



A STUDY TO ASSESS THE EFFECTIVENESS OF SIMULATION-BASED TRAINING ON NEONATAL RESUSCITATION SKILLS AND THEIR RETENTION AMONG HEALTHCARE PROVIDERS IN SELECTED HOSPITALS OF INDORE, MADHYA PRADESH.

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Abstract

Background

Neonatal resuscitation is a critical intervention that significantly reduces neonatal morbidity and mortality. Although simulation-based training (SBT) enhances healthcare providers' knowledge and clinical skills, retention of these competencies over time remains a challenge. Periodic evaluation of knowledge and practical skills is essential to ensure sustained competency in neonatal resuscitation.

Objectives

1. To assess the baseline knowledge and practical skills regarding neonatal resuscitation among healthcare providers.
2. To evaluate the effectiveness of simulation-based training on knowledge and practical skills.
3. To assess knowledge and skill retention at 3, 6, and 12 months after training.
4. To determine the association between selected demographic variables and knowledge and skill retention.

Materials and Methods

A longitudinal quasi-experimental one-group repeated-measures study was conducted among **300 healthcare providers** working in labour rooms, NICUs, pediatric wards, and obstetric units of selected hospitals in Indore, Madhya Pradesh. Participants were selected using purposive sampling. Data were

collected using a structured demographic questionnaire, a 40-item knowledge questionnaire, and a 100-mark Objective Structured Clinical Examination (OSCE) checklist. Assessments were conducted at baseline, immediately after simulation-based training, and at 3, 6, and 12 months. Data were analyzed using descriptive statistics, paired *t*-test, repeated-measures ANOVA, Chi-square test, Pearson correlation, and multiple linear regression.

Results

The mean knowledge score significantly increased from 18.62 ± 3.42 before training to 34.24 ± 2.36 immediately after training ($t = 41.82, p < 0.001$). The mean OSCE skill score improved from 48.22 ± 7.84 to 89.16 ± 4.94 ($p < 0.001$). Knowledge and practical skills gradually declined during follow-up; however, competency remained significantly higher than baseline at 12 months. Repeated-measures ANOVA showed statistically significant differences across all assessment periods ($p < 0.001$). Knowledge and skill scores demonstrated a strong positive correlation ($r = 0.846, p < 0.001$). Clinical experience, previous neonatal resuscitation training, and baseline knowledge significantly predicted long-term skill retention.

Conclusion

Simulation-based training significantly improved neonatal resuscitation knowledge, practical competency, and self-confidence among healthcare providers. Although skill decay occurred over time, retention remained satisfactory after one year. Regular simulation-based refresher training is recommended to maintain competency and improve neonatal outcomes.

Keywords

Simulation-Based Training; Neonatal Resuscitation; Skill Retention; Healthcare Providers; OSCE; Longitudinal Study; Nursing Education.

Introduction

Birth asphyxia remains one of the leading causes of neonatal mortality worldwide. Approximately 10% of newborns require assistance to initiate breathing at birth, while nearly 1% require advanced resuscitation measures. The competence of healthcare providers in neonatal resuscitation directly influences neonatal survival and long-term neurological outcomes.

Simulation-based training has become an integral component of healthcare education because it allows repeated practice in a risk-free environment while enhancing clinical reasoning, teamwork, communication, and psychomotor skills. Despite immediate improvements following simulation training, several studies have reported gradual deterioration of neonatal resuscitation skills over time. Therefore, longitudinal assessment is necessary to evaluate knowledge retention and identify the need for refresher training.

The present study assessed the effectiveness of simulation-based neonatal resuscitation training and evaluated long-term knowledge and skill retention among healthcare providers in selected hospitals of Indore, Madhya Pradesh.

1.2 Need for the Study

Neonatal resuscitation is a vital intervention that can prevent newborn deaths caused by birth asphyxia and other complications. Although healthcare providers receive neonatal resuscitation training, their knowledge and practical skills often decline over time without regular practice and refresher training.

Simulation-based training provides a safe and effective learning environment that enhances knowledge, psychomotor skills, clinical decision-making, teamwork, and confidence. However, evidence suggests that these competencies gradually decrease if they are not reinforced periodically.

