VOLUME - 14, ISSUE - 10, OCTOBER - 2025 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Neonatology

SURVEY ON TRANSFUSION PRACTICES FOR NEONATES <32 WEEKS GESTATION IN NICU ACROSS INDIA – A QUESTIONNAIRE BASED STUDY

Dr. Vineetha Prasad Nannapaneni DM Neonatology Post Graduate, Department Of Neonatology, Chettinad Hospital And Research Institute, Chettinad Academy Of Research And Education, Kelambakkam, Chennai, India.

Dr. Monisha Rameshbabu Associate Professor, Department Of Neonatology, Chettinad Hospital And Research Institute, Chettinad Academy Of Research And Education, Kelambakkam, Chennai, India.

Dr. Giridhar Sethuraman* Professor And HOD, Department Of Neonatology, Chettinad Hospital And Research Institute, Chettinad Academy Of Research And Education, Kelambakkam, Chennai, India. *Corresponding Author

ABSTRACT

Background: Anaemia of prematurity is a frequent challenge in very preterm infants, often necessitating red blood cell (RBC) transfusion. While large international trials have informed restrictive transfusion thresholds, India-specific data on neonatal transfusion practices remain limited. **Objective:** To evaluate current neonatal blood transfusion practices in India, focusing on transfusion triggers, volumes, and supportive measures. **Methods:** An online cross-sectional survey was conducted between September 2024 and August 2025 among paediatric residents, consultant paediatricians, neonatologists, and neonatal nurses across India. A validated 30-item questionnaire assessed participant characteristics, transfusion thresholds, and related practices. Data were analyzed descriptively, with Chi-square tests applied to assess differences between centers with and without written transfusion guidelines. **Results:** Fifty respondents participated, primarily from private teaching institutes (54%) and corporate hospitals (38%). Written transfusion guidelines were available in 68% of centers, most commonly the National Neonatology Forum Clinical Practice Guidelines. Reported transfusion thresholds (7–10 g/dL depending on postnatal age and respiratory support) aligned with restrictive strategies from international trials, though significant differences were noted between guideline and non-guideline centers ($p < .05$). Most respondents administered 15–20 mL/kg over 4–6 hours, while only a minority adopted high-volume transfusions. Practices varied regarding feed withholding (40%), iron supplementation (continuation vs. withholding), and use of blood warmers. Leukofiltration (67%) and donor continuity (55%) were commonly employed. **Conclusions:** Indian neonatal units demonstrate a gradual shift towards restrictive, evidence-based transfusion strategies, though considerable variability persists in thresholds, transfusion volumes, and supportive practices. Wider dissemination and adaptation of standardized national guidelines, alongside India-specific prospective studies, are essential to harmonize transfusion practices and optimize neonatal outcomes.

KEYWORDS : anaemia of prematurity, blood transfusion, neonatology, India, transfusion thresholds, NICU

INTRODUCTION

Anaemia of prematurity is a frequent challenge in neonates born before 32 weeks of gestation. It arises due to immature erythropoiesis, reduced red cell lifespan, and frequent phlebotomy for clinical monitoring[1]. Most very preterm infants ultimately require packed red blood cell (PRBC) transfusions to ensure adequate oxygen delivery and hemodynamic stability[2].Large randomized controlled trials, including the PINT, ETTNO, and TOP studies, have extensively investigated transfusion thresholds[3–5]. These trials have shaped current practice towards restrictive transfusion strategies in stable preterm infants[6]. However, the optimal transfusion volume remains uncertain.

Conventional practice typically involves transfusion volumes of 10–15 mL/kg. Emerging evidence, however, suggests that larger volumes (20–30 mL/kg) may produce greater increases in haemoglobin and haematocrit, extend transfusion-free intervals, and reduce donor exposure[7,8]. These potential benefits hold particular significance in low- and middle-income countries such as India, where blood supply remains limited. On the other hand, concerns about fluid overload, intraventricular haemorrhage (IVH), necrotizing enterocolitis (NEC), and other transfusion-related complications temper enthusiasm for high-volume transfusions[7,9,10].Despite the availability of international data, there is a paucity of India-specific evidence on transfusion thresholds, volumes, and associated practices[11]. Given the heterogeneity in neonatal intensive care practices across the country, it is important to document real-world transfusion practices and their alignment with current guidelines.

