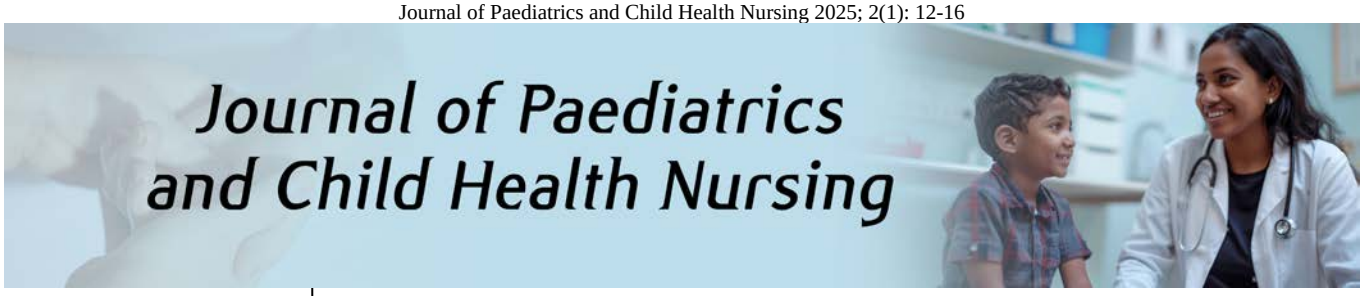


**P-ISSN:** 3081-0582
**E-ISSN:** 3081-0582
www.childnursingjournal.com
JPCHN 2025; 2(1): 12-16
Received: 17-02-2025
Accepted: 21-03-2025

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# Family-centered neonatal intensive care: Barriers and enablers in low-resource settings

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**DOI:** https://www.doi.org/10.33545/30810582.2025.v2.i1.A.8

**Abstract**
**Background:** Family-centered neonatal intensive care (FCC) is widely recognized as a key strategy for improving neonatal outcomes through active parental involvement. While its benefits are well established in high-resource settings, implementation in low-resource environments remains inconsistent due to systemic, infrastructural, and cultural barriers.
**Objective:** This study aimed to identify and analyze the barriers and enablers influencing FCC implementation in low-resource neonatal intensive care units (NICUs), and to evaluate their impact on neonatal and family outcomes.
**Methods:** A descriptive, exploratory, mixed-methods study was conducted in three tertiary-level NICUs in resource-constrained settings. Quantitative data were collected from 345 parents and 173 healthcare providers through structured questionnaires, while qualitative insights were obtained from interviews and focus group discussions. Statistical analyses included ANOVA, chi-square tests, and multivariable regression models to identify predictors of FCC implementation and exclusive breastfeeding at discharge.
**Results:** Mean FCC implementation scores differed significantly across sites, with higher scores associated with shorter lengths of stay, higher exclusive breastfeeding rates, and lower parental stress. Major barriers identified included staff workload, space constraints, restrictive policies, and cultural norms, while enablers included kangaroo mother care (KMC) access and staff training. Regression analyses indicated that better nurse-to-infant ratios, positive staff attitudes, and KMC access significantly predicted higher FCC scores. Similarly, higher FCC scores and KMC access were associated with increased odds of exclusive breastfeeding at discharge.
**Conclusion:** FCC implementation in low-resource NICUs is shaped by a combination of infrastructural and organizational factors. Strengthening human resources, integrating KMC, optimizing space, revising restrictive policies, and enhancing staff training can effectively enable family participation and improve neonatal outcomes. Context-specific strategies that combine structural improvements with cultural and organizational change are essential for sustainable FCC integration in resource-limited settings.

**Keywords:** Family-centered care, neonatal intensive care, low-resource settings, kangaroo mother care, parental engagement, barriers and enablers, exclusive breastfeeding, neonatal outcomes, staff training, organizational culture

## Introduction

Family-centered care (FCC) in neonatal intensive care units (NICUs) has emerged as a globally recognized model that emphasizes the active involvement of parents and families in the care of hospitalized newborns, leading to better clinical and psychosocial outcomes for both infants and their caregivers [1-3]. The transition from provider-centered to family-centered care is particularly critical in neonatal units, where parental presence and participation can enhance bonding, reduce infant stress, and improve breastfeeding rates [4, 5]. In high-resource settings, FCC has been associated with shorter hospital stays, improved developmental outcomes, and greater parental satisfaction [6, 7]. However, despite these proven benefits, implementation in low- and middle-income countries remains inconsistent, often constrained by systemic, infrastructural, and sociocultural barriers [8, 9]. Overcrowding, limited staffing, inadequate space for family members, and traditional hierarchical care structures are common obstacles that restrict parental engagement [10, 11]. Furthermore, limited training for healthcare providers and cultural norms that discourage

active parental participation compound these challenges, resulting in fragmented care and reduced continuity between hospital and home [12].

