VER
Vascular & Endovascular Review

Rethinking Neonatal Transient Tachypnoea Of Newborn Management: Efficacy And Safety Of Fluid Restriction In A Randomized Study

Dr. A. Aiswarya[1], Dr. Karthikeyan K[2]

[1]MD (Pediatrics), Postgraduate, Department of Pediatrics, Sri Balaji Vidyapeeth (Deemed to be University), Pondicherry, India
[2]MD (Pediatrics), Professor, Department of Pediatrics, Mahatma Gandhi Medical College and Research Institute, Pondicherry, India

Corresponding author
Dr. Karthikeyan K.
Department of Pediatrics, Mahatma Gandhi Medical College and Research Institute, Pondicherry, India
Email: drkk3179@gmail.com

ABSTRACT

Structured abstract: Background Transient Tachypnoea of the Newborn (TTN) is a self-limited respiratory condition resulting from delayed clearance of fetal lung fluid. Excess fluid administration may worsen pulmonary edema. This study evaluated whether fluid restriction improves clinical outcomes in neonates with TTN.
Objective To determine whether fluid restriction reduces respiratory support requirements and hospital stay in neonates with TTN.
Methods (design, setting, participants, interventions, outcomes, timeframe)
Design: Randomized controlled trial.
Setting: Neonatal unit at a tertiary care center.
Participants: Neonates diagnosed with TTN.
Interventions: Restricted Group (RG) vs Standard Group (SG) for fluid management.
Outcomes: Primary—duration of oxygen therapy, progression of Downes score, need for non-invasive ventilation (NIV), and length of hospital stay.
Timeframe: From birth to hospital discharge.
Results (outcomes with p value)
Baseline characteristics showed no significant differences between groups: birth weight ($p = 0.283$), gestational age ($p = 0.889$), sex distribution ($p = 0.250$), cesarean delivery ($p = 0.380$), antenatal steroid coverage ($p = 1.000$). Progression of respiratory distress ($p = 0.633$), duration of oxygen therapy ($p = 0.072$), and NIV requirement ($p = 1.000$) were similar between groups. Hospital stay was significantly shorter in the RG (4.68 ± 1.03 days) compared with the SG (5.84 ± 1.38 days; $p = 0.001$).
Conclusions Restricting fluid intake in neonates with TTN may not significantly alter short-term respiratory interventions but appears to reduce hospital stay, likely through enhanced pulmonary fluid clearance. Other outcome measures do not consistently support routine restrictive fluid strategies in TTN management.
Trial status Completed.

KEYWORDS: Transient tachypnoea of the newborn; TTN; neonate; fluid restriction; randomized controlled trial; pulmonary fluid clearance; hospital stay

How to Cite: A. Aiswarya, Karthikeyan K, (2025) Rethinking Neonatal Transient Tachypnoea Of Newborn Management: Efficacy And Safety Of Fluid Restriction In A Randomized Study, Vascular and Endovascular Review, Vol.8, No.3, 39-42.

INTRODUCTION

Background on transient tachypnea of the newborn (TTN)

TTN is a common cause of respiratory distress in term and late preterm neonates, due to delayed clearance of fetal lung fluid.(1) Incidence is about 16–20 per 1,000 live births and is more frequent in male infants, cesarean deliveries, and term neonates.(2)

Current TTN management and rationale for fluid restriction

Management often includes supplemental oxygen, CPAP, and non-invasive ventilation. Fluid restriction during the first 48–72 hours is proposed to enhance pulmonary fluid absorption via lymphatics and accelerate clinical resolution.(3)

Biological plausibility: Fuid balance, pulmonary edema, and gas exchange
Excess neonatal fluid may cause interstitial edema and impaired gas exchange; restricting intake may promote fluid clearance, improve oxygenation, and facilitate recovery.(1)

Gaps in existing evidence

Evidence is heterogeneous, with limited high-quality randomized data across settings; safety and optimal restriction levels remain uncertain.

Hypotheses and objectives

We hypothesize that fluid restriction will shorten oxygen therapy duration, improve Downes score progression, reduce NIV use, and shorten hospital stay.

Pre-specified primary and secondary aims
Primary: duration of oxygen therapy; Downes score progression; NIV requirement; length of hospital stay. Secondary: safety signals, adverse events, and time to breastfeeding initiation.

METHODS

Study size Based on prior data (Sardar et al.), the study was powered to detect a clinically meaningful difference in fluid-restriction impact. A total of 50 neonates were planned and enrolled, with 25 randomized to Standard Fluid (SG) and 25 to Restricted Fluid (RG), using alpha = 0.05 and beta = 0.20 (80% power). The sample size accommodates potential dropouts and protocol deviations.

Duration Study enrollment occurred from August 2023 to July 2024 (12 months), with in-hospital follow-up through TTN resolution or discharge. Data analysis followed after completion of follow-up for the last participant.

Ethics / CTRI registration Approval was obtained from the Institutional Ethics Committee of Mahatma Gandhi Medical College and Research Institute (MGMC&RI) (Protocol number: MGMCRI/Res/01/2022/38/IHEC/65). Written informed consent was obtained from parents/guardians prior to enrollment. The trial was registered with the Clinical Trials Registry of India (CTRI): CTRI/REF/2024/06/086444.

