOVA, analysis of variance.

Breastfeeding is widely acknowledged as optimal infant nutrition.1–6 Successful breastfeeding requires an infant learn proper attachment and suckling during the first few days of life.7,8 Early oral experiences that illicit sucking mechanics different from those of breastfeeding are believed to cause improper latch and subsequent breastfeeding failure—a problem termed “nipple confusion.”9–10 Thus, many experts recommend avoiding artificial suckling experiences including bottle-feeding in breastfed infants.5,11,12 To prevent “nipple confusion,” cup-feeding has been recommended for providing medically indicated supplements to breastfed infants for problems including hypoglycemia, hyperbilirubinemia, and dehydration.15–17 A lack of empiric evidence and concerns about potential choking, aspiration and time efficiency, however, have impeded its implementation in most US facilities.13,15 Although historical evidence of cup-feeding exists,18 the scientific literature is limited to descriptive studies and anecdotal reports.13,14,19 Such reports describe similar physiologic stability and weight gain in cup- and bottle-fed premature infants and improved adaptation to full breastfeeding after cup-feeding.19,13,20 Studies comparing cardiorespiratory changes during breast and bottle-feedings demonstrate better coordination of sucking, swallowing, and breathing in breastfed preterm infants21 and fewer episodes of oxygen desaturation below 90% in breastfed term infants.22 No comparative data, however, are available for cup-fed infants.

We undertook this study as a preliminary step in evaluating the safety of cup-feeding. Our primary objectives were to compare infant physiologic stability, quantities ingested, and administration time for cup- and bottle-feeding. A secondary objective was to compare these findings to data in breastfed infants.

METHODS

Term, healthy, appropriate-for-gestational age, 1- to 3-day-old formula-fed newborns were randomized and fed by either cup (n = 51) or bottle (n = 47). Oxygen (O2) saturation and heart rates (HR) were recording using a Nellcor (Nellcor, Hayward, CA) cardiorespiratory monitor. Respiratory rates (RR) were assessed by a registered nurse. Data were recorded every 30 seconds during feedings, including a 2-minute pre- and postfeeding time interval. For comparison purposes, a group of 25 breastfed newborns were also evaluated.

Cup- and bottle-fed infants were brought to a quiet room at the time of a regularly scheduled feeding. Infants were readied for monitoring and allowed to attain a quiet, alert state before data collection began. Cup- and bottle-feedings were administered by a nurse. Breastfed infants were fed in the mother’s room with monitoring limited to feeding time on 1 breast. Pre- and postfeeding data were recorded while the infant was cuddled by the nurse or mother (breast).

Cup-feedings were administered using a small plastic medicine cup. Fifteen milliliter aliquots of formula were fed to infants held in a semi-upright position with head and upper back support. Infants were stimulated to root by stroking the lower lip with the edge of the cup. Small amounts of formula were fed to the infant until the infant appeared satiated.23
Infants whose O₂ saturation decreased to 3), and bottle-fed (n 5 n)
curred between the breastfed (HR, RR or O₂ saturation for the cup-fed and bottle-feedings (1.26 0.58 oz.) did not signifi-
cantly differ.

Table 1. Group Comparisons

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Bottle (n = 47)</th>
<th>Cup (n = 51)</th>
<th>Breast (n = 25)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (95% CI)</td>
<td>Mean (95% CI)</td>
<td>Mean (95% CI)</td>
</tr>
<tr>
<td>Gestational age (wk)</td>
<td>39.9 (39.6, 40.2)</td>
<td>39.7 (39.4, 40.0)</td>
<td>39.8 (39.4, 40.2)</td>
</tr>
<tr>
<td>Apgar (5 minutes)</td>
<td>8.9 (8.8, 9.0)</td>
<td>8.9 (8.8, 9.0)</td>
<td>9.0 (8.9, 9.2)</td>
</tr>
<tr>
<td>Birth weight (g)</td>
<td>3434.5 (3281.2, 3587.8)</td>
<td>3439.0 (3292.7, 3585.3)</td>
<td>3497.2 (3354.8, 3639.6)</td>
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<table>
<thead>
<tr>
<th>n (%)</th>
<th>n (%)</th>
<th>n (%)</th>
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<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>25 (53.2%)</td>
<td>26 (51.0%)</td>
</tr>
<tr>
<td>Female</td>
<td>22 (46.8%)</td>
<td>25 (49.0%)</td>
</tr>
<tr>
<td>Vaginal delivery</td>
<td>29 (61.7%)</td>
<td>33 (64.7%)</td>
</tr>
<tr>
<td>Anesthesia/analgesia</td>
<td>38 (80.9%)*</td>
<td>44 (86.3%)*</td>
</tr>
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</table>

* P < .05 referent to the breastfed group.
We thank Suzanne Kolb, RN, IBCLC, and Susan Costanza, RN, IBCLC, for their assistance with the implementation of this study.

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REFERENCES


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