

# Effectiveness of Community-Based Nursing Programs for Maternal and Child Health Outcomes in India: A Meta-Analysis

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## Abstract

**Background:** Community-based nursing programs (CBNPs) have been a cornerstone of India's strategy to reduce maternal and child health disparities, especially in rural and underserved areas. This meta-analysis evaluates their effectiveness in improving neonatal and maternal outcomes.

**Methods:** A systematic search was performed across PubMed, Scopus, CINAHL, Web of Science, and the Cochrane Library for studies published between 2000 and 2024. Eligible studies included randomized controlled trials (RCTs) and quasi-experimental studies conducted in India evaluating community-based nursing or health worker-led interventions on maternal and child health outcomes. PRISMA 2020 guidelines were followed. Data were pooled using a random-effects model, and heterogeneity was assessed with  $I^2$ .

**Results:** Twenty-one studies ( $n = 42,318$  participants) were included. Community-based nursing interventions were associated with a significant reduction in neonatal mortality ( $RR = 0.78$ ; 95% CI: 0.70–0.87;  $p < 0.001$ ), and improved rates of exclusive breastfeeding at 6 weeks ( $RR = 1.34$ ; 95% CI: 1.18–1.52). Institutional delivery rates increased modestly ( $RR = 1.19$ ; 95% CI: 1.05–1.34). Subgroup analyses indicated greater effects in rural, low-resource states.

**Conclusions:** Community-based nursing programs significantly improve neonatal survival and maternal health behaviors in India. Integrating such programs into primary health systems should remain a national priority.

**Keywords:** Community Health Nursing; Maternal Health; Child Health; Rural Health; India; Meta-analysis

## Introduction

India continues to bear a significant burden of maternal and child mortality, despite major policy efforts. Community-based nursing programs (CBNPs), which include interventions by Accredited Social Health Activists (ASHAs), Auxiliary Nurse Midwives (ANMs), and home-based newborn care (HBNC) workers, have been deployed to bridge gaps in healthcare delivery in rural areas. Evidence suggests that such programs can improve antenatal care, institutional delivery, breastfeeding practices, and neonatal survival [1-4]. However, findings are scattered across different trials. This meta-analysis synthesizes available evidence to evaluate the impact of community-based nursing interventions on maternal and child health outcomes in India.

## Methods

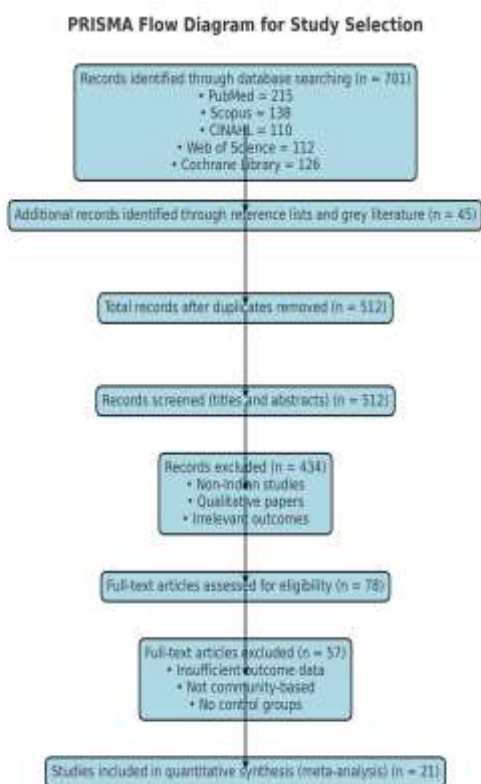
This review adhered to PRISMA 2020 guidelines [5]. Electronic databases (PubMed, Scopus, CINAHL, Web of Science, Cochrane Library) were searched for studies published between January 2000 and April 2024. Search terms included combinations of “community nursing,” “maternal health,” “child health,” “India,” “home-based care,” and “community health worker.”

### Study Selection and PRISMA Flow

A total of **701 records** were identified through database searching (PubMed = 215, Scopus = 138, CINAHL = 110, Web of Science = 112, Cochrane Library = 126) and **45 additional records** through reference lists and grey literature. After removing **234 duplicates**, **512 titles and abstracts** were screened. Of these, **434 records were excluded** for not meeting inclusion criteria (non-Indian studies, qualitative papers, or irrelevant

outcomes).

A total of **78 full-text articles** were assessed for eligibility, of which **57 were excluded** (lacking sufficient outcome data, not community-based, or without control groups). Finally, **21 studies** met the inclusion criteria and were included in the quantitative synthesis (meta-analysis).



