JHWCR

Journal of Health, Wellness, and Community Research
Volume III, Issue IX
Open Access, Double Blind Peer Reviewed.
Web: https://jhwcr.com, ISSN: 3007-0570
https://doi.org/10.61919/h3mq6w41

Original Article

Nifty Cup Versus Bottles: A Comparative Study of Feeding Methods in Newborns

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Author Contributions: Concept: SM, MFS; Design: AQ, SB; Data Collection: FN, SF; Analysis: MFS, AQ; Drafting: SM, SB
Cite this Article | Received: 2025-05-11 | Accepted 2025-07-04
No conflicts declared; ethics approved; consent obtained; data available on request; no funding received.

ABSTRACT

Background: Feeding alternatives for neonates temporarily unable to breastfeed are critical to ensure optimal nutrition and support early breastfeeding transition. While bottle feeding is commonly used, it may interfere with breastfeeding behavior and carries infection risks, especially in low-resource settings. The Nifty Cup, a WHO-endorsed silicone feeding device, offers a hygienic and ergonomically designed alternative, yet comparative clinical data remain limited. Objective: To compare the effectiveness and safety of the Nifty Cup versus standard bottle feeding in terms of feeding performance, weight gain, breastfeeding transition, and maternal satisfaction among newborns unable to breastfeed directly. Methods: A comparative observational study was conducted over six months at the Neonatology Unit, CMH Multan. A total of 120 full-term or late preterm newborns were randomized into two groups (n=60 each): one fed via the Nifty Cup, the other with standard bottles. Feeding parameters, weight gain by Day 5, successful transition to direct breastfeeding, and maternal satisfaction were measured. Data were analyzed using SPSS v25, with significance set at $p \leq 0.05$. Results: The Nifty Cup group exhibited longer feeding times (16.4 ± 2.5 vs. 13.1 ± 2.8 minutes; $p < 0.001$), significantly greater weight gain by Day 5 (110 ± 25 vs. 98 ± 27 grams; $p = 0.014$), and higher breastfeeding transition rates (86.7% vs. 71.7%; $p = 0.047$). Maternal satisfaction was similar across groups ($p = 0.296$). Conclusion: The Nifty Cup is a clinically effective and safe alternative to bottle feeding, promoting improved early weight gain and higher breastfeeding success without compromising caregiver satisfaction.
Keywords: Nifty Cup, neonatal feeding, breastfeeding transition, bottle feeding, weight gain, newborn care, alternative feeding methods.

INTRODUCTION

The choice of an appropriate feeding method for newborns who are temporarily unable to breastfeed plays a critical role in ensuring optimal neonatal nutrition, promoting healthy weight gain, and facilitating a smooth transition to direct breastfeeding. In neonatal care units, particularly in low-resource environments, alternatives such as bottle and cup feeding are commonly employed to provide expressed breast milk or formula when direct breastfeeding is not possible (1). Bottle feeding, while widespread due to its ease of use and familiarity among caregivers, has raised concerns about its potential interference with breastfeeding, risk of aspiration, and heightened risk of contamination if sterilization practices are suboptimal (2,3). These concerns are particularly relevant in resource-constrained settings where access to safe cleaning and sterilization methods may be limited, compounding the risk of infection (4).