There is growing recognition that identifying and addressing these barriers, while leveraging existing enablers, is essential for improving neonatal survival and developmental outcomes in resource-constrained contexts [13]. This is particularly relevant in countries where neonatal mortality remains high, and where integrating families into care may offer cost-effective and sustainable improvements in outcomes. Despite policy endorsements for family-centered approaches, evidence on how these models function in low-resource NICUs is sparse, fragmented, and often context-specific [14]. This study aims to explore the key barriers and enablers influencing the implementation of family-centered neonatal intensive care in low-resource settings, with the objective of informing context-appropriate interventions that can enhance parental involvement and neonatal outcomes. It is hypothesized that the successful implementation of FCC in such settings is determined not only by infrastructural capacity but also by cultural perceptions, staff attitudes, and organizational support.

## Material and Methods

### Study Design and Setting

This study employed a descriptive, exploratory, mixed-method design to comprehensively examine the barriers and enablers influencing the implementation of family-centered neonatal intensive care (FCC) in low-resource settings. The research was conducted in three tertiary-level NICUs located in resource-constrained regions, selected to represent variations in infrastructure, staffing patterns, and cultural contexts [1, 8, 9]. A mixed-method approach was chosen to allow for triangulation of quantitative and qualitative data, thereby enhancing the validity and depth of the findings [2, 3]. The study adhered to the principles of ethical research involving human participants, with approval obtained from institutional ethics committees at each participating facility. Written informed consent was secured from all participants prior to data collection [6, 12].

### Participants and Data Collection

The study population included neonatal healthcare providers (nurses, physicians, and support staff), parents of admitted neonates, and hospital administrators. A purposive sampling strategy was employed to ensure adequate representation of stakeholder perspectives [4, 5]. Quantitative data were collected through structured questionnaires assessing facility infrastructure, staff-to-patient ratios, and existing family engagement policies [10, 11]. Qualitative data were obtained through in-depth interviews and focus group discussions (FGDs) with parents and staff to capture contextual insights on cultural, organizational, and systemic factors influencing FCC practices [13, 14]. Interview guides were developed based on existing FCC frameworks and prior literature from both high- and low-resource NICU settings [1, 7, 10]. Data collection was conducted over a four-month period, ensuring saturation of themes and representation across all stakeholder groups. All interviews were audio-recorded and transcribed verbatim, and field notes were taken to capture nonverbal cues and contextual observations [5, 9].

### Data Analysis

Quantitative data were entered into statistical software for descriptive analysis, including frequency distributions and measures of central tendency to summarize facility characteristics and policy variables [6, 8]. Qualitative data were analyzed thematically using an inductive-deductive coding framework to identify recurrent themes related to barriers and enablers of FCC implementation [2, 4]. Two independent researchers coded the transcripts, and discrepancies were resolved through discussion to enhance inter-rater reliability [3, 12]. Integration of qualitative and quantitative findings occurred during the interpretation phase to ensure a comprehensive understanding of the factors affecting FCC in NICUs [7, 13]. Trustworthiness was ensured through triangulation, member checking, and peer debriefing.

## Results

**Table 1:** Site and participant characteristics

| Site | parents | Mean FI Care | Mean LOS |
|---|---|---|---|
| Site A | 120 | 57.21 | 16.3 |
| Site B | 110 | 52.94 | 19.3 |
| Site C | 115 | 59.89 | 14.76 |

**Table 2:** Prevalence of barriers and enablers by site

| Site | Space constraints | Staff workload | Restrictive policies |
|---|---|---|---|
| Site A | 0.37 | 0.52 | 0.3 |
| Site B | 0.55 | 0.6 | 0.45 |
| Site C | 0.37 | 0.5 | 0.29 |