Blinding Given the nature of fluid-management interventions,doctors and nurse blinding was not done. However, outcome assessment for key endpoints (e.g., Downe's score and duration of oxygen therapy) was performed by blinded assessors where possible, and data analysis was conducted with the analyst blinded to group assignment.

Randomization Randomization used a computer-generated sequence with block sizes of four to ensure balance. Allocation was concealed by a centralized, secure web-based system.

Subjects
Late preterm and term neonates admitted to the NICU of tertiary care hospital in south india meeting TTN criteria and requiring respiratory support within 2 hours of birth were eligible.

Inclusion and exclusion criteria
Inclusion: Gestational age between 34–40 weeks; TTN with oxygen requirement within 2 hours of birth; parental consent. **Exclusion:** Major congenital anomalies or chromosomal abnormalities; TTN due to meconium aspiration, PPHN, congenital pneumonia, sepsis; significant dehydration risk; renal/hepatic impairment; prior fluid restriction.

Post-randomization exclusions (if any) Post-randomization exclusions include withdrawal of consent, major protocol violations, or death/transfer prior to outcome assessment. But none were excluded.

RESULTS:

Table 4.1 Demographic characteristics by study group (SG vs RG), N = 50

Characteristic	SG (N=25)	RG (N=25)	p value
Birth weight (g) – mean ± SD	2986.8 ± 494	3013.6 ± 514.9	0.283
Gestational age (weeks) – mean ± SD	37.07 ± 0.79	38.19 ± 0.84	0.889
Male sex – n (%)	13 (52%)	17 (68%)	0.250
Cesarean section – n (%)	17 (68%)	14 (56%)	0.380
Antenatal steroids (late preterm) – n (%)	8/9 (88.9%)	2/2 (100%)	1.000
In labour before C-section – n (%)	11 (44%)	12 (48%)	0.354
Multigravida – n (%)	7 (28%)	12 (48%)	0.263
Infant of diabetic mother (IDM) – n (%)	3 (12%)	3 (12%)	1.000

Characteristic	SG (N=25)	RG (N=25)	p value
Spontaneous vaginal delivery – n (%)	8 (32%)	11 (44%)	0.380
Mode of delivery: LSCS – n (%)	17 (68%)	14 (56%)	0.380
Total male/female – n (%)	30/20	30/20	—

4.2 TABLE ON OUTCOME MEASURES:

Outcome	SG (N=25)	RG (N=25)	Effect estimate	95% CI	p value
Downe's score progression to mild–moderate distress (Yes)	5 of 18 (27.8%)	4 of 19 (21.1%)	Relative risk: RG vs SG 0.76	0.24–2.39	0.633
Oxygen therapy duration (days)	2.28 ± 0.84	1.84 ± 0.85	Mean difference: RG − SG = −0.44 days	−0.91 to 0.03	0.072
Non-invasive ventilation need (Yes)	10 of 25 (40%)	10 of 25 (40%)	Relative risk: 1.00	0.51–1.96	1.000
Hospital stay (days)	5.84 ± 1.38	4.68 ± 1.03	Mean difference: RG − SG = −1.16 days	−1.83 to −0.49	0.001 *

Notes:

- p values significant if < 0.05 .P values are from appropriate tests (t-tests for continuous variables, Fisher's exact or chi-square for categorical variables) as reported in the manuscript.
- No statistically significant differences were observed in balanced across baseline characteristics,But in outcome measures duration of hospital stay shows significant p value for the listed variables.

RESULTS

The demographic table compares baseline characteristics between the Standard Fluid group (SG, n=25) and the Restricted Fluid group (RG, n=25) to ensure groups are similar before treatment. The table lists birth weight, gestational age, gender and maternal factors (antenatal steroids, labour before cesarean, multigravida) and delivery details (mode of delivery, IDM). Most comparisons show non-significant P values (e.g., birth weight p=0.283, gestational age p=0.889, Male sex p=0.250, cesarean p=0.380), indicating balanced groups. Some variables have small sample subgroups (e.g., antenatal steroids in late preterm with n=9 in SG and n=2 in RG; P=1.000). Overall, the table demonstrates no meaningful baseline imbalance, supporting a fair comparison of outcomes.

Outcome measures:

The outcome table presents the primary and key secondary outcomes by group. Downe's score progression (to mild–moderate distress) is shown as the number and percentage with available data (SG: 5/18; RG: 4/19; p=0.633; RR 0.76), reflecting data missing. Oxygen therapy duration (days) shows means with standard deviations (SG 2.28±0.84; RG 1.84±0.85; p=0.072; MD −0.44), suggesting RG may require less oxygen, though not statistically conclusive. NIV need is binary (Yes/No); both groups have 40% requiring NIV (p=1.000). Hospital stay (days) shows RG shorter (4.68±1.03 vs SG 5.84±1.38; p=0.001; MD −1.16), statistically significant and clinically relevant. Together, these data imply fluid restriction reduced hospitalization duration, but other respiratory outcomes did not reach conventional significance.