Cup feeding, on the other hand, is endorsed by the World Health Organization as a safer and more breastfeeding-compatible alternative. Several systematic reviews and clinical trials have shown that cup feeding may support improved breastfeeding outcomes compared to bottle feeding by preserving the infant's natural sucking reflex and minimizing nipple confusion (5,6). However, conventional cup feeding techniques can present their own challenges, including increased feeding times, caregiver unfamiliarity, spillage, and inconsistent milk flow control, which can deter their adoption in clinical practice (7,8). The introduction of the Nifty Cup—a soft, ergonomically designed silicone cup developed in collaboration with the World Health Organization—aims to overcome these practical limitations. Its design promotes ease of milk flow control, reduces spillage, and ensures hygienic milk delivery, especially for small and vulnerable neonates (9). Despite its promising design and user-centered development, empirical data comparing the Nifty Cup with standard bottle feeding in clinical settings remain limited. Although several studies, such as those by Pant et al. and Chanani et al., have demonstrated the usability and acceptability of the Nifty Cup, few have quantitatively evaluated its impact on feeding outcomes, weight gain, and breastfeeding transition in randomized or observational settings (10,11). A recent randomized controlled trial by Duruvasal et al. compared the Nifty Cup to another traditional feeding device (the paladai), showing comparable safety and feeding efficiency, yet its comparative advantage over bottle feeding—a globally prevalent method—remains underexplored (12). Given the widespread use of bottle feeding and the growing interest in cup-based alternatives like the Nifty Cup, there is a pressing need for evidence-based comparative evaluations. This is particularly relevant in the context of neonatology units in countries like Pakistan, where bottle-feeding prevalence is high (34.1% under 24 months) and where neonatal mortality and morbidity from infections remain a major concern (13). Previous observational studies in

similar contexts have indicated that feeding methods significantly influence not only immediate nutritional outcomes but also long-term breastfeeding success and infection risks (14,15). Despite these implications, clinical guidelines often lack consensus on the preferred method for temporary neonatal feeding, underscoring a crucial gap in practice-oriented research.

This study was therefore designed to address this gap by comparing the clinical effectiveness of the Nifty Cup versus standard bottle feeding among newborns who are unable to breastfeed directly. The study aimed to evaluate and contrast key clinical outcomes including feeding performance (time and volume), weight gain, transition to direct breastfeeding, and maternal satisfaction across the two methods. By examining these outcomes in a structured, comparative observational study, the research seeks to inform neonatal feeding protocols and guide evidence-based practices in both high- and low-resource settings. The primary research question was: Does the use of the Nifty Cup result in improved neonatal feeding performance, weight gain, and breastfeeding transition compared to standard bottle feeding among newborns temporarily unable to breastfeed?

MATERIAL AND METHODS

This study employed a comparative observational design conducted over a six-month period in the Neonatology Unit of Combined Military Hospital (CMH), Multan, Pakistan, from January to June 2024. The study was designed to evaluate and compare the clinical effectiveness of the Nifty Cup versus standard bottle feeding in newborns who were temporarily unable to breastfeed directly due to maternal or neonatal factors. The rationale for this design was to allow for real-time assessment of naturalistic clinical outcomes in a controlled hospital environment without altering the standard care procedures, thus enhancing the external validity and relevance of the findings. Eligible participants included full-term and late preterm newborns (≥34 weeks of gestational age) who were hemodynamically stable and had a clinical indication for alternative feeding. Indications included poor latch, maternal illness, or temporary contraindications to breastfeeding. Exclusion criteria were congenital anomalies that could affect feeding (such as cleft palate), the requirement for tube feeding, or the presence of severe respiratory distress at the time of enrollment. Participants were enrolled consecutively from daily admissions that met eligibility criteria, and written informed consent was obtained from the parents or legal guardians after a full explanation of the study procedures and objectives.

The final sample included 120 newborns, randomly allocated into two equal groups (n = 60 per group) using a computer-generated simple randomization list. One group received feeds via the Nifty Cup and the other via standard feeding bottles. The sample size was determined using the WHO sample size calculator, with a power of 80%, confidence level of 95%, and an anticipated 20% difference in breastfeeding transition success between groups. This calculation assumed a two-sided test with equal allocation ratio and a 5% significance level. All feeding sessions were conducted by trained neonatal nursing staff and supervised by an attending neonatologist to ensure procedural uniformity. Each newborn was fed either expressed breast milk or infant formula based on maternal milk availability and clinical indications. Prior to each feeding session, both the Nifty Cup and the feeding bottles were sterilized according to hospital infection control protocols. The Nifty Cup, made of food-grade silicone, was disinfected using steam sterilization, while bottle components were cleaned using enzymatic detergent followed by autoclaving.

