Transforming neonatal nursing in India: challenges, opportunities, and the way forward

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The Lancet Regional Health - Southeast Asia 2025;32: 100522

Published Online xxx
https://doi.org/10.1016/j.lansea.2024.100522

Summary

Neonatal care is essential for the well-being of newborns, particularly premature or critically ill patients. Despite advancements in medical technology and evidence-based practice, India faces significant challenges in neonatal nursing, including resource limitations, inconsistent training, and inadequate policy support. This paper examines the current state of neonatal nursing in India, highlighting disparities between urban and rural areas, and comparing them to global practices. It explores systemic issues affecting neonatal care, such as inadequate educational frameworks, a shortage of trained faculty, and insufficient clinical exposure. We outline a comprehensive approach to address these challenges, including the introduction of Neonatal Nurse Practitioner programs, enhancements in specialized training, promotion of evidence-based practices, and integration of technology. We also emphasize the need for stronger policy support and increased funding to improve the neonatal care infrastructure. By adopting these recommendations, India can make significant strides towards improving neonatal outcomes and aligning itself with global health targets.

Keywords: Infant; Newborn; Neonatal nursing; Infant mortality; Nurse practitioners; Technology; India

Introduction

Neonatal care is essential for newborns, particularly those who are premature, critically ill, or need specialized medical attention.[1] Neonatal nurses significantly impact the survival and health outcomes of vulnerable newborns through advanced skills and timely decision-making.[2,3] Studies indicate that higher neonatal nurse staffing levels are associated with reduced neonatal and perinatal mortality rates.[4] Despite technological and evidence-based practices (EBP) advancements, neonatal care challenges persist, especially in low-and middle-income countries (LMICs) like India.[5] Global health goals like Sustainable Development Goal 3, Target 3.2, aim to lower neonatal mortality to below 12 per 1000 live births by 2030,[6] yet India's neonatal mortality rate is high at 21.7 per 1000 live births.[7] Achieving these targets requires strengthening medical infrastructure and the specialized neonatal nursing workforce.

Background

India's healthcare landscape shows both progress and persistent challenges, particularly disparities in neonatal care across regions.[8] Urban centers often have advanced neonatal care facilities, whereas rural and resource-limited settings struggle with access to essential services.[9] The diversity within India means challenges and solutions vary significantly by states and regions. Rural areas have notably higher under-five and neonatal mortality rates.[10,11] These regions suffer from shortages of trained neonatal nurses, infrastructure constraints, limited professional development, insufficient medical equipment, poor transportation, and inadequate referral facilities.[12–14] These issues hinder the effective management of high-risk neonatal cases like sepsis, birth asphyxia, and low birth weight. Despite progress in maternal and child health initiatives,[15,16] neonatal nursing specialization is often overlooked. There is a critical need for structured education, training, and infrastructure support tailored to India's unique neonatal care challenges, particularly in rural areas with limited resources.

This personal view aimed to 1) critically evaluate the current state of the neonatal nursing workforce and education in India, 2) examine specific challenges in neonatal care, and 3) outline advancements in neonatal nursing in India. Drawing insights from high-income countries, this personal view provides recommendations for policymakers, educators, and healthcare providers to align Indian neonatal care systems with global best practices.

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Neonatal nursing workforce

Neonatal nursing workforce development shows significant disparities between high-income and LMICs, in training standards, workforce distribution, and access to ongoing education.[17,18]

Global overview of neonatal nursing workforce

The neonatal nursing workforce is crucial to global neonatal health systems. Organizations like the World Health Organization (WHO) have established essential neonatal care benchmarks to guide and standardize practices,[19] but their implementation varies. High-income countries have structured certification programs and rigorous standards for neonatal nurses, leading to better neonatal outcomes.[20] For instance, the United States (U.S.), Canada, and the United Kingdom (U.K.) have established specialized training programs and regulated nurse-to-infant ratios in Neonatal Intensive Care Units (NICUs).[21] LMICs, however, face challenges such as persistent shortages of trained neonatal nurses, affecting care quality.[13,22] These countries may require tailored neonatal nursing education and workforce development strategies. Various strategies have been used to address these challenges. In the USA, Neonatal Nurse Practitioners (NNPs) play a central role in NICU care, while Canada and the UK have structures similar to specialized registered nurses. Australia expanded its neonatal nursing workforce through simulation-based training, an approach adapted to suit countries such as India, considering local resources and healthcare systems.