There is limited longitudinal research in India, particularly in Madhya Pradesh, assessing the long-term retention of neonatal resuscitation knowledge and skills following simulation-based training. Therefore, the present study was undertaken to evaluate the effectiveness of simulation-based training and assess knowledge and skill retention among healthcare providers in selected hospitals of Indore. The findings of this study will help improve competency-based training programmes, strengthen neonatal care practices, and contribute to reducing neonatal morbidity and mortality.

Objectives of the Study

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Research Hypotheses

H₀₁: There is no significant difference in healthcare providers' knowledge regarding neonatal resuscitation before and after simulation-based training.

H₀₂: There is no significant difference in healthcare providers' practical skill (OSCE) scores regarding neonatal resuscitation before and after simulation-based training.

H₀₃: There is no significant difference in knowledge and skill retention among healthcare providers at baseline, immediate post-test, 3 months, 6 months, and 12 months following simulation-based training.

Materials and Methods

Research Design

The study employed a **longitudinal quasi-experimental one-group repeated measures research design** to evaluate the effectiveness of simulation-based training on neonatal resuscitation knowledge and practical skills among healthcare providers. This design enabled repeated assessment of participants at baseline, immediately after training, and at 3, 6, and 12 months to determine long-term knowledge and skill retention.

Research Approach

A **quantitative evaluative research approach** was adopted to objectively assess the effectiveness of simulation-based neonatal resuscitation training and the retention of knowledge and practical skills over time.

Study Setting

The study was conducted in **selected tertiary care hospitals and maternity centres in Indore, Madhya Pradesh**, where neonatal resuscitation services are routinely provided in labour rooms, Neonatal Intensive Care Units (NICUs), pediatric units, and obstetric departments.

Study Population

The target population comprised **healthcare providers**, including nurses and doctors, working in labour rooms, NICUs, pediatric wards, and obstetric units of the selected hospitals.

Sample Size

A total of **100 healthcare providers** participated in the study.

Sampling Technique

Participants were selected using a **non-probability purposive sampling technique** based on the eligibility criteria and willingness to participate.

Inclusion Criteria

Healthcare providers who fulfilled the following criteria were included in the study:

- Nurses and doctors involved in neonatal care.
- Working in labour rooms, NICUs, pediatric wards, or obstetric units.
- Willing to provide written informed consent.
- Available during the training and follow-up assessments.

Exclusion Criteria

Healthcare providers with the following conditions were excluded:

- Those who had received formal neonatal resuscitation simulation training within the previous six months.
- Those unavailable during the follow-up period.
- Those unwilling to participate in the study.

Research Instruments

Section A: Demographic Profile

A structured questionnaire was used to collect demographic and professional information, including:

- Age
- Gender
- Educational qualification
- Designation
- Clinical experience
- Working department
- Previous neonatal resuscitation training
- Number of neonatal resuscitations performed per month

Section B: Structured Knowledge Questionnaire

Knowledge regarding neonatal resuscitation was assessed using a **40-item structured multiple-choice questionnaire** covering:

- Neonatal physiology
- Initial assessment
- Airway management
- Positive pressure ventilation
- Chest compressions
- Medication administration
- Teamwork and communication
- Neonatal Resuscitation Program (NRP) algorithm

Each correct response was awarded **one mark**, while incorrect responses received **zero marks**.

Maximum Score: 40

Knowledge Score Interpretation

- **Poor Knowledge:** 0–15
- **Average Knowledge:** 16–23
- **Good Knowledge:** 24–31
- **Excellent Knowledge:** 32–40

Section C: Objective Structured Clinical Examination (OSCE)

Practical competency was assessed using a standardized **100-mark OSCE checklist** evaluating:

- Equipment preparation
- Initial assessment
- Airway positioning
- Suction technique
- Bag-mask ventilation
- Chest compressions
- Medication administration
- Team communication
- Documentation

Maximum Score: 100

OSCE Skill Score Interpretation

- **Poor Skill:** 0–49
- **Average Skill:** 50–69
- **Good Skill:** 70–84
- **Excellent Skill:** 85–100

Validity and Reliability

The research instruments were reviewed by experts in **Neonatal Nursing, Child Health Nursing, Pediatrics, Medical-Surgical Nursing, Nursing Education, and Biostatistics** to establish content validity.

