

ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCE SCHOOL OF MEDICINE
DEPARTMENT OF PEDIATRICS AND CHILD HEALTH



Research Thesis

**A Quality Improvement Project to Improve the Knowledge of
Nurses Working at Tikur Anbessa Specialized Hospital Neonatal
Intensive Care Unit (NICU): A Pre - and Post - Test Study**

By:

Firehiwot Markos(MD)

Neonatology Fellow

DECEMBER 2024

ADDIS ABABA, ETHIOPIA

**A RESEARCH THESIS TO BE SUBMITTED TO TIKUR ANBESSA
SPECIALIZED HOSPITAL, DEPARTMENT OF PEDIATRICS AND
CHILD HEALTH IN PARTIAL FULFILMENT OF THE REQUIREMENT
FOR FELLOWSHIP PROGRAM IN NEONATOLOGY**

**A QUALITY IMPROVEMENT PROJECT TO IMPROVE THE
KNOWLEDGE OF NURSES WORKING AT TIKUR ANBESSA
SPECIALIZED HOSPITAL NEONATAL INTENSIVE CARE
UNIT(NICU): A PRE - AND POST - TEST STUDY**

**A RESEARCH THESIS
BY
FIREHIWOT MARKOS(MD)**

ADVISOR:

**DR ASRAT DEMTSE, MD
CONSULTANT NEONATOLOGIST, ASSISTANT PROFESSOR OF
PEDIATRICS**

**DECEMBER 2024
ADDIS ABABA, ETHIOPIA**

Addis Ababa University
School of Graduate Studies

This is to certify the thesis prepared by Dr. Firehiwot Markos entitled “A Quality Improvement Project to Improve the Knowledge of Nurses Working at Tikur Anbessa Specialized Hospital Neonatal Intensive Care Unit(NICU): A Pre - and Post - Test Study” and submitted in partial fulfillment of requirements for completion of fellowship program in Neonatology complies with regulations of the university and meets the accepted standards with the respect to originality and quality.

Advisor: Dr.

Signature ----- Date -----

Examining committee:

External Examiner:

Signature ----- Date -----

Internal Examiner:

Signature ----- Date -----

Advisor:

Signature ----- Date -----

Acknowledgement

I would like to express my deepest gratitude to my advisor Dr. Asrat Demtse for her valuable time and expertise she invested in this study. I would also like to thank Dr Kullehe Haddis for taking a huge part of this study and training the nurses with the team. I would also like to thank Bethelhem Lemma for being part of the training team and for her hard work in the NICU over the years. I would also like to thank all the members of neonatal ICU at TASH especially Heaven Lemma for her time in collecting the data for this study. I would like to thank all the nurses who participated in this study for their time and patience through the whole process of the study. Lastly, I would like to acknowledge my family for their support and encouragement throughout my studies.

Table of contents

Acknowledgement	i
Table of contents	ii
List of tables and figures	iv
List of Figures	iv
Acronym	v
Abstract	vi
1. Introduction.....	1
1.1. Background	1
1.2 Statement of the problem	3
1.3 Significance of the study	4
2. Literature Review.....	5
3. Objective	8
3.1 General Objective.....	8
3.2 Specific Objective	8
4. Materials and Methods.....	9
4.1 Study Setting	9
4.2 Study Population	9
4.3 Study Design and Study Period.....	9
4.4 Sampling Methods.....	12
4.5 Inclusion and Exclusion Criteria	12
4.6 Study Variables	12
4.7 Data Collection strategy	13
4.8 Data Management	13
4.9 Data Quality Assurance.....	13
4.10 Data Analysis	13
4.11 Ethical Consideration	13
4.12 Consent.....	14
4.13 Conflicts of Interest.....	14
4.14 Dissemination of findings	14

4.15 Funding Sources	14
5. RESULT	15
6. DISCUSSION	18
7. Conclusion	20
8. Limitation of the Study	20
9. Recommendation	20
10. References	21
Annexes.....	23
Annex I.....	23
Annex II.....	24
Annex III	25
Annex IV	27

List of tables and figures

Table 1 a - Training schedule day 1

Table 1b - Training schedule day 2

Table 2 - Trainers profile

Table 3: Sociodemographic characteristics

Table 4: Training experiences of the participants

List of Figures

Figure1: Descriptive statistics for the pretest, post training test and follow-up test