Current status of neonatal nurses in India

India's neonatal nursing workforce faces systemic challenges, particularly in rural and resource-limited settings where neonatal mortality rates are the highest. These challenges are compounded by inconsistencies in national standards and certification programs for neonatal nursing, which prevent them from meeting international benchmarks. The disparity between urban and rural areas is stark, with rural regions experiencing severe shortages in both nurse numbers and training resources, limiting their capacity to deliver high-quality neonatal care.[23] This inequality is reflected in India's neonatal nurse-to-patient ratio. While the Staff Inspection Unit (SIU) Norms (1991–1992) recommend a nurse-to-neonate ratio of 1:2 in NICUs,[24] structural barriers often result in ratios as high as 1:25 in rural public hospitals,[25] compromising care quality. The per capita number of neonatal nurses in India is significantly below the global average, with few trained specifically for neonatal care.[26,27] Estimates suggest that six million nurses will be needed across India by 2030 to meet healthcare demands,[28] with a significant portion required to address the growing needs in neonatal care. However, the lack of support for targeted training initiatives may leave this growing workforce insufficient to meet specific neonatal care demands.

Neonatal nursing education

Neonatal nursing education is critical for improving neonatal outcomes worldwide. While high-income countries have established specialized training programs, India's neonatal nursing education system faces gaps that affect training quality, particularly in underserved areas.

Neonatal nursing education in high-income countries

In high-income countries, neonatal nursing education emphasizes advanced skills, EBP, and leadership. For instance, the U.S. and the UK offer NNP and Specialist Neonatal Nurse certifications, respectively, which provide neonatal nurses with specialized training to care for critically ill newborns. In Australia and Canada, structured certifications and continuing education programs are the standard. Australia's Graduate Certificate in Neonatal Intensive Care Nursing and Master of Advanced Nursing Practice (Neonatal Intensive Care) and New Zealand's Postgraduate Certificate in Neonatal Intensive Care Nursing are equipped with specialized clinical skills, which are reinforced through continuous professional development programs. These countries' emphasis on ongoing education keeps neonatal nurses current, with advancements in care. However, challenges such as rural workforce shortages persist, highlighting the need for uniform access to specialized neonatal care.

Current state of neonatal nursing education in India

India's neonatal nursing education system is currently in a state of transition, striving to meet the growing demand for specialized neonatal care. Although the country has established nursing programs that include neonatal care components, there is a significant need for more focused and standardized neonatal nursing education. The existing system faces challenges in providing comprehensive, specialized training, particularly in rural and underserved areas.

In India, neonatal nursing education is typically provided as part of broader nursing programs, such as Auxillary Nurse Midwives (ANM), General Nursing and Midwifery (GNM), Bachelor of Science in Nursing (BSc Nursing), and Master of Science in Nursing (MSc Nursing), specializing in Pediatric Nursing[29] (Table 1). However, standardized neonatal nursing specialization remains limited.

Several initiatives have aimed to enhance the neonatal nursing workforce in India through specialized training and continuing education (Table 2). Unlike

high-income countries, India lacks standardized, widely accessible, and continuing education programs for neonatal nurses. These programs often face limitations in enrollment, outreach, and accessibility, especially in rural areas. Despite their potential to improve neonatal care, their reach is limited to remote areas. In contrast, countries such as Canada and Australia have integrated ongoing professional development into their healthcare systems, keeping neonatal nurses updated on their latest practices.

Incorporating these specialized programs into regular nursing education in India is inconsistent. The implementation of structured online continuing education programs and the establishment of standardized neonatal nursing certifications could significantly enhance the quality of neonatal care across the country. These improvements would help bridge the gap between India's current neonatal nursing education system and the more advanced models seen in high-income countries, ultimately leading to better outcomes for newborns.