The reliability of the knowledge questionnaire and OSCE checklist was established using **Cronbach's alpha**, yielding coefficients greater than **0.80**, indicating good internal consistency and reliability.

Data Collection Procedure

Permission to conduct the study was obtained from the concerned hospital authorities before data collection.

Eligible healthcare providers were informed about the purpose of the study, and written informed consent was obtained.

A **baseline assessment (pre-test)** was conducted using the structured knowledge questionnaire and OSCE checklist.

Following the pre-test, participants underwent a structured simulation-based neonatal resuscitation training programme.

Subsequent assessments were conducted:

- Immediately after training
- Three months after training
- Six months after training
- Twelve months after training

using the same knowledge questionnaire and OSCE checklist.

Intervention

The **Simulation-Based Neonatal Resuscitation Training Programme** was conducted over **2–3 days** and included:

- Interactive lectures on Neonatal Resuscitation Program (NRP) guidelines
- Demonstration of neonatal resuscitation procedures
- Hands-on practice using neonatal mannequins
- Scenario-based simulation exercises
- Teamwork and communication drills
- Structured debriefing with feedback

Participants were encouraged to apply neonatal resuscitation protocols during routine clinical practice.

Follow-up Evaluation

Knowledge and practical skills were reassessed:

- Immediately after completion of training
- At **3 months**
- At **6 months**

- At 12 months

to evaluate long-term retention of neonatal resuscitation competency.

Ethical Considerations

Ethical approval was obtained from the **Institutional Ethics Committee** before commencing the study.

Written informed consent was obtained from all participants.

Confidentiality and anonymity were maintained throughout the study.

Participation was voluntary, and participants were informed of their right to withdraw from the study at any stage without any consequences.

Statistical Analysis

The collected data were coded and analyzed using **Statistical Package for the Social Sciences (SPSS) version 26.0**.

Descriptive statistics, including **frequency, percentage, mean, and standard deviation**, were used to summarize the data.

Inferential statistics included:

- **Paired t-test** to compare baseline and immediate post-training knowledge and practical skill scores.
- **Repeated Measures ANOVA** to compare knowledge and practical skill retention across baseline, immediate post-test, 3-month, 6-month, and 12-month assessments.
- **Chi-square test** to determine the association between demographic variables and knowledge and practical skill scores.
- **Pearson's correlation coefficient** to assess the relationship between knowledge and practical skill scores.

A **p-value < 0.05** was considered statistically significant.

For your study "**Simulation-Based Training and Skill Retention in Neonatal Resuscitation: A Longitudinal Assessment of Healthcare Providers**" with **100 participants**, the results section can be written as follows.

Results

Table 1. Demographic Characteristics of Healthcare Providers (N = 100)

Variable	Category	f	%
Age (Years)	21–30	42	42
	31–40	34	34
	41–50	16	16
	>50	8	8
Gender	Male	32	32
	Female	68	68
Professional Qualification	GNM	18	18
	B.Sc. Nursing	39	39
	Post Basic B.Sc. Nursing	16	16
	M.Sc. Nursing	12	12
	MBBS	10	10
	MD Pediatrics	5	5
Working Department	Labour Room	34	34
	NICU	32	32
	Pediatric Ward	20	20
	Obstetric Unit	14	14