DISCUSSION

Outcome measures were prespecified to reflect TTN resolution and resource use.

The present study found that progression of respiratory distress, as measured by a rising Downes score, occurred in 27.8% of

neonates in the restricted-fluid (RG) group and 21% in the standard-fluid (SG) group, with no statistically significant difference (p = 0.633). While this suggests that fluid restriction did not clearly prevent worsening distress in all cases, the overall modest rate in both groups and the direction of effect—slightly lower Downes scores in RG—may reflect physiologic benefits from reduced intravascular fluid accumulation and interstitial edema in TTN. These findings are in line with a broader literature pattern where several studies emphasize reduced severity or duration of TTN with fluid restriction, yet seldom document a universal reduction in progression risk. For example, studies by Sardar et al. (2020) (4), Dehdashtian et al. (2014) (5), and Eghbalian et al. (2018) (6) report favorable outcomes on TTN severity or duration, but do not consistently focus on progression events, leaving a gap that our data begin to address.

Regarding oxygen therapy duration, the present cohort showed a shorter mean duration in RG (1.84 ± 0.85 days) versus SG (2.28 ± 0.84 days), not reaching statistical significance (p = 0.072). This trend aligns with Stroustrup et al. (2012) (3), who observed a modest, non-significant reduction, yet echoes the significant reductions reported in other work (Dehdashtian 2014 (5), Sardar 2020 (4), Akbarian Rad 2018 (7), Eghbalian 2018 (6)). The non-significant result here may reflect sample size or local practice patterns, despite a consistent directional benefit in several studies.

On non-invasive ventilation (NIV) requirement, both groups had 40% need, with p = 1.000—no difference. This parallels mixed findings in the literature (e.g., Gupta 2021 (8), Eghbalian 2018) (6), where fluid restriction did not reliably alter NIV rates.

Hospital stay was notably shorter in RG (4.68 ± 1.03 days) than SG (5.84 ± 1.38 days; p = 0.001). This aligns with impactful reductions reported by Akbarian Rad (2018) (7)and Eghbalian (2018)(6) and contrasts with non-significant results in Stroustrup (2012)(3) and Dehdashtian (2014) (5). Taken together, our findings support a trend toward clinically meaningful benefits of fluid restriction in TTN—particularly for earlier discharge—while recognizing heterogeneity across studies. Larger, multi-center RCTs are warranted to define the magnitude of effect and to ensure safety across diverse patient populations

CONCLUSION:

The trial showed no statistically significant differences in progression to distress , oxygen duration,NIV need ,however, hospital stay was significantly shorter in restricted group. Overall, fluid restriction did not demonstrate consistent clinical benefits in TTN outcomes and thus is not supported as routine therapy in this study. Future studies should be larger, multicenter, assess long-term respiratory and developmental outcomes to determine any subgroup-specific benefits and safety.

REFERENCES:

1. Bruschettini M, Hassan KO, Romantsik O, Banzi R, Calevo MG, Moresco L. Interventions for the management of transient tachypnoea of the newborn - an overview of systematic reviews. Cochrane Database Syst Rev. 2022 Feb 24;2(2):CD013563.
2. Chavan S, Malwade SD, Kumari S, Garud BP, Agarkhedkar S. Incidence, Clinical Features, and Outcomes of Transient Tachypnea of the Newborn at a Tertiary Care Center in Western India. Cureus. 2022 Apr;14(4):e23939.
3. Stroustrup A, Trasande L, Holzman IR. Randomized Controlled Trial of Restrictive Fluid Management in Transient Tachypnea of the Newborn. The Journal of Pediatrics. 2012 Jan 1;160(1):38-43.e1.
4. Sardar S, Pal S, Mishra R. A randomized controlled trial of restricted versus standard fluid management in late preterm and term infants with transient tachypnea of the newborn. J Neonatal Perinatal Med. 2020;13(4):477–87.
5. Dehdashtian M, Aramesh MR, Melekian A, Aletayeb MH, Ghaemmaghami A. Restricted versus Standard Maintenance Fluid Volume in Management of Transient Tachypnea of Newborn: A Clinical Trial. Iran J Pediatr. 2014 Oct;24(5):575–80.
6. Eghbalian F, Sabzehei M, Emamzadeh N, Shokouhi M, Basiri B, Faradmal J, et al. Comparison of restricted fluid volume with standard fluid volume in management of transient tachypnea of the newborns: a randomized controlled trial. International Journal of Pediatrics 2018;6(9):8289-96. [DOI: 10.22038/ijp.2018.30462.2677]
7. Akbarian Rad Z, Gorji Rad M, Haghshenas M. Effects of Restrictive Fluid Management in Transient Tachypnea in Neonates. Iranian Journal of Neonatology. 2018 Dec 1;9(4):47–52.
8. Gupta N, Bruschettini M, Chawla D. Fluid restriction in the management of transient tachypnea of the newborn. Cochrane Database Syst Rev. 2021 Feb 18;2(2):CD011466.