Challenges in neonatal nursing education in India

India encounters significant challenges in neonatal nursing education that hinder nurses' preparation for critical neonatal care. Improving neonatal health outcomes and reducing infant mortality necessitates addressing curriculum design, faculty shortages, clinical exposure gaps, limited continuing education, and resource constraints.

Inadequate curriculum design and implementation

India's neonatal nursing curriculum suffers from inadequate curriculum design, varying by region and institution type.[13] Public institutions typically follow a standardized curriculum, whereas private colleges often lack consistency, especially in neonatal-specific skills such as preterm infant management, neonatal emergencies, and resuscitation.[38] This issue is more severe in states with under-resourced nursing councils, leading to weaker oversight. Additionally, curricula often do not mandate minimum clinical hours for neonatal care, resulting in inconsistent practical experiences and competencies among nursing graduates.

Shortage of trained faculty and expertise

Rural areas and states with limited health resources, such as Bihar, Odisha, and Jharkhand, face a significant shortage of qualified neonatal nursing faculty members. This is compounded by challenges in healthcare infrastructure and workforce development. In contrast, urban centers like Delhi and Mumbai attract skilled educators, leaving rural institutions with many unqualified faculties. Many nursing colleges have struggled to recruit and retain educators with both clinical and academic expertise in neonatal nursing. The faculty-to-student ratio in India can reach 1:45,[39] hindering individualized mentorship and hands-on training, which are essential for neonatal nursing. The WHO recommends lower faculty-to-student ratios to ensure quality education and mentorship.[40]

Program	Focus and limitations
ANM	This two-year diploma course focuses on primary care, including essential neonatal care. Students receive theoretical instruction and practical experience, although the depth and breadth of neonatal care training are limited.[30]
GNM	The three-year nursing diploma program offers basic neonatal care but has limited clinical practice hours in high-risk areas like the NICU, affecting students' hands-on experience with neonatal patients.
BSc Nursing	This undergraduate program provides a broader scope of training, including specialized neonatal care. However, the clinical hours dedicated to neonatal care are often not sufficient to fully prepare students for the complexities of NICU environments.[31]
MSc Nursing (Pediatrics)	At the postgraduate level, specialized training in pediatric and neonatal care is more comprehensive. However, despite offering opportunities for in-depth clinical and theoretical learning, access to advanced facilities and specialized training remains inconsistent across institutions.

ANM, Auxillary Nurse Midwives; GNM, General Nursing and Midwifery; BSc Nursing, Bachelor of Science in Nursing; MSc Nursing, Master of Science in Nursing.

Table 1: **Pre-service education programs in India.**

Limited clinical exposure and training opportunities

Clinical exposure is essential for neonatal nursing students to develop practical skills,[41] yet Indian nursing programs lack sufficient hands-on training. Limited specialized neonatal units and high clinical placement demands have exacerbated this issue. Urban centers offer better access to advanced NICUs, whereas rural

Training	Focus and limitations
Indira Gandhi Open University (IGNOU)	IGNOU provides a post-GNM distance education course in Infant and Neonatal Nursing (CINN).[32] Despite the six-month program's aim to enhance nursing professionals' skills and knowledge, enrollment is low, as noted by an author who is also a course counselor, indicating a need for increased outreach and awareness of the importance of specialized neonatal nursing training.
National and Regional Training Programs	The National Neonatology Forum, the All India Institute of Medical Sciences (AIIMS), New Delhi, the WHO Collaborating Center, and the Indian Association of Neonatal Nurses provides various neonatal training programs. The AIIMS, New Delhi, in collaboration with the WHO Collaborating Center, offers an Online Training Orientation Program in India, which includes courses like the sick newborn care course, facility-based newborn nursing course, and neonatal nurses orientation course.[33] The WHO Collaborating Center also provides the preterm baby video package,[34] essential newborn care course,[35] skill videos on neonatal procedures,[36] and podcasts on NICU equipment. The National Neonatology Forum additionally offers a fellowship courses for nurses and doctors in neonatology.[37]