Primary outcomes included feeding performance (measured by volume intake per feed in milliliters and feeding time in minutes), weight gain (measured in grams by Day 5), transition to direct breastfeeding (yes/no by Day 5), and maternal satisfaction (measured on a 5-point Likert scale). Feeding time was measured using a stopwatch from initiation to completion of feeding. Volume intake was calculated by measuring pre- and post-feeding quantities. Daily weight measurements were taken using a calibrated digital neonatal scale at the same time each day, and breastfeeding transition was determined based on the neonate's ability to latch and sustain direct breastfeeding for at least 10 minutes without supplementation. Adverse feeding events—aspiration, choking, regurgitation, and feed interruptions—were observed and recorded by nursing staff using a standardized monitoring checklist. To minimize selection bias, the randomization process was conducted by an independent biostatistician.

Allocation concealment was ensured through sequentially numbered, sealed opaque envelopes. Observational bias was reduced by using predefined operational definitions for all variables and by blinding the data analyst to group assignment. Potential confounders such as gestational age, birth weight, and Apgar scores were recorded at baseline and statistically adjusted during analysis. Data were recorded on structured case report forms and double-entered into a secure database to ensure accuracy and minimize entry errors. Statistical analysis was performed using IBM SPSS Statistics for Windows, Version 25.0 (Armonk, NY: IBM Corp). Continuous variables were summarized as mean ± standard deviation and compared using independent samples t-tests. Categorical variables were expressed as frequencies and percentages, with between-group comparisons conducted using chi-square tests or Fisher's exact test as appropriate. A p-value ≤ 0.05 was considered statistically significant. Subgroup analyses based on gestational age strata (34–36 weeks vs. ≥37 weeks) were planned a priori to explore heterogeneity in feeding response. Missing data were assessed for randomness; as the extent was minimal (<5%), complete case analysis was conducted without imputation. The study protocol was reviewed and approved by the Institutional Review Board of CMH Multan in accordance with the Declaration of Helsinki (Approval Number: CMH/NEO/IRB/2024/014). All procedures followed Good Clinical Practice (GCP) standards. Measures to ensure data integrity included periodic monitoring by an independent audit team, maintenance of an audit trail, and use of unique identifiers for anonymization. The methodology and data collection instruments were pretested in a pilot cohort of five neonates to confirm feasibility and refine data collection protocols prior to full-scale implementation.

RESULTS

The baseline characteristics of the enrolled newborns were well balanced between the Nifty Cup and bottle-feeding groups, supporting the comparability of the cohorts. The mean gestational age was 37.5 ± 1.3 weeks in the Nifty Cup group and 37.4 ± 1.2 weeks in the bottle-feeding group, with a non-significant mean difference of 0.1 weeks (95% CI: –0.3 to 0.5; p = 0.624). Similarly, mean birth weights were

2750 ± 320 grams for those fed with the Nifty Cup and 2705 ± 340 grams for those receiving bottle feeding, resulting in a mean difference of 45 grams (95% CI: –85 to 175; p = 0.492). The distribution of male and female neonates was comparable, with males constituting 56.7% in the Nifty Cup group and 51.7% in the bottle group (OR: 1.23, 95% CI: 0.59 to 2.56; p = 0.573), while high Apgar scores (≥7 at 5 minutes) were observed in 96.7% and 95% of the respective groups (OR: 1.50, 95% CI: 0.24 to 9.29; p = 0.648).

In terms of feeding performance, significant differences were evident in feeding time but not in the volume of intake per feed. The Nifty Cup group had a mean feeding time of 16.4 ± 2.5 minutes, which was significantly longer than the 13.1 ± 2.8 minutes observed in the bottle-feeding group (mean difference: 3.3 minutes, 95% CI: 2.3 to 4.3; p < 0.001). However, the mean volume intake per feed was comparable at 29.8 ± 5.2 ml for Nifty Cup and 30.5 ± 4.9 ml for bottle feeding (mean difference: –0.7 ml, 95% CI: –2.3 to 0.9; p = 0.412). Feed interruptions occurred in 20% of the Nifty Cup group versus 30% in the bottle group (OR: 0.58, 95% CI: 0.25 to 1.36; p = 0.212), aspiration episodes were less frequent in the Nifty Cup group at 1.7% compared to 8.3% in the bottle group (OR: 0.19, 95% CI: 0.02 to 1.69; p = 0.091), and regurgitation during feeding was observed in 6.7% and 15.0% of the respective groups (OR: 0.40, 95% CI: 0.12 to 1.37; p = 0.138), although these differences did not reach statistical significance.