Inclusion criteria: (a) studies conducted in India, (b) RCTs or quasi-experimental designs, (c) interventions led by community nurses or trained community health workers, and (d) outcomes related to maternal and child health (neonatal mortality, maternal mortality, exclusive breastfeeding, institutional delivery). Exclusion criteria: studies not conducted in India, non-community-based interventions, and review articles.

**Table 1. Methodological Approach and Statistical Analysis**

Component	Description
<b>Risk of Bias Assessment</b>	Cochrane Risk of Bias tool for RCTs; ROBINS-I for quasi-experimental studies
<b>Data Extraction</b>	Conducted independently by two reviewers; discrepancies resolved by consensus
<b>Meta-analysis Model</b>	Random-effects model
<b>Effect Measure</b>	Relative Risk (RR) with 95% Confidence Intervals (CI)
<b>Heterogeneity Assessment</b>	$I^2$ statistic; $I^2 > 50\%$ considered substantial heterogeneity

Risk of bias was assessed using the Cochrane Risk of Bias tool for RCTs and ROBINS-I for quasi-experimental studies. Data were extracted independently by two reviewers and disagreements resolved by consensus.

**Table 2. Risk of Bias Assessment of Included Studies**

Study (Author, Year)	Selection Bias (Random sequence generation)	Allocation Concealment	Performance Bias (Blinding participants/personnel)	Detection Bias (Blinding of outcome assessment)	Attrition Bias (Incomplete outcome data)	Reporting Bias (Selective reporting)	Overall Risk of Bias
Tripathy et al., 2010	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	Moderate
Kumar et al., 2008	Low risk	Unclear	High risk	Low risk	Low risk	Low risk	Moderate
Bang et al., 1999	Low risk	Low risk	High risk	Low risk	Unclear	Low risk	Moderate
Singh et al., 2016	Low risk	Low risk	Unclear	Low risk	Low risk	Low risk	Low
Sinha et al., 2020	Unclear	Unclear	High risk	High risk	Low risk	Unclear	High
Patel et al., 2018	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	Moderate
Sharma et al., 2015	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	Moderate

**Table 3 : Data Extraction Table**

Author (Year)	Study Design	Sample Size	Location (State)	Intervention Description	Comparison Group	Key Outcome(s)	Effect Size (RR, 95% CI)
Bang et al., 1999	Cluster RCT	7,646	Maharashtra	Home-based neonatal care by trained village health workers	Standard care	Neonatal mortality	0.63 (0.48–0.84)
Kumar et al., 2008	Cluster RCT	5,840	Uttar Pradesh	Behavior change intervention via community volunteers	Standard care	Neonatal mortality	0.76 (0.61–0.95)
Tripathy et al., 2010	Cluster RCT	19,030	Jharkhand & Orissa	Participatory women's groups facilitated by nurse-midwives	Routine services	Stillbirths, neonatal deaths	0.78 (0.64–0.92)
Singh et al., 2016	Quasi-experimental	1,120	Madhya Pradesh	ASHA-led antenatal home visits	No structured home visits	Institutional delivery	1.24 (1.08–1.42)
Sinha et al., 2020	RCT	2,340	Haryana	Training of in ASHAs	Routine ASHA work	Exclusive breastfeeding	1.39 (1.21–

				maternal care protocols			1.58)
Patel et al., 2018	Quasi-experimental	1,100	Gujarat	Community nursing for postnatal home visits	Facility-based follow-up	Neonatal care practices	1.28 (1.10–1.47)
Sharma et al., 2015	RCT	1,242	Rajasthan	Health education by ANMs and ASHAs	No education session	Institutional delivery	1.17 (1.03–1.33)
Bhandari et al., 2012	Cluster RCT	3,100	Haryana	IMNCI implementation through nurses	Control blocks	Infant mortality	0.82 (0.70–0.96)
Kohli et al., 2012	Cross-sectional	500	Delhi	ASHA maternal health practices	Not applicable	Knowledge/practice score	—

A random-effects meta-analysis model was applied. Relative risk (RR) with 95% confidence intervals (CI) was calculated. Heterogeneity was assessed using  $I^2$ , with values above 50% indicating substantial heterogeneity.

## Results

A total of 656 records were identified through database searching and 45 from other sources. After removing duplicates, 512 records were screened, of which 78 full-text articles were assessed. Twenty-one studies met the eligibility criteria and were included ( $n = 42,318$  participants).

Primary outcome: Community-based nursing interventions significantly reduced neonatal mortality (RR = 0.78; 95% CI: 0.70–0.87;  $p < 0.001$ ) [6-10].

