Effectiveness of Simulation-based Training Intervention on Resuscitation Management for Newborn in Sarlahi district, Nepal: A Cluster Randomized Controlled Trial (SaLiN Trial)

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Background

- Globally 2.4 million children died in the first month of life in 2020.
- Neonatal deaths account 47% of all child health under the age of five years (*UN IGME, 2021.*)
- Nepal has observed a stagnant neonatal mortality rate (NMR) at 21 per 1000 live birth from 2016 to 2022 *(NDHS 2016 and 2022).*
- Nepal's SDG target to reduce NMR 12 per 10000 live births by 2030 is still challenging to achieve

Asphyxia in neonates and simulation-based training

- In Nepal, birth asphyxia is the second leading cause of neonatal mortality after sepsis *(Erchick et al., 2022).*

- Nepal's birthing centers lack skilled birth attendants to provide essential newborn care including resuscitation management *(Wrammert et al., 2017)*

- Newborn resuscitation simulation training has been found to be effective in improving clinical performance of health service providers and perinatal outcomes *(Vadla, Moshiro, et al., 2022).*

- Use of NeoNatalie simulator for neonatal resuscitation training has improved performance of midwives and their motivation

(Vadla, Mdoe, et al., 2022). NeoNatalie™

Objectives

General

To assess the effectiveness of **Simulation-based Training Intervention** for resuscitation management on performance of neonatal care providers in primary health care facilities of Sarlahi district, Madesh Province, Nepal

Specific

- To assess the effectiveness of **Simulation-based Training Intervention** in improving knowledge and confidence on essential newborn care

- To assess the effectiveness of **Simulation-based Training Intervention** in improving resuscitation management skills of health workers

Methodology

- **Study design:** **C**luster randomized controlled trial where birthing centers are designated as cluster

- **Setting:** The study was conducted in birthing centers of Sarlahi district of Madhesh Province of Nepal.

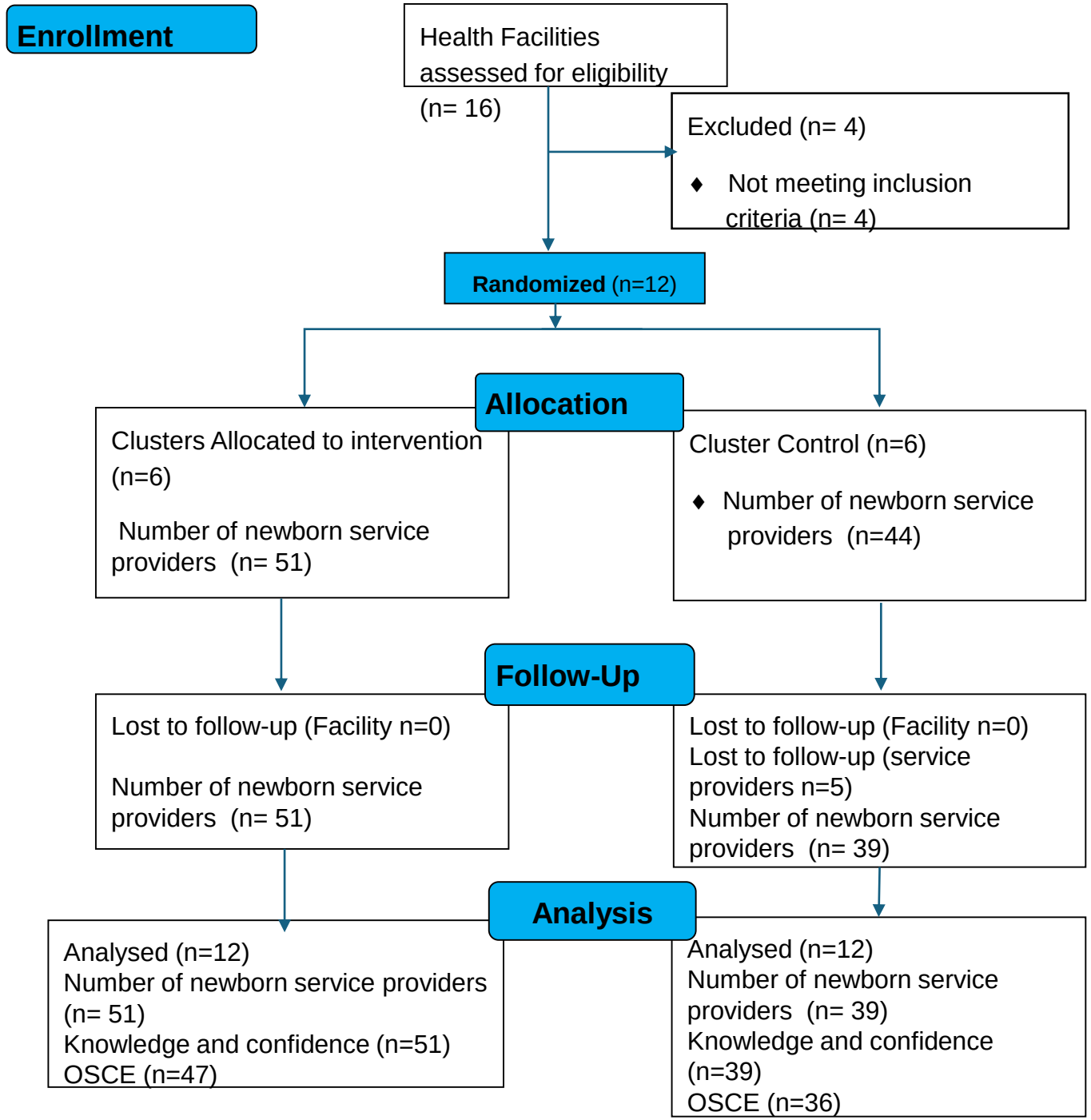
- **Sample size:** 12 birthing centers and 95 Health workers providing newborn care