Table 2: **Specialized training and continuing education.**

and semi-urban areas fall short. Studies show that about one-third of Indian nursing students graduate without NICU experience,[42] limiting their proficiency in ventilator management, infection control, and emergency procedures. States with better healthcare infrastructure like Kerala, provide more consistent clinical exposure.[43]

Inconsistent access to continuing education

Access to continuing education programs is uneven across India, with nurses in rural and remote regions facing significant barriers. States like Rajasthan and Uttar Pradesh have fewer institutions offering advanced training programs in neonatal nursing compared to southern states like Tamil Nadu and Kerala.[44] Geographical isolation, financial constraints, and limited institutional support exacerbate this issue in rural areas, preventing nurses from staying updated on evolving practices and technology.[45,46] This inconsistency perpetuates disparities in neonatal care quality across the country.

Resource constraints and infrastructure issues

Resource availability varies significantly between urban and rural areas, with rural institutions often struggling with inadequate infrastructure. Urban centers often have better access to simulation labs and up-to-date NICU training equipment, while many rural nursing colleges lack basic resources for hands-on training. These disparities reflect broader regional inequities in health care investment and the need for targeted infrastructure development.

Positive examples of progress

While resource constraints and infrastructure issues pose significant challenges, there are positive examples of progress in neonatal nursing education in India. The NNF has collaborated with various state governments, including Haryana and Madhya Pradesh, through Memorandums of Understanding (MOUs) to improve neonatal care. Similarly, the Tamil Nadu Nurse and Midwives Council has partnered with the Apollo Simulation Center to integrate competency-based simulation training into nursing curricula, providing essential hands-on experience.[47] These initiatives serve as a model for improving neonatal nursing education across India, demonstrating the potential for positive change when stakeholders collaborate effectively.

The way forward

Enhancing neonatal nursing education in India necessitates a phased approach to strengthen the curriculum, bolster faculty expertise, increase clinical exposure, and address resource limitations. This strategy involves collaboration with international partners, government funding, and targeted interventions in both rural and underserved areas. Each recommendation specifies steps, measurable goals, and implementation suggestions for a cohesive plan.

Strengthening neonatal nursing education and training

As outlined in Table 3, a phased, multi-tiered approach is essential to address the gaps in the neonatal nursing curriculum and training. This includes standardizing curriculum updates to include neonatal-specific NICU rotations and mandatory competency assessments in preterm care, neonatal resuscitation, and family centered practices. Partnerships with international nursing organizations can align curriculum standards with global best practices. National certification programs in neonatal care would establish high competency standards and improve care quality.

Implementation in rural areas

Budget allocations should prioritize rural institutions with mobile training units and tele-education platforms to improve accessibility. Urban pilot programs can serve as a foundation for phased rural expansion, based on observed outcomes and necessary adjustments. Success metrics should include tracking the percentage of neonatal nurses completing neonatal-specific rotations and certification programs within a specified timeframe.

Neonatal Nurse Practitioners

While strengthening education and training is crucial, introducing specialized roles like NNP is equally important to address workforce shortages. NNPs can significantly contribute to NICU management, critical care, and leadership roles within healthcare institutions.[48] Successful models from the USA and the UK indicate that NNPs excel with clear career progression, defined practice scopes, and robust institutional support.[49] In India, pilot NNP programs begin in larger hospitals with clearly defined outcomes, such as improved NICU care quality, to assess effectiveness and adjust training needs. Competitive salaries and policy frameworks are essential to attract skilled nurses. Benchmarks like retention rates and NICU outcomes, can be used to evaluate NNP effectiveness in India's healthcare system.

EBP and research capacity

Training neonatal nurses in EBP is essential for improving neonatal care quality.[50] To embed EBP in routine practice, neonatal nurses should receive training in standardized clinical guidelines and research interpretation. Collaborating with established neonatal research institutions can cultivate a research-oriented culture and provide study mentorship.