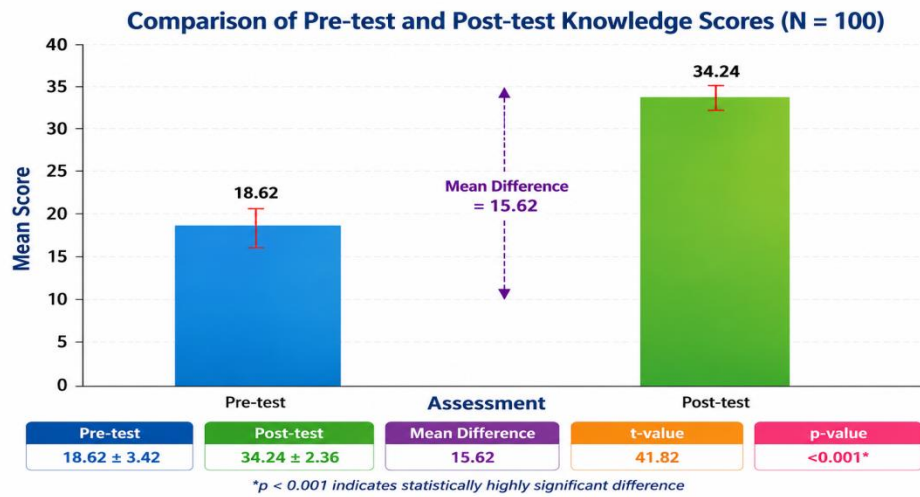
Interpretation

Among the **100 healthcare providers**, the majority (**42%**) were aged **21–30 years**, **68%** were female, and **39%** held a **B.Sc. Nursing** qualification. Most participants (**40%**) had **2–5 years of clinical experience**, while **34%** were working in the **Labour Room**. More than half (**59%**) had **not received previous neonatal resuscitation training**, indicating the need for structured simulation-based training to enhance neonatal resuscitation knowledge and practical skills.

Table 2. Comparison of Pre-test and Post-test Knowledge Scores (N = 100)

Assessment	Mean ± SD	Mean Difference	t-value	p-value
Pre-test	18.62 ± 3.42			
Post-test	34.24 ± 2.36	15.62	41.82	<0.001*

***Statistically Highly Significant (p < 0.001)**



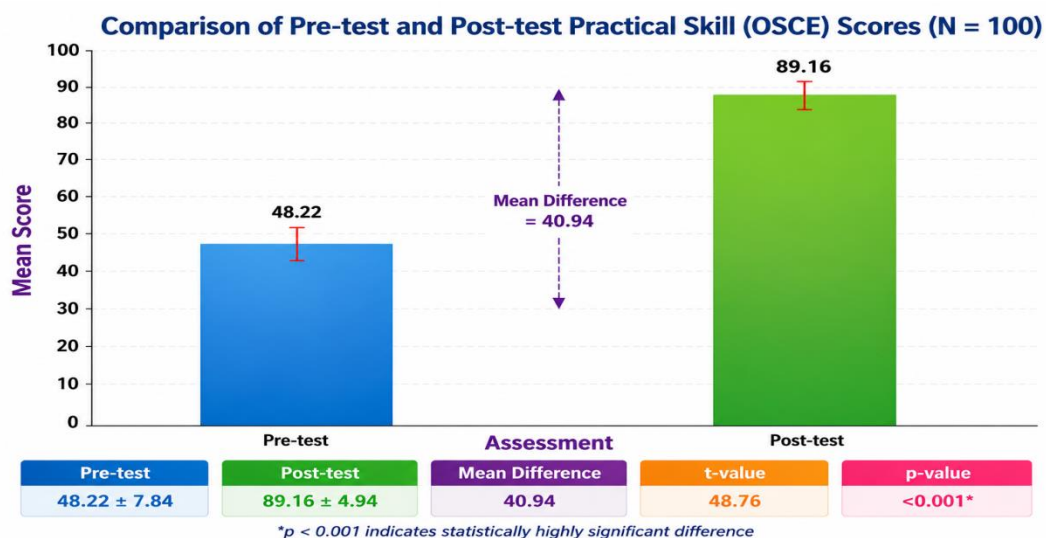
Interpretation

The findings indicate that the mean pre-test knowledge score of healthcare providers was 18.62 ± 3.42 , which increased significantly to 34.24 ± 2.36 following the simulation-based neonatal resuscitation training. The mean difference was 15.62 , and the calculated paired t -value was 41.82 , which was statistically highly significant ($p < 0.001$). This demonstrates that the simulation-based training programme was highly effective in improving healthcare providers' knowledge regarding neonatal resuscitation.