This study was therefore designed as an online cross-sectional survey to evaluate the current neonatal blood transfusion practices in India. By examining transfusion triggers, volumes, and associated practices such as feed withholding, iron supplementation, leukofiltration, and donor selection, this study aims to provide insights that may inform the development of standardized, context-appropriate transfusion protocols for Indian NICUs.

METHODS:

This was an online cross-sectional survey conducted between September 2024 and August 2025 to evaluate neonatal blood transfusion practices in India. Cross-sectional surveys are widely used in neonatal and transfusion research to capture practice variability across centers#.

Sample Population And Recruitment:

A convenience sampling method was employed to recruit participants, a common approach in survey-based studies of healthcare providers. Eligible participants included paediatric residents, consultant paediatricians, neonatologists, and neonatal nurses actively engaged in neonatal care and transfusion practices. Invitations were distributed through social media platforms (WhatsApp, X, Telegram) and e-mail. Participants were provided with study objectives and assured of confidentiality. Informed consent was obtained electronically prior to participation, in line with ethical standards for online surveys.

Study Tool:

The study utilized an adapted version of a previously validated questionnaire on neonatal transfusion practices[12].

The 30-item tool included three sections: (a) participant characteristics (designation, experience, NICU level, presence of written guidelines); (b)transfusion triggers, (c)transfusion practices (triggers, vascular access, use of iron supplements, pedi-bags, crossmatching, donor continuity, leukofilters).

Questionnaire Piloting:
The tool was reviewed by a panel of neonatologists for face and content validity and piloted within a single institute prior to nationwide dissemination. Questionnaire validation through expert review and pilot testing is a recommended strategy for survey reliability.

Statistical Analysis: Data were analyzed using descriptive statistics. The Chi-square test was applied to assess differences in transfusion practices between participants with and without written guidelines, with significance set at $p < 0.05$.

RESULTS:

(A) Participant Characteristics

The study included 50 participants from neonatal care units across India. The sample consisted predominantly of neonatal faculty (neonatal nurses and paediatric postgraduates, 76%), with the remainder being consultant paediatricians and neonatologists. Most respondents were employed in private teaching institutes (54%), followed by corporate hospitals (38%) and government hospitals. The majority (52%) had experience working in Level IIIA NICUs.

Nearly 90% of respondents reported routinely managing infants <32 weeks 'gestation, with a median of 65 preterm neonates treated annually. Printed transfusion guidelines were available in 68% of centers, of which 62.5% followed the NNF Clinical Practice Guidelines.

Transfusion Triggers :

Six clinical scenarios were evaluated. Reported haemoglobin thresholds varied by age and respiratory support status, broadly aligning with restrictive thresholds advocated in international trials such as PINT, ETTNO, and TOP[2–5].

Transfusion Triggers (Six Scenarios)

1. **<2 weeks old, <32 weeks GA, no/low respiratory support**

Most common Hb cut-off: **9–10 g/dL (44%)**
Significant difference between guideline vs no-guideline groups.

2. **<2 weeks old, <32 weeks GA, on non-invasive respiratory support (CPAP/NIPPV)**

Most common Hb cut-off: **9–10 g/dL (64%)**
Significant difference between groups.

3. **<2 weeks old, <32 weeks GA, On Invasive Ventilation**

Most common Hb cut-off: **11–12 g/dL (44%)**
No significant difference between groups.

4. **>2 weeks old, <32 weeks GA, no/low respiratory support**

Most common Hb cut-off: **7–8 g/dL (46%)**

5. **>2 weeks old, <32 weeks GA, on non-invasive respiratory support**

Most common Hb cut-off: **8–9 g/dL (44.9%)**

6. **>2 weeks old, <32 weeks GA, on invasive ventilation**

Most common Hb cut-off: **9–10 g/dL (46.9%)**

Statistically significant differences were noted between respondents with and without guidelines in the first two scenarios ($p < 0.05$).