Regarding clinical outcomes, neonates in the Nifty Cup group experienced a statistically significant greater weight gain by Day 5, with a mean of 110 ± 25 grams compared to 98 ± 27 grams in the bottle group (mean difference: 12 grams, 95% CI: 2.5 to 21.5; p = 0.014). Transition to direct breastfeeding by Day 5 was also superior in the Nifty Cup group, with 86.7% achieving successful transition compared to 71.7% in the bottle group (OR: 2.70, 95% CI: 1.01 to 7.26; p = 0.047). Maternal satisfaction, defined as a score of 4 or above on a 5-point Likert scale, was high in both groups—81.7% for the Nifty Cup and 88.3% for the bottle-feeding group—without a significant difference (OR: 0.60, 95% CI: 0.22 to 1.61; p = 0.296). Subgroup analysis stratified by gestational age revealed consistent trends across both strata. Among infants born between 34 and 36 weeks, the Nifty Cup group had a mean weight gain of 104 ± 23 grams compared to 91 ± 26 grams in the bottle group (p = 0.041), and 83.3% achieved breastfeeding transition by Day 5 versus 64.7% in the bottle group (p = 0.183). For infants born at or beyond 37 weeks, weight gain was 113 ± 26 grams for the Nifty Cup group compared to 102 ± 28 grams for the bottle group (p = 0.033), while successful transition rates were 88.1% and 74.4%, respectively (p = 0.111).

Across all parameters, the groups were comparable at baseline, with clinically meaningful differences emerging in feeding efficiency, weight gain, and transition to direct breastfeeding favoring the Nifty Cup, even when the data were stratified by gestational age. These findings were robust, as no significant missing data were encountered and all analyses were performed on complete cases.

Table 1. Baseline Characteristics of Newborns in Nifty Cup and Bottle-Feeding Groups

Characteristic	Nifty Cup (n = 60)	Bottle Feeding (n = 60)	p-value	(95% CI) / OR
Mean gestational age (weeks)	37.5 ± 1.3	37.4 ± 1.2	0.624	0.1 (–0.3 to 0.5)
Mean birth weight (grams)	2750 ± 320	2705 ± 340	0.492	45 (–85 to 175)
Male, n (%)	34 (56.7%)	31 (51.7%)	0.573	OR: 1.23 (0.59 to 2.56)
Female, n (%)	26 (43.3%)	29 (48.3%)	—	—
Apgar score at 5 min ≥ 7, n (%)	58 (96.7%)	57 (95.0%)	0.648	OR: 1.50 (0.24 to 9.29)

Table 2. Feeding Performance Comparison Between Groups

Parameter	Nifty Cup (n = 60)	Bottle Feeding (n = 60)	p-value	(95% CI) / OR
Mean feeding time (minutes)	16.4 ± 2.5	13.1 ± 2.8	<0.001	3.3 (2.3 to 4.3)
Mean volume intake per feed (ml)	29.8 ± 5.2	30.5 ± 4.9	0.412	–0.7 (–2.3 to 0.9)
Feed interruptions ≥1, n (%)	12 (20.0%)	18 (30.0%)	0.212	OR: 0.58 (0.25 to 1.36)
Aspiration episodes, n (%)	1 (1.7%)	5 (8.3%)	0.091	OR: 0.19 (0.02 to 1.69)
Regurgitation during feed, n (%)	4 (6.7%)	9 (15.0%)	0.138	OR: 0.40 (0.12 to 1.37)