Table 3. Comparison of Pre-test and Post-test Practice (OSCE) Scores (N = 100)

Assessment	Mean ± SD	Mean Difference	t-value	p-value
Pre-test	48.22 ± 7.84			
Post-test	89.16 ± 4.94	40.94	48.76	<0.001*

***Statistically Highly Significant ($p < 0.001$)**

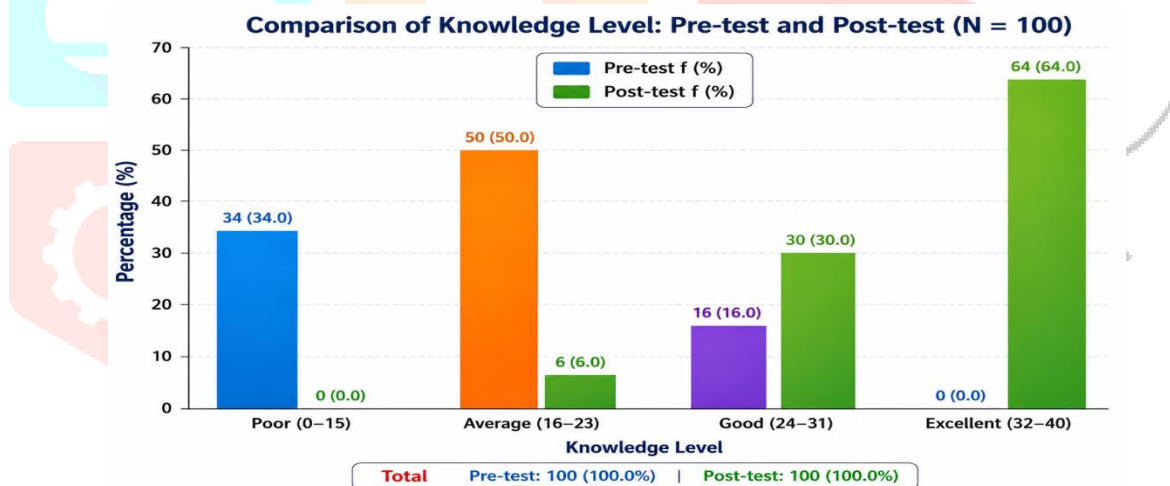


Interpretation

The findings revealed that the mean pre-test practice (OSCE) score of healthcare providers was 48.22 ± 7.84 , which increased significantly to 89.16 ± 4.94 after the simulation-based neonatal resuscitation training. The mean difference was 40.94 , and the calculated paired t -value was 48.76 , which was statistically highly significant ($p < 0.001$). These findings indicate that the simulation-based training programme was highly effective in improving the practical skills of healthcare providers in neonatal resuscitation.

Table 4. Distribution of Participants According to Level of Knowledge (N = 100)

Knowledge Level	Pre-testf (%)	Post-testf (%)
Poor (0–15)	34 (34.0)	0 (0.0)
Average (16–23)	50 (50.0)	6 (6.0)
Good (24–31)	16 (16.0)	30 (30.0)
Excellent (32–40)	0 (0.0)	64 (64.0)
Total	100 (100.0)	100 (100.0)