(Control Arm:44, Intervention: 51)

- **Randomization:** Computer generated method by statistician not involved in the design

- **Allocation Concealment:** Each health facility (control and intervention arms) was allocated using a sealed envelope.
- **Participant enrollment:** Newborn care service providers in the selected health facilities

CONSORT DIAGRAM



- We randomized 12 eligible birthing centers into intervention and control arm (1:1 Ratio)
- Newborn care providers (Intervention:51; Control:44)
- Lost to Follow up: Intervention=0;
- Control=5
- Analyzed (Intervention:51; Control: 39

Measurement and Intervention

Pre-intervention data collection Baseline (September 2024)

- Sociodemographic factors
- Training related factors
- Service availability and readiness for newborn care
- Knowledge and Confidence on newborn care
- Objective Structural Clinical examination (health baby and asphyxiated baby

Intervention Arm (12 months)

- Simulation based training by pediatrician for 3 days
- Monthly coaching and mentoring by pediatrician
- Follow-up visits by coach when required

Control Arm

Ongoing services for newborn care

Post intervention data collection Endline (December 2025)

- Knowledge and Confidence on newborn care
- Objective Structural Clinical examination (health baby and asphyxiated baby
- Baseline variables

Data analysis: intention-to-treat principle, linear mixed-effects ANCOVA model included intervention status;
Secondary cohort analysis was restricted to workers matched between baseline and endline

Ethical consideration: Approval obtained from NHRC (Approval Number: 593/2023)

Results: Neonatal care profile of staff

Job contract type	Overall	Control (n=44)	Intervention (n=51)	0.667
Contract	32	16 (36.4)	16 (31.4)	
Permanent	63	28 (63.6)	35 (68.6)	
Work experience (years)	4.0	4.5 (3.0, 7.3)	4.0 (2.0, 8.0)	0.555
Experience in deliveries	33	17 (39.5)	16 (31.4)	0.516
Involvement in labor monitoring	15 (8, 30.0)	10.0 (8.0, 18.0)	23 (14.3, 52.5)	0.056
Deliveries managed	10 (8.0, 28.0)	10.0 (8.0, 18.0)	16.0 (8.0, 50.0)	0.319
Received SBA training	26	13 (29.5)	13 (25.5)	0.818
Received in-service training	8	4 (9.1)	4 (7.8)	>0.999
Received HBB training	6	3 (6.8)	3 (5.9)	>0.999

- There is no significant differences in characteristics of control and intervention participants.
- A quarter of the participants had received SBA training and only around 6% received helping baby breath training

Changes in Knowledge on Resuscitation Management after the intervention

Characteristic	Baseline overall (N=95)	Baseline control	Baseline intervention	Baseline p-value	Endline overall (N=90)	Endline control	Endline intervention	P-value
Total Knowledge Score	15.47 (3.61)	15.77 (3.67)	15.22 (3.58)	0.462	17.51 (2.65)	15.95 (2.68)	18.71 (1.92)	<0.001

Knowledge score was assessed using 22 items

By endline, knowledge performance was consistently higher in the intervention group than in the control group across a broad range of items, and the mean total knowledge score was substantially greater in the intervention arm (18.71 [SD 1.92] vs 15.95 [2.68]).

Changes in skills on Resuscitation Management after the intervention

Characteristic	Baseline overall (N=95)	Baseline control	Baseline intervention	Baseline p-value	Endline overall (N=83)	Endline control	Endline intervention
Total OSCE score	10.40 (6.24)	11.14 (5.96)	9.76 (6.45)	0.293	18.16 (6.47)	14.25 (7.24)	21.15 (3.69)

Objective structural clinical examination score was calculated using 24 items and total score is presented here

The mean total OSCE score, which was markedly higher in the intervention group than in the control group at endline (21.15 [SD 3.69] vs 14.25 [7.24]), indicating substantially better observed neonatal resuscitation skills following the intervention.

Intervention effect estimates across competency outcomes (ITT at endline workforce)

Outcome / Analysis	Adjusted beta (95% CI)	p-value	Effect (SD units)	Interpretive summary	N
Knowledge Score	2.89 (2.28 to 3.51)	<0.001	0.80	Approx. 18% higher vs control mean	90
Confidence Score	1.34 (0.18 to 2.51)	0.029	0.37	Approx. 10% higher vs control mean	90
OSCE Total Score	6.49 (3.87 to 9.11)	0.002	1.04	Approx. 46% higher vs control mean	83

- Primary intention to treat analysis shows that increased mean knowledge score was 18% higher and mean OSCE score 46% higher in intervention groups compared to control groups
- In secondary analysis, matching bassline, knowledge score improved 24% higher and OSCE 50% (table not shown)

Conclusions and key take-away message

Conclusions

- Simulation based training aided with monthly mentoring and coaching led to improve the OSCE skills among newborn care providers

- Simulation training approach had impacted on both improving OSCE skills and knowledge. Impact on skills is observed significantly.

Key take-away Message from this trial

- Birthing centers, which provide essential newborn care with limited sources, need to give priority in newborn care providers' training
- Simulation-based training should be priortized as tailored intervention to improve skills on managing normal and asphyxiated babies.

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Bio of the presenter

- Dr. Khem Pokhrel is a global health researcher with experience in longitudinal studies and randomized controlled trials (RCTs) and health systems research.
- He has extensive experience in designing, implementing, and evaluating public health interventions, with strong expertise in implementation research and monitoring and evaluation.
- His work focuses on generating high-quality evidence to strengthen health systems and inform policy and practice in Nepal and beyond.

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