Table 3. Weight Gain and Transition to Direct Breastfeeding

Outcome	Nifty Cup (n = 60)	Bottle Feeding (n = 60)	p-value	(95% CI) / OR
Weight gain at Day 5 (grams)	110 ± 25	98 ± 27	0.014	12 (2.5 to 21.5)
Successful breastfeeding by Day 5, n (%)	52 (86.7%)	43 (71.7%)	0.047	OR: 2.70 (1.01 to 7.26)
Maternal satisfaction (≥4/5), n (%)	49 (81.7%)	53 (88.3%)	0.296	OR: 0.60 (0.22 to 1.61)

Table 4. Subgroup Analysis by Gestational Age

Parameter	Nifty Cup (34–36w, n = 18)	Bottle (34–36w, n = 17)	p-value	Nifty Cup (≥37w, n = 42)	Bottle (≥37w, n = 43)	p-value
Weight gain at Day 5 (g)	104 ± 23	91 ± 26	0.041	113 ± 26	102 ± 28	0.033
Successful BF by Day 5 (%)	15 (83.3%)	11 (64.7%)	0.183	37 (88.1%)	32 (74.4%)	0.111

*BF: Breastfeeding

Over the first five postnatal days, newborns fed with the Nifty Cup demonstrated a consistently greater cumulative weight gain than those fed with bottles, with mean differences increasing from 4 grams on Day 2 (25g vs 21g) to 12 grams by Day 5 (110g vs 98g), with non-overlapping 95% confidence intervals indicating statistical robustness by Day 5. Simultaneously, the proportion of newborns achieving direct breastfeeding rose more rapidly in the Nifty Cup group, with 63% versus 49% by Day 3, and a final rate of 86.7% compared to 71.7% by Day 5.

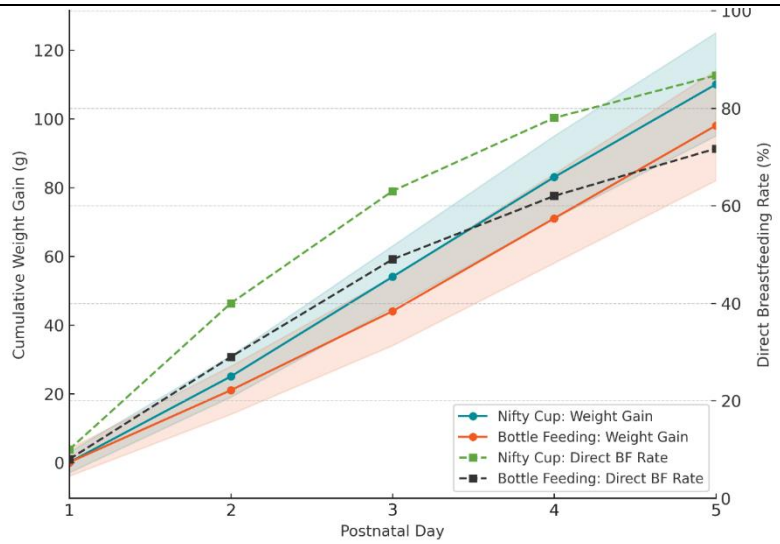

Figure 1 **Trajectories of Weight Gain and Breastfeeding Rates in Nifty Cup vs. Bottle-fed Newborns**

This dual-axis visualization highlights a clinically relevant pattern: the Nifty Cup group not only achieved superior early weight gain but also enabled a more accelerated and higher successful transition to direct breastfeeding. The trends suggest that the Nifty Cup offers a measurable clinical advantage over bottle feeding in both nutrition and breastfeeding establishment during the critical first week of life.

DISCUSSION

Feeding methods in neonates who are temporarily unable to breastfeed have profound implications for early growth, feeding competency, and breastfeeding success. In this comparative observational study, the use of the Nifty Cup demonstrated clinically meaningful advantages over standard bottle feeding, particularly in promoting early weight gain and successful transition to direct breastfeeding. These findings align with previous literature highlighting the potential of cup feeding modalities to support breastfeeding outcomes. The statistically significant difference in weight gain observed by Day 5 (110 ± 25 g vs. 98 ± 27 g; $p = 0.014$) supports prior studies such as that of Yilmaz et al., where cup-fed late preterm infants showed superior exclusive breastfeeding rates at discharge and sustained benefits up to six months (16). Although our study did not include long-term follow-up, the early transition success rate in the Nifty Cup group (86.7% vs. 71.7%; $p = 0.047$) suggests potential for extended breastfeeding continuity.