Practical training

Implementation could involve mandatory workshops, online modules, and access to journals and guidelines. Allocating specific research funding and incentivizing research participation can bridge this gap. Success metrics should include the percentage of nurses trained in EBP and number of research projects completed by nursing professionals.

Nurse-led family-centered care

Family centered care, a core element of neonatal nursing, improves neonatal outcomes and family satisfaction.[51] Empowering neonatal nurses to lead these initiatives encourages parental participation in care, decision-making, and support. Establishing family centered models, like daily family consultations and active involvement in care planning, clarifies expectations.

Cultural adaptation and training

Nurses require training in communication, cultural sensitivity, and family engagement. Pilot programs in urban NICUs can assess effectiveness, measured by improved family satisfaction and neonatal health outcomes. Government and private healthcare institutions should develop standardized family centered training modules and fund family-support initiatives, including patient education materials in regional languages.

Collaborative and multidisciplinary approaches

Effective neonatal care necessitates an interdisciplinary approach where neonatal nurses collaborate with neonatologists, pediatricians, and allied health professionals for comprehensive care.[52] Establishing structured frameworks for interdisciplinary teams within NICUs enhances communication and patient outcomes. Regular interdisciplinary meetings, shared clinical rounds, combined continuing education, and interprofessional neonatology education are recommended to bolster teamwork. Counseling sessions for parents and caregivers, including nursing representatives can improve communication and support. Clearly defined roles for each team member minimize overlap and ensure comprehensive care. The strategies presented in Table 3 emphasize the importance of integrating neonatal nursing improvements with multidisciplinary collaboration.

Incentivizing interdisciplinary training

Healthcare institutions can incentivize interdisciplinary training through financial rewards. Pilot programs should measure success through metrics such as reduced NICU stays and improved nurse-patient ratios.

Category	Implementation strategies
Neonatal nursing education and training	1. Establish a national task force for neonatal nursing improvement, including representatives from government, healthcare institutions, and nursing associations. 2. Develop a phased implementation plan with clear timelines and milestones for curriculum updates, faculty training, and infrastructure development. 3. Create regional centers of excellence for neonatal nursing education to serve as hubs for training and research. 4. Implement a mentorship program pairing experienced neonatal nurses with new graduates to provide ongoing support and guidance. 5. Develop a national database to track the neonatal nursing workforce distribution and identify areas of critical need.
Collaborative and multidisciplinary approaches	1. Integrate neonatal nursing improvements with maternal health initiatives to create a continuum of care from pregnancy through early childhood. 2. Collaborate with public health departments to incorporate neonatal nursing education into community health worker training programs. 3. Partner with medical colleges to develop joint training programs for neonatologists and neonatal nurses, fostering teamwork and mutual understanding. 4. Work with nutrition experts to enhance neonatal nurses' knowledge of infant feeding practices and nutritional support for premature infants. 5. Collaborate with social workers and mental health professionals to develop comprehensive family support programs in NICUs. 6. Engage with technology experts to develop and implement telemedicine solutions for remote neonatal care support and education.

Table 3: **Implementation strategies for neonatal nursing education and training and collaborative and multidisciplinary approaches.**

Policy and funding support for neonatal nursing

Advancing neonatal nursing in India necessitates the advocacy of specialized government policies and increased funding. Recommendations include recognizing neonatal nursing as a distinct field with clear career progression and providing incentives for neonatal specialization, financial support for training, and competitive salaries. Collaborating with professional organizations to ensure neonatal nursing representation in health policy discussions is essential for sustainable change.

Rural focus

Dedicated government grants, especially for rural and underserved regions, would help address disparities in care quality. Measurable outcomes such as increased enrollment in neonatal programs and improved rural NICU outcomes should guide future funding decisions.