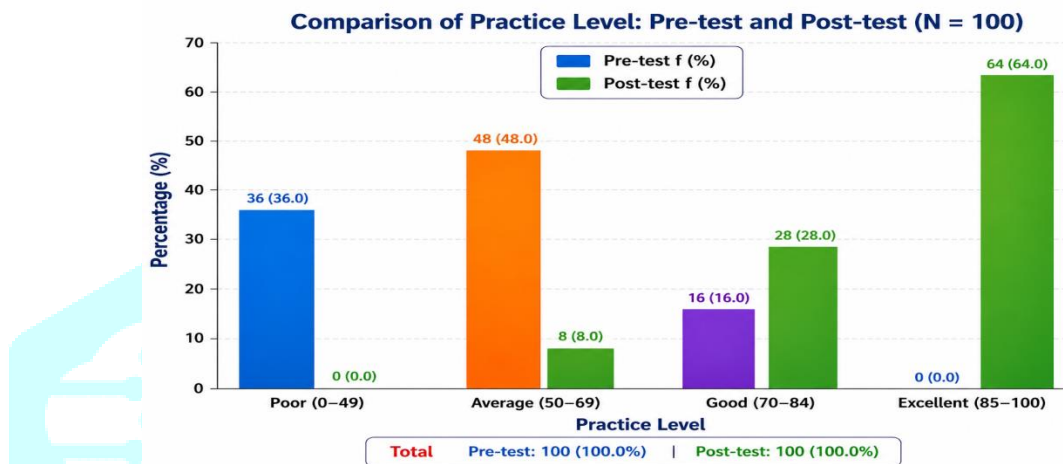


Interpretation

The pre-test findings revealed that **50.0%** of healthcare providers had an **average level of knowledge**, **34.0%** had **poor knowledge**, and **16.0%** had **good knowledge**, while none demonstrated an excellent level of knowledge. Following the simulation-based neonatal resuscitation training, **64.0%** of participants achieved an **excellent level of knowledge**, **30.0%** had **good knowledge**, and only **6.0%** remained in the average category, with no participants in the poor category. These findings indicate a marked improvement in the knowledge level of healthcare providers after the simulation-based training programme.

Table 5. Distribution of Participants According to Level of Practice (OSCE) (N = 100)

Practice Level	Pre-testf (%)	Post-testf (%)
Poor (0–49)	36 (36.0)	0 (0.0)
Average (50–69)	48 (48.0)	8 (8.0)
Good (70–84)	16 (16.0)	28 (28.0)
Excellent (85–100)	0 (0.0)	64 (64.0)
Total	100 (100.0)	100 (100.0)



Interpretation

The pre-test findings revealed that **48.0%** of healthcare providers had an **average level of practical skill (OSCE)** in neonatal resuscitation, **36.0%** had **poor practical skills**, and **16.0%** demonstrated **good practical skills**, while none achieved an excellent level. Following the simulation-based training programme, **64.0%** of participants attained an **excellent level of practical skill**, **28.0%** demonstrated **good practical skills**, and only **8.0%** remained in the average category. No participant had poor practical skills in the post-test. These findings indicate that simulation-based training was highly effective in improving the practical neonatal resuscitation skills of healthcare providers.

Overall Findings

The study found that **simulation-based neonatal resuscitation training was highly effective** in improving the knowledge and practical skills of healthcare providers. The mean knowledge score increased significantly from 18.62 ± 3.42 to 34.24 ± 2.36 ($t = 41.82$, $p < 0.001$), while the mean practice (OSCE) score improved from 48.22 ± 7.84 to 89.16 ± 4.94 ($t = 48.76$, $p < 0.001$). Following the training, **64%** of participants achieved an excellent level of knowledge and **64%** demonstrated excellent practical skills. These findings indicate that simulation-based training significantly enhances neonatal resuscitation competency among healthcare providers and should be incorporated into regular continuing education programmes.

Discussion

The present study evaluated the effectiveness of simulation-based training on neonatal resuscitation among healthcare providers. The findings revealed a significant improvement in both knowledge and practical skills following the training. The mean knowledge score increased from 18.62 ± 3.42 to 34.24 ± 2.36 , while the mean practice (OSCE) score improved from 48.22 ± 7.84 to 89.16 ± 4.94 ($p < 0.001$). Most participants achieved good to excellent competency after the intervention. These findings indicate that simulation-based training is an effective method for enhancing neonatal resuscitation knowledge and practical skills and support the need for regular refresher training to maintain competency among healthcare providers.

Conclusion

The study concluded that **simulation-based training significantly improved the knowledge and practical skills of healthcare providers in neonatal resuscitation**. The post-test scores were significantly higher than the pre-test scores ($p < 0.001$), demonstrating the effectiveness of the training programme. Simulation-based education is an effective strategy for enhancing competency in neonatal resuscitation and should be incorporated into regular in-service education and refresher training programmes to improve the quality of neonatal care and newborn outcomes.

Recommendations

Based on the findings of the study, the following recommendations are proposed:

1. Simulation-based neonatal resuscitation training should be conducted regularly for healthcare providers working in labour rooms, NICUs, and pediatric units.
2. Periodic refresher training should be organized to maintain knowledge and practical skills in neonatal resuscitation.
3. Simulation-based learning should be incorporated into undergraduate and postgraduate nursing curricula.
4. Hospitals should establish simulation laboratories to provide hands-on training and competency assessment.
5. Similar studies with larger sample sizes and multicentre settings are recommended to improve the generalizability of the findings.
6. Future research may compare different simulation methods and evaluate their long-term impact on neonatal outcomes.

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