Acronym

AAU -	Addis Ababa University
ANC -	Antenatal Care
bCPAP -	bubble Continuous Positive Airway Pressure
CPAP -	Continuous Positive Airway Pressure
DW -	Dextrose in water
EPS -	Ethiopian Pediatrics Society
HBB -	Helping Babies Breath
HR -	Heart Rate
IV -	Intravenous
ICU -	Intensive Care Unit
KMC -	Kangaroo Mother Care
MCQs -	Multiple Choice Questions
MDGs -	Millennium Development Goals
MSI -	Marie Stopes International
NICU -	Neonatal Intensive Care Unit
NPO -	Nil Per Os
NRP -	Neonatal Resuscitation Program
PI -	Primary Investigator
PNC -	Postnatal Care
RDS -	Respiratory Distress Syndrome
SNNPR -	Southern Nation, Nationalities and Peoples Region
SPSS -	Statistical Package for Social Sciences
TASH -	Tikur Anbessa Specialized Hospital
WHO -	World Health Organization

Abstract

Background: The first 28 days of life – the neonatal period – is the most vulnerable time for a child’s survival. Globally 2.3 million children died in the first 28 days of life in 2022. Children who die within the first 28 days of birth suffer from conditions and diseases associated with lack of quality care at birth or skilled care and treatment immediately after birth and in the first days of life. The neonatal intensive care unit (NICU) is the home to a fragile patient population consisting of babies born prematurely or with congenital anomalies and newborns requiring surgical intervention. These patients need special medical attention and support. The medical staff must provide quality care and implement evidence-based nursing practices to improve outcomes for the neonatal population.

Objective of the study:

The aim of this study is to improve the knowledge of NICU nurses by training on common neonatal problems.

Method and Materials: A Quasi Experimental Pre- and Post- Test study design was used to assess knowledge of NICU nurses in Tikur Anbessa Specialized Hospital(TASH). A structured knowledge questionnaire in the form of Multiple Choice Questions(MCQs) was administered to obtain data regarding the knowledge of NICU nurses on common neonatal problems. Statistical analysis included differences in the knowledge scores before, immediately after the training and after 1 year of the training sessions and between the three periods.

Result: A total of 35 NICU nurses were trained on common newborn problems with a majority of female participants(82.9%). Seventeen(48.0%) of the nurses have Bachelor's degree in nursing and 14(40%) have Masters in Neonatal Nursing.The majority of them 14 (40.0%) had over 10 years of nursing experience. The participants' mean knowledge score during pre-test was 6.97 ± 1.85 which increased to 9.23 ± 1.09 immediately after the training and dropped to 6.94 ± 1.51 . This increase in mean scores indicates the effectiveness of the training in enhancing participants' performance in the short term.

Conclusion: The training programs are effective and significantly improve knowledge of nurses on common neonatal problems.

Key words: Neonatal Resuscitation, Hypothermia, Training, Pre-test, Post-test

1. Introduction

1.1. Background

The first 28 days of life – the neonatal period – is the most vulnerable time for a child’s survival. Globally 2.3 million children died in the first 28 days of life in 2022. A staggering 6,500 newborns died each day, representing 47% of all under-5 child deaths. While neonatal mortality has decreased globally by 44% since 2000, the newborn period remains critically vulnerable and requires intensified, high-quality care during and after birth. Sub-Saharan Africa accounted for 57% of under-5 deaths in 2022, despite only representing 30% of global live births, and had the highest neonatal mortality rate at 27 deaths per 1,000 live births, followed by Central and Southern Asia (21 deaths per 1,000 live births). Premature birth, birth complications, neonatal infections, and congenital anomalies remain the primary causes of these deaths. Children who die within the first 28 days of birth suffer from conditions and diseases associated with lack of quality care at birth or skilled care and treatment immediately after birth and in the first days of life(1).

The Neonatal mortality rate of Ethiopia decreased by 3.21% from 28.0 deaths per 1,000 live births in 2021 to 27.1 deaths per 1,000 live births in 2022. Since the 2.93% fall in 2012, neonatal mortality rate sank by 25.55% in 2022(2). Ethiopia has approved strategies to halt the burden of neonatal mortality through ANC, postnatal care (PNC), immunization during and after pregnancy, and skilled birth attendance. Despite there is a reduction in neonatal mortality, still there is a need to have focused attention on newborn interventions(3).

A recent study identified effective interventions for reducing neonatal mortality, categorized as community-based interventions and a continuum of care approach. Community-based intervention packages, primarily focused on establishing community support or women's groups, demonstrate potential for significant impact: 1) One package is projected to decrease neonatal mortality by 16%. 2) Another shows a greater potential decrease of 40%. 3) Community mobilization and home-based neonatal treatment also likely reduce neonatal mortality. Furthermore, strengthening the continuum of care, specifically interventions linking pre-pregnancy and pregnancy care, is projected to reduce neonatal mortality by 21%(4).

The neonatal intensive care unit (NICU) is the home to a fragile patient population consisting of babies born prematurely or with congenital anomalies and newborns requiring surgical intervention. These patients need special medical attention and support. The medical staff must provide quality care and implement evidence-based nursing practices to improve outcomes for the neonatal population(5). Nurses and midwives have critical roles and responsibilities to help reduce this significant problem in keeping with the United Nation Millennium Development Goal (6).