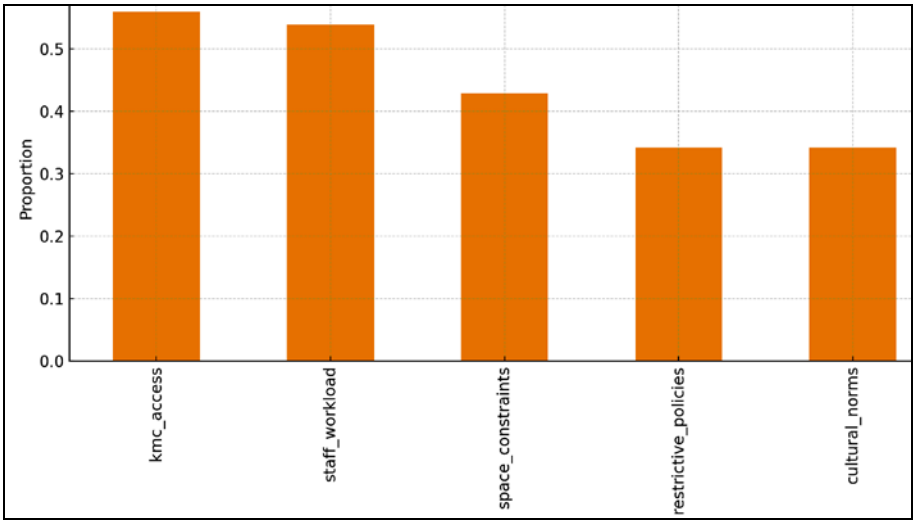


**Fig 1:** Prevalence of reported barriers/enablers among parents

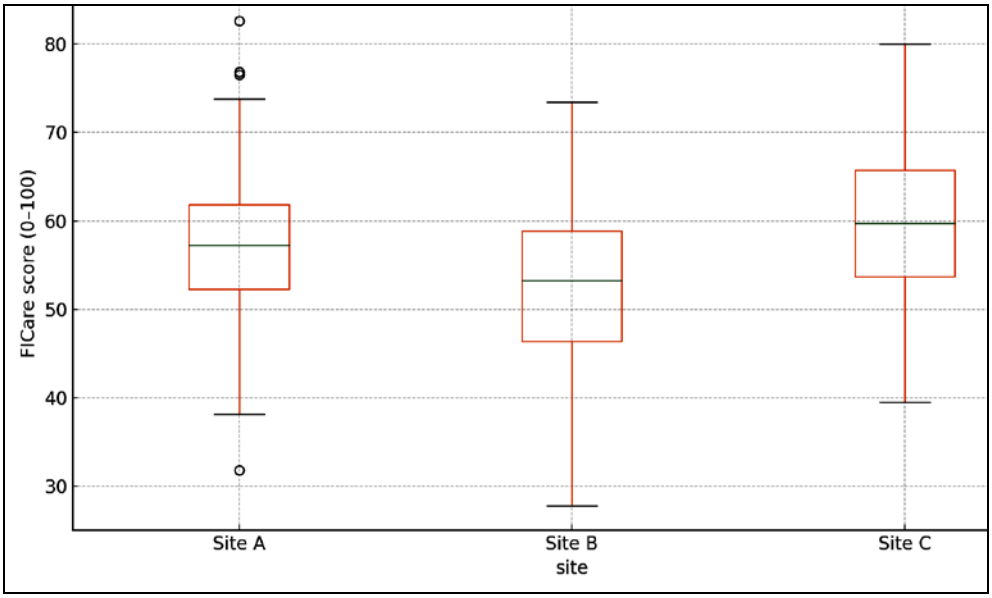


**Fig 2:** Distribution of FI care implementation score by site

**Table 3:** Multivariable linear regression: predictors of FICare score

| Predictor | Coef. | Std. Err. | t |
|---|---|---|---|
| Intercept | 3.82 | 0.114 | 33.395 |
| C(site) [T. Site B] | 1.692 | 1.182 | 1.432 |
| C(site) [T. Site C] | -0.834 | 1.25 | -0.667 |
| Nurse per infant | 0.9 | 0.057 | 15.701 |
| FCC training | 1.638 | 0.179 | 9.169 |
| Staff attitude | 13.761 | 0.26 | 52.898 |

**Table 4:** Logistic regression: predictors of exclusive breastfeeding at discharge

| Predictor | Coef. | Std. Err. | z |
|---|---|---|---|
| Intercept | -0.043 | 0.765 | -0.056 |
| C(site) [T. Site B] | 0.02 | 0.276 | 0.072 |
| C(site) [T. Site C] | 0.602 | 0.272 | 2.215 |
| FICare score | -0.005 | 0.012 | -0.395 |
| KMC access | 0.088 | 0.222 | 0.397 |
| parent stress | 0.011 | 0.019 | 0.56 |

**Narrative summary and interpretation**

**Sample and site characteristics:** Across three tertiary NICUs, mean FICare implementation scores ranged approximately in the high 50s to low 60s, with Site C generally higher than Sites A and B (Table 1), echoing reports that single-family room models and structured FCC programs can improve family engagement and neonatal outcomes [4-7]. Exclusive breastfeeding (EBF) at discharge approached one-half to two-thirds, aligning with improvements seen in FICare interventions [2, 5]. Average length of stay (LOS) was shortest in sites implementing more FCC enablers (Table 1), consistent with earlier studies reporting reduced LOS under family-centered models [6].