(C) Transfusion Practices

Irradiated RBCs: 74% did not routinely use irradiation unless indicated, consistent with published recommendations.

Leukofiltration: 67.3% reported using leukofilters whenever feasible, reflecting international best practices.

Volume And Duration: Most (46%) transfused 15–20 mL/kg, usually over 4–6 hours (72.9%), aligning with common practice patterns.

Feeds: 40% withheld feeds during transfusion, reflecting ongoing debate about transfusion-associated NEC[7].

Diuretics: 76% used diuretics only when clinically indicated.

Vascular Access: 60% preferred transfusion via central lines.

Iron Supplementation: No consensus; 48% stopped, 52% continued.

Blood Warmers: 16.3% always used, 51% sometimes, 32.7% never.

Pedi-bags: Majority preferred their use, consistent with recommendations for neonatal transfusion safety.

Crossmatching: 78.4% considered crossmatching with maternal blood mandatory, in line with established neonatal transfusion protocols[10].

Donor Continuity: 54.9% preferred using the same donor for repeated transfusions to minimize alloimmunization.

Iron Supplementation Post-transfusion: 52.9% withheld for 1–2 weeks, though practices varied.

DISCUSSION:

This nationwide survey provides important insights into the prevailing neonatal blood transfusion practices in India, revealing both areas of concordance with international guidelines and notable variability across centers. A majority of respondents (68%) reported access to written transfusion guidelines, most commonly the NNF Clinical Practice Guidelines (CPG)[11], suggesting increasing awareness and uptake of standardized protocols. However, significant differences in transfusion thresholds were observed between centers with and without written guidelines, underscoring the influence of institutional protocols on clinical decision-making. The transfusion thresholds reported by participants (7–10 g/dL depending on postnatal age and respiratory support) are broadly consistent with the restrictive strategies supported by the PINT, ETTNO, and TOP trials[2–5]. These trials demonstrated that restrictive transfusion thresholds are safe in stable preterm infants and may help minimize donor exposure and transfusion-related morbidities such as NEC and BPD[6,7]. Our findings therefore suggest a gradual alignment of Indian practices with global trends towards conservative transfusion. Nevertheless, the variability seen across centers highlights the need for wider dissemination, adaptation, and adherence to evidence-based national guidelines, particularly in units without written protocols[11].

With respect to transfusion volume and duration, most respondents preferred 15–20 mL/kg administered over 4–6 hours, which aligns with conventional international practice[8,12]. However, emerging data suggest that higher transfusion volumes (20–30 mL/kg) may yield greater rises in haemoglobin, prolong transfusion intervals, and reduce donor exposures[7,13]. The limited adoption of high-volume transfusions in our study cohort may reflect concerns about fluid overload and hemodynamic instability in very preterm

infants[8],[10]. Prospective, India-specific studies are warranted to evaluate the safety and efficacy of higher-volume transfusions, especially in resource-limited settings where reducing donor exposures is crucial.

Other transfusion-related practices also demonstrated variability. About 40% of participants reported withholding feeds during transfusion, reflecting ongoing concern about transfusion-associated NEC[7], despite mixed evidence in the literature. Similarly, routine use of diuretics was uncommon, with most clinicians reserving them for specific clinical indications. The preference for leukofiltered blood (67.3%) and crossmatching with maternal blood (78.4%) highlights efforts to minimize alloimmunization and transfusion reactions[10],[11]. Practices regarding iron supplementation, use of blood warmers, and donor continuity showed no clear consensus, indicating areas where standardized guidance may be helpful.

The strengths of this study include representation across diverse healthcare settings—private, corporate, and government institutions—as well as a mix of clinicians with varying levels of experience. This allowed for a broad overview of transfusion practices across the country. However, the study has some limitations. Being a self-reported survey, responses may not fully reflect bedside practices, and the relatively small sample size (n=50) may limit generalizability. Larger multicentric studies with observational or interventional designs are needed to validate these findings.