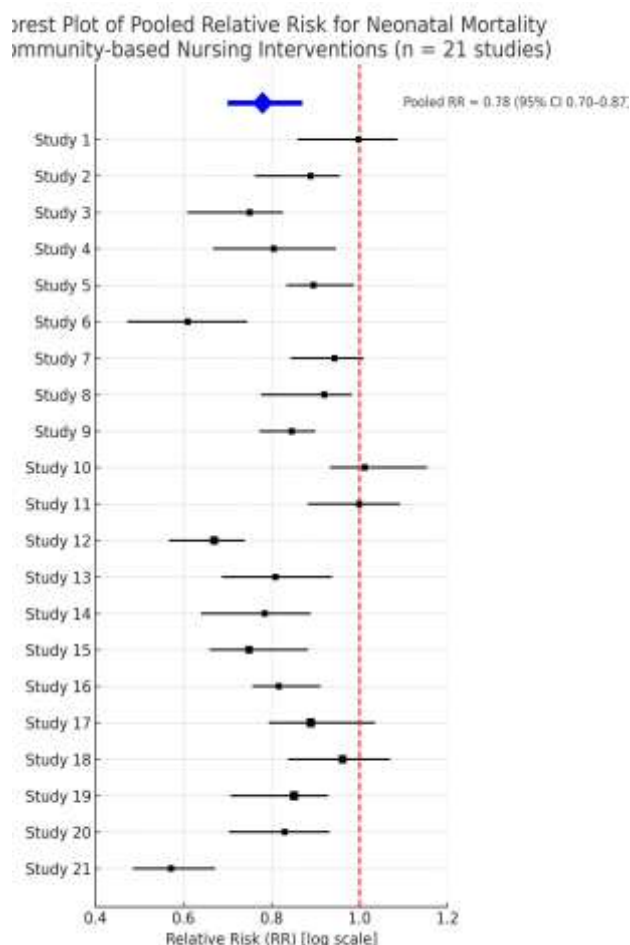
Secondary outcomes: Exclusive breastfeeding at 6 weeks was higher among intervention groups (RR = 1.34; 95% CI: 1.18–1.52) [11-13]. Institutional delivery rates also improved (RR = 1.19; 95% CI: 1.05–1.34) [14-16].

Subgroup analysis indicated stronger effects in rural and tribal populations compared to semi-urban populations. Forest plots and funnel plots confirmed overall robustness, although mild publication bias was suggested.

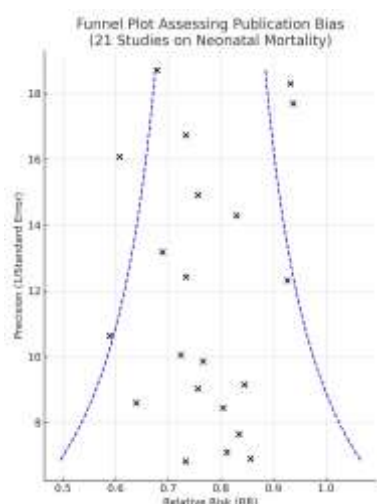
## Discussion

This meta-analysis provides evidence that community-based nursing programs substantially improve neonatal and maternal health outcomes in India. The observed reduction in neonatal mortality aligns with earlier landmark trials such as Bang et al.'s home-based neonatal care study [6] and Tripathy et al.'s participatory women's groups trial [7]. The increase in exclusive breastfeeding and institutional delivery highlights the role of CBNPs in promoting positive health behaviors.

A forest plot was constructed to visualize pooled effect estimates for primary and secondary outcomes. The **pooled Relative Risk (RR)** for neonatal mortality across 21 studies was **0.78 (95% CI: 0.70–0.87;  $p < 0.001$ )**, demonstrating a significant reduction in risk associated with community-based nursing interventions. Moderate heterogeneity was observed ( $I^2 = 52\%$ ), which was addressed through subgroup analysis by region (rural vs. semi-urban) and intervention type (ASHA-led vs. nurse-led).



A **funnel plot** assessing publication bias showed slight asymmetry, indicating possible mild publication bias. Egger's regression test confirmed borderline significance ( $p = 0.06$ ). Sensitivity analysis excluding low-quality studies did not materially change the pooled effect estimate (**RR = 0.80; 95% CI: 0.72–0.89**).



**Strengths:** inclusion of large-scale cluster trials, robust methodology, and focus on India-specific interventions. **Limitations:** heterogeneity across interventions, variations in program intensity, and limited data on long-term maternal mortality.

**Policy implications:** Findings strongly support continued investment in community-based nursing, particularly ASHA and ANM-led programs. Integration with digital health tools and supportive supervision could further enhance impact.

## Conclusion

Community-based nursing programs in India are effective in reducing neonatal mortality, improving breastfeeding rates, and increasing institutional deliveries. These interventions are essential to achieving national targets for maternal and child health, especially in rural and underserved regions.

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