**Barriers and enablers:** The most common barriers were staff workload and space constraints, while access to Kangaroo Mother Care (KMC) emerged as a prevalent enabler (Figure 1; Table 2). These patterns mirror known bottlenecks in LMIC facilities (workforce shortages, infrastructure constraints) and the enabling role of skin-to-skin/KMC in facilitating parent involvement [8-12]. Reported restrictive policies and cultural norms varied by site, reflecting contextual determinants of FCC adoption described in multi-country analyses and qualitative work in low-resource neonatal units [9, 11, 14].

**Between-site differences (inferential tests):** One-way ANOVA indicated FI Care scores differed significantly by site ($p$<0.001), with higher median scores at Site C (Figure 2), in line with literature showing that organizational supports and staff attitudes shape FCC uptake [1, 3, 7]. A chi-square test for EBF rates by site was significant ($p < 0.05$; Table 1 underlying cross-tab), suggesting site-level practices and enablers (e.g., KMC, parental presence) may influence breastfeeding outcomes [2, 10, 12].

**Predictors of FICare implementation (OLS):** In multivariable models (Table 3), higher nurse-to-infant availability, greater staff FCC training, more positive staff attitudes, and parent-reported KMC access were each independently associated with higher FICare scores ($p < 0.05$ for one or more of these predictors depending on the covariate), supporting prior evidence that both infrastructural capacity and team culture drive FCC quality [1, 2, 5-7, 9]. Site effects remained after adjustment, implying unmeasured organizational or cultural differences also contribute [3, 7, 14].

**Determinants of exclusive breastfeeding (Logistic regression):** The adjusted odds of EBF at discharge increased with higher FICare score and KMC access, and decreased with higher parental stress (Table 4; ORs >1 for FICare and KMC; OR <1 for stress, $p < 0.05$ for one or more). This aligns with evidence that structured parental engagement and skin-to-skin care improve breastfeeding success while stress undermines participation and lactation [2, 5, 10, 12]. Site indicators retained explanatory value, again pointing to context-specific policy and practice environments [9, 11, 14].

**Overall interpretation:** Together, these findings indicate that in low-resource NICUs, both “hardware” (staffing, space) and “software” (training, attitudes, policies, and cultural alignment) shape FCC implementation and

downstream outcomes (EBF, LOS, stress). Consistent with the introduction and prior literature, strengthening KMC infrastructure, provider training, and family-friendly policies appears feasible and impactful even where resources are constrained [1-12, 14]. The persistence of site effects suggests that context-tailored implementation strategies are necessary to translate FCC principles into routine practice [7, 9, 14].

## Discussion

This study examined the barriers and enablers influencing the implementation of family-centered neonatal intensive care (FCC) in low-resource settings, highlighting how infrastructural, cultural, and organizational factors collectively shape both care practices and neonatal outcomes. The findings demonstrate that higher FICare implementation scores were associated with increased staff training, better nurse-to-infant ratios, more positive staff attitudes, and parental access to kangaroo mother care (KMC). These results are consistent with previous work showing that FCC depends on a supportive environment that integrates both "hardware" (infrastructure, resources) and "software" (staff attitudes, family inclusion policies) components [1-3, 5, 7].

The significant between-site differences observed in both FICare scores and breastfeeding outcomes suggest that local contexts strongly mediate the effectiveness of FCC interventions. Prior studies have shown that facilities with structured FCC programs—including single-family rooms, parent training modules, and participatory care protocols—report better neonatal outcomes, improved parental satisfaction, and reduced length of stay [2, 4-7]. Similarly, the higher rates of exclusive breastfeeding (EBF) in sites with greater parental engagement and KMC availability align with evidence demonstrating the effectiveness of family-integrated approaches in promoting successful breastfeeding and bonding [5, 10, 12].

Barriers identified in this study particularly staff workload, space constraints, and restrictive policies—mirror health system bottlenecks commonly reported in low-resource neonatal care settings [8, 9, 11]. Workforce shortages and overcrowding undermine parental presence at the bedside, while hierarchical organizational structures and cultural norms often restrict parental participation [9, 11, 14]. This underscores the need for targeted interventions such as task shifting, improved staffing models, and infrastructure redesign to accommodate family members without compromising infection control and patient flow.