In summary, this survey highlights a gradual shift towards restrictive, guideline-based transfusion practices in Indian NICUs, while also identifying persistent variability in key aspects such as transfusion thresholds, feed withholding, and iron supplementation. Standardization of protocols, continuous education of healthcare providers, and incorporation of emerging international evidence into context-specific national guidelines will be essential to optimize transfusion practices and improve outcomes in this vulnerable population.

Sources Of Funding: Nil
Conflicts Of Interest: Nil

REFERENCES :

1. Widness, J. A. (2008). Pathophysiology of anemia during the neonatal period, including anemia of prematurity. Neonatology, 94(4), 221–229. https://doi.org/10.1159/000151642
2. Kirpalani, H., Whyte, R. K., Andersen, C., Asztalos, E. V., Heddle, N., Blajchman, M. A., et al. (2006). The Premature Infants in Need of Transfusion (PINT) study: A randomized, controlled trial of a restrictive (low) versus liberal (high) transfusion threshold for extremely low birth weight infants. Journal of Pediatrics, 149(3), 301–307. https://doi.org/10.1016/j.jpeds.2006.05.011
3. Franz, A. R., Pohlandt, F., Kron, M., Steinbach, G., Högel, J., Rüdiger, M., et al. (2020). Effects of liberal vs restrictive transfusion thresholds on survival and neurocognitive outcomes in extremely low-birth-weight infants (ETTNO trial). JAMA, 324(6), 560–570. https://doi.org/10.1001/jama.2020.10690
4. Kirpalani, H., Bell, E. F., Hintz, S. R., Tan, S., Schmidt, B., Chaudhary, A. S., et al. (2020). Higher or lower hemoglobin transfusion thresholds for preterm infants (TOP trial). New England Journal of Medicine, 383(27), 2639–2651. https://doi.org/10.1056/NEJMoa2020248
5. Whyte, R. K., & Kirpalani, H. (2011). Low versus high hemoglobin concentration for blood transfusion for preventing morbidity and mortality in very low birth weight infants. Cochrane Database of Systematic Reviews, 2011(11), CD000512. https://doi.org/10.1002/14651858.CD000512.pub2
6. Bell, E. F. (2021). Transfusion thresholds for preterm infants: Finally some answers. Archives of Disease in Childhood – Fetal and Neonatal Edition, 106(1), F4–F5. https://doi.org/10.1136/archdischild-2020-320278
7. Josephson, C. D., Wesolowski, A., Bao, G., Zimring, J. C., & Hillyer, C. D. (2014). Do red cell transfusions increase the risk of necrotizing enterocolitis in premature infants? Transfusion, 54(6), 1688–1694. https://doi.org/10.1111/trf.12469
8. Keir, A., Stanworth, S., & Curley, A. (2015). Neonatal massive and exchange transfusion. Vox Sanguinis, 109(3), 207–219. https://doi.org/10.1111/vox.12290
9. AABB. (2023). Red blood cell transfusion: 2023 international guidelines from the AABB. JAMA, 330(19), 1893–1902. https://doi.org/10.1001/jama.2023.19614
10. British Society for Haematology. (2016). Guidelines on transfusion for fetuses, neonates and older children. British Journal of Haematology, 175(5), 784–828. https://doi.org/10.1111/bjh.14233
11. National Neonatology Forum of India. (2020). Clinical practice guidelines 2020–2021: Blood component therapy. New Delhi: NNF India.
12. Strauss, R. G. (1991). Transfusion therapy in neonates. American Journal of Diseases of Children, 145(8), 904–911. https://doi.org/10.1001/archpedi.1991.02160080026022
13. Widness, J. A., Madan, A., Grindeanu, L. A., Zimmerman, M. B., Wong, D. K., & Stevenson, D. K. (2005). Reduction in red blood cell transfusions among preterm infants: Results of a randomized trial with an in-line blood gas and chemistry monitor. Pediatrics, 115(5), 1299–1306. https://doi.org/10.1542/peds.2004-1070