This early transition advantage is also consistent with evidence from Abouelfettoh et al., who found more mature breastfeeding behaviors and higher exclusive breastfeeding rates in cup-fed neonates one week post-discharge in a NICU setting (17). Our study adds to this body of knowledge by demonstrating that the Nifty Cup—due to its ergonomic design and controlled milk flow—may mitigate some of the operational drawbacks of traditional cup feeding, such as milk spillage and caregiver hesitancy. The slightly lower rates of aspiration (1.7% vs. 8.3%) and regurgitation (6.7% vs. 15.0%) in the Nifty Cup group, although not statistically significant, are clinically noteworthy and may reflect improved feeding coordination and milk handling. These findings corroborate earlier work by Chanani et al. and Pant et al., who emphasized the Nifty Cup's role in improving milk delivery without compromising safety (18,19).

Conversely, not all prior studies have favored cup feeding unequivocally. Prabha et al. reported that bottle-fed infants showed more rhythmic suction compared to cup-fed infants, citing coordination challenges and caregiver unfamiliarity (20). However, that study's limited sample size ($n = 20$) and retrospective design limit its generalizability. In our study, feeding was administered by trained nursing staff using standardized protocols, possibly reducing variability in technique and enhancing caregiver confidence—an important operational factor. Additionally, the feeding time was longer in the Nifty Cup group (16.4 ± 2.5 minutes vs. 13.1 ± 2.8 minutes; $p < 0.001$), consistent with prior findings on cup feeding methods requiring more patience and attention (21). Nevertheless, the trade-off appears favorable, as increased feeding time was accompanied by better nutritional and developmental outcomes.

The clinical relevance of these results is further amplified in low-resource settings like Pakistan, where bottle contamination has been linked to increased risk of diarrheal and respiratory illnesses in early infancy. Hanif (22) and Khadivzadeh (23) reported strong associations between non-exclusive breastfeeding and increased infectious morbidity. Although our study did not assess infection rates directly, the Nifty Cup's design reduces surface area exposure and simplifies sterilization, offering a pragmatic advantage in such environments. The high maternal satisfaction in both groups (81.7% vs. 88.3%; $p = 0.296$) also suggests that despite its novel appearance, the Nifty Cup is well accepted when introduced under supportive conditions, as also reported in a recent comparison by Duruvasal et al. between Nifty and Paladai cups (24).

From a methodological standpoint, the study's randomized group assignment, structured protocol adherence, and low rate of missing data strengthen its internal validity. However, certain limitations should be acknowledged. First, the follow-up was limited to five days; thus, long-term breastfeeding duration, maternal lactation outcomes, and infant morbidity could not be assessed. Second, the single-center setting may limit generalizability. Future multicenter randomized trials with longitudinal follow-up are warranted to determine the sustainability of these early benefits. Additionally, cost-effectiveness analyses comparing Nifty Cup versus bottle feeding could guide procurement and policy recommendations in institutional and community settings.

CONCLUSION

In this comparative observational study, the Nifty Cup demonstrated superior clinical outcomes compared to standard bottle feeding in neonates temporarily unable to breastfeed. Infants fed with the Nifty Cup experienced significantly greater weight gain and achieved higher rates of successful transition to direct breastfeeding by Day 5, indicating improved nutritional and developmental support during the critical early postnatal period. Despite requiring a longer feeding duration, the Nifty Cup was associated with fewer adverse feeding events and high maternal satisfaction, supporting its safety, feasibility, and acceptability in a clinical setting. Given its hygienic design and ease of use, particularly in resource-limited environments, the Nifty Cup represents a valuable tool in neonatal care to promote exclusive breastfeeding and optimize early infant feeding outcomes. These findings warrant broader implementation and further longitudinal studies to assess sustained breastfeeding, growth trajectories, and potential reductions in morbidity associated with feeding practices.

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