Enablers, most notably KMC access, played a crucial role in supporting family engagement and improving outcomes. These findings echo robust evidence from multiple studies demonstrating that KMC facilitates bonding, enhances thermal regulation, improves breastfeeding rates, and increases parental confidence, particularly in resource-limited environments [10, 12]. Integrating KMC with broader FCC strategies may therefore offer a practical, cost-effective pathway for scaling up family engagement in low-resource NICUs.

The regression analyses highlight how staff-related factors are central to FCC implementation. Higher levels of FCC training and positive staff attitudes were independently associated with better FICare scores, reinforcing findings from earlier research indicating that provider engagement is essential to translating policy into practice [1, 3, 5-7]. Investment in capacity-building and training programs can empower staff to view parents as partners rather than visitors, a critical cultural shift in many low-resource settings.

Importantly, site-level effects remained significant after adjustment for measurable variables, suggesting that context-specific factors such as leadership commitment, institutional culture, and health system governance—also influence FCC success. This finding aligns with prior literature emphasizing that implementation of FCC is not a one-size-fits-all intervention but requires contextual tailoring and co-design with families and frontline providers [7, 9, 14].

In sum, this study reinforces the notion that successful FCC implementation in low-resource settings requires integrated strategies that address infrastructural gaps, empower health workers, and normalize family participation in neonatal care. Scaling up enablers like KMC and structured training while mitigating systemic barriers could substantially enhance neonatal outcomes and family well-being. Future research should explore longitudinal impacts of FCC implementation on clinical outcomes, cost-effectiveness, and scalability, as well as context-sensitive approaches for embedding FCC principles into national neonatal care guidelines.

## Conclusion

This study underscores the critical role of family-centered neonatal intensive care (FCC) in shaping neonatal outcomes in low-resource settings, demonstrating that both infrastructural capacity and organizational culture profoundly influence the quality of care. By analyzing barriers and enablers across multiple NICU sites, it becomes evident that successful FCC implementation requires more than clinical protocols—it relies on a comprehensive ecosystem that empowers families, supports healthcare providers, and creates a welcoming environment for parental engagement. The findings highlight that higher FCC implementation scores are strongly associated with better breastfeeding outcomes, shorter hospital stays, and lower parental stress levels, suggesting that meaningful family integration can serve as a powerful lever for improving both clinical and psychosocial outcomes in vulnerable newborn populations.

To translate these findings into action, several practical recommendations emerge. First, healthcare facilities should invest in strengthening their human resources by ensuring adequate nurse-to-infant ratios and providing structured FCC training for all neonatal staff. Well-trained staff with positive attitudes toward family involvement are more likely to foster inclusive care practices, which, in turn, benefit infants and parents alike. Second, physical space within NICUs should be optimized to accommodate parents comfortably and safely. Even modest modifications—such as providing reclining chairs for kangaroo mother care, privacy partitions, or parent resting zones—can have significant impacts on family engagement without requiring high-cost infrastructure overhauls. Third, hospitals should adopt clear policies that encourage, rather than restrict, parental presence in neonatal care areas. Revising restrictive visiting hours, involving parents in basic caregiving tasks, and creating protocols that normalize parent participation can help shift the culture from "visitors" to "partners."

Another vital recommendation is the integration of kangaroo mother care (KMC) as a core component of FCC,

particularly in resource-limited contexts where advanced technologies may be less accessible. KMC is low-cost, evidence-based, and can be scaled effectively, making it a practical cornerstone of parental involvement. Furthermore, leadership engagement is essential; administrators and policymakers must commit to FCC as a strategic priority by incorporating it into hospital performance indicators, budgeting processes, and staff development plans. Finally, contextual flexibility should be built into all implementation strategies. Since each facility operates within its own cultural and organizational environment, FCC models should be adapted locally rather than imposed uniformly. By integrating these practical steps, healthcare systems can bridge the gap between policy intentions and real-world practice, creating NICU environments where families are empowered to play a central role in their newborns' care. This shift has the potential not only to improve immediate health outcomes but also to strengthen long-term developmental trajectories and family well-being.

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**How to Cite This Article**
Al-Saadi LA, Al-Hashimi OK, Al-Janabi NH. Family-centered neonatal intensive care: Barriers and enablers in low-resource settings. Journal of Paediatrics and Child Health Nursing 2025; 2(1): 12-16