Modernization and knowledge exchange in neonatal nursing

Integration of technology into neonatal nursing can improve care accessibility in remote areas through telehealth, electronic health records, and remote

Search strategy

A structured search was conducted using PubMed, Scopus, Directory of Open Access Journals, Web of Sciences, and Google Scholar with terms like "neonatal nurse training programs," "neonatal intensive care certification," and "neonatal nursing education in India." We included peer-reviewed studies, healthcare organization reports, and systematic reviews from the last ten years to compare India's educational landscape with international models.

monitoring. Telehealth improvements in rural India necessitate investment in digital infrastructure and training. Insights from successful telehealth projects in rural U.S. communities offer useful insights,[53] but scaling in India requires addressing local issues, such as inconsistent Internet and varying digital literacy among healthcare workers. Mobile health units and partnerships with telecommunication providers can expand neonatal care access.

Training modules for technological proficiency

Training programs should focus on technical skills and patient communication, with success measured by better neonatal health outcomes and reduced neonatal emergency response time in rural areas.

Promoting global knowledge exchange can help neonatal nursing in India to meet international standards. Exchange programs, virtual conferences, and webinars with countries like the UK and Canada can introduce best practices. Online forums and mentorship platforms support continuous knowledge sharing despite budget constraints. Success metrics may include the annual number of Indian neonatal nurses participating in international conferences, online learning sessions, or exchange programs.

State and district-level interventions for neonatal care improvement

India's decentralized healthcare system places healthcare under the purview of individual states,[54] making state- and district-level interventions essential for improving neonatal care outcomes. States can address local healthcare staff shortages by establishing neonatal nursing training programs within regional institutions. District health authorities could collaborate with hospitals to create specialized neonatal care units with essential technology and training facilities, particularly in high-mortality areas. State-led initiatives to develop standardized neonatal care protocols tailored to regional challenges would enable a cohesive, targeted approach, allowing policymakers to make data-driven decisions for specific population needs.

Pilot programs in high-mortality districts

Pilot programs in high-mortality districts can offer insights for scaling effective practices, focusing on outcomes such as reduced neonatal mortality, improved breastfeeding, and increased family engagement. Additionally, incentives like scholarships or loan forgiveness for nurses in rural or underserved areas, could support these initiatives and promote EBP.

Leveraging existing strengths and knowledge in India's healthcare system

India's rich healthcare tradition and extensive network of institutions can enhance neonatal care by scaling successful local initiatives, assessing, and replicating proven models while adapting them regionally. Integrating indigenous knowledge and traditional practices into modern protocols can enhance acceptance and effectiveness in diverse communities. Empowering local experts in training, curriculum development, and research ensures tailored solutions. Upgrading facilities and resources in nursing colleges can create centers of excellence in training and research. Adapting strategies from successful public health campaigns, such as polio eradication and immunization programs, can guide effective approaches to improving neonatal health nationwide.

Conclusion

The future of neonatal care in India hinges on recognizing neonatal nursing as a cornerstone of pediatric health services. Despite significant strides in neonatal care globally, India continues to face daunting challenges, particularly in rural areas with underdeveloped healthcare infrastructures. Addressing these challenges requires more than incremental changes; it demands systemic reforms in neonatal nursing education, workforce management, and policy prioritization. Strengthening the training and education of neonatal nurses, expanding the role of NNPs, promoting EBP, and advocating better policy and funding support are essential steps towards reducing neonatal mortality and morbidity. Moreover, integrating technological innovations and promoting collaborative care models will enhance the capacity of neonatal nurses to deliver high-quality family centered care. Without swift interventions, India risks missing its national and global health targets for its most vulnerable population, neonates, further exacerbating health inequities across regions. The time for transformative action in neonatal nursing is now. With sustained commitment and strategic implementation of the proposed recommendations, India can build a robust neonatal nursing workforce capable of providing world-class care to every newborn, regardless of their geographical location or socioeconomic status.

Contributors
Study conception and design: GK, PJ, LM, SKT, MCY; Literature search: SKT, PJ; Manuscript writing: SKT, GK, PJ, LM, MCY; Critical revisions for important intellectual content: SKT, GK, PJ, LM, and MCY.

Declaration of interests
We declare no competing interests.

Acknowledgements
The helpful comments of the anonymous reviewers are gratefully acknowledged.

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