The retention of knowledge and skills is a critical challenge in healthcare professional training, especially in low- and middle-income countries (LMICs). This is particularly relevant for newborn resuscitation, as demonstrated by a systematic review of training programs in resource-limited settings. The review revealed that performance often declines over time. However, it also showed that refresher training, conducted between nine months and two years after initial training, can effectively mitigate this decline, with four studies reporting minimal or no loss of knowledge and skills following such interventions(10).

Recognizing that competence can decline over time in all professions, nursing requires a strong commitment to continuous learning. To ensure nurses maintain their skills and knowledge throughout their careers, it's essential to implement a diverse range of teaching and learning strategies, including both formal instruction and self-directed study. Virtual learning, simulations, and competency performance evaluations offer powerful tools for enhancing learning and skill development as nurses progress professionally(5). It is crucial to ensure that NICU nursing staff possess the knowledge and skills necessary to prevent and manage life-threatening conditions in this fragile patient population.

1.2 Statement of the problem

Globally, Neonatal deaths account for 47% of all deaths in children younger than 5 years. More than a third of newborn deaths are due to preterm birth complications, which is the leading cause of death. Understanding the causes and factors contributing to neonatal deaths is needed to identify interventions that will reduce mortality (1). The quality of neonatal care depends on several factors like: Adequate space for NICU with closest distance from delivery ward, appropriate equipment, qualified and motivated human resource, medications and updated guidelines. Sick newborns require continuous supportive care and observation, with repeated and often multiple interventions delivered within 24 hours and their condition can change rapidly. Good outcomes for this population are, therefore, particularly dependent on good nursing care.

Nurses are the largest group of healthcare providers and play several roles, one of the important goals of nursing care in neonatal intensive care units is to implement holistic care that lead to the best possible health outcome, most importantly to provide quality care to patients, protecting their safety, promoting health, and reducing their pain and suffering.

1.3 Significance of the study

Newborn care is provided by a number of health professionals in Ethiopia including pediatricians, general practitioners, nurses and in a few teaching hospitals by neonatologists and neonatology fellows. The most care for newborns is provided by nurses working in neonatal ICU who are by the bedside of the babies everyday. We wanted to give training for the nurses working at the NICU at TASH on common newborn problems they face everyday. We wanted to assess the baseline knowledge of the nurses before the training and also assess the impact of the training on their knowledge. We also wanted to assess the level of retention of the training after one year from the training which will possibly lead to a regular scheduled on job training of the nurses in the future. This study is potentially significant because it demonstrates how targeted educational programs can empower nurses to provide improved newborn care, particularly in settings like Ethiopia where high infant and maternal mortality and morbidity underscore the critical need for skilled healthcare providers. By enhancing nurses' knowledge and skills, these programs can contribute to better newborn outcomes.

2. Literature Review

An experimental study conducted at Liaquat National Hospital in Pakistan in 2018 assessed the effectiveness of a basic neonatology course developed in partnership between the Department of Pediatrics and the Nursing Education Service and Research Development and Skill Center. The study, involving 25 participants, revealed a significant increase in knowledge among participants following the course, as evidenced by the difference in mean scores between the mid-course quiz (26.82 ± 6.16) and the final quiz (31.9 ± 10.45 ; $p=0.005$). These findings highlight the value of continuous nursing education in enhancing nurses' proficiency in the NICU, ultimately leading to improved and safer care for neonates(11).

A quasi-experimental, time-series pre-test/post-test study without a control group was conducted to evaluate the impact of an educational intervention on nurses' newborn care knowledge and practice. The study utilized a convenience sample of 30 nurses working in the emergency room, delivery room, or birthing center of Paropakar Maternity and Women's Hospital in Kathmandu, Nepal. The findings indicated that the educational intervention significantly improved nurses' knowledge and practice, and a positive correlation was observed between knowledge and practice scores(12).

A pre- and post-intervention study assessed the impact of both initial and refresher neonatal resuscitation training on healthcare professionals in Zanzibar, Tanzania. In 2017, 23 participants received two days of initial training, followed by two days of refresher training in 2018. Both training sessions resulted in significant improvements in knowledge: scores increased from 9.60 to 13.60 after the initial training ($p < 0.001$) and from 10.80 to 15.44 after the refresher training ($p < 0.001$). Furthermore, knowledge retention was improved, as indicated by a significant increase in knowledge scores between 2017 and 2018 ($p = 0.030$). Resuscitation skills performance also demonstrated significant improvement, rising from a mean of 32.26 (SD = 2.35) to 42.43 (SD = 1.73) between the two training periods ($p < 0.001$)(13).

From February to June 2017, a pre- and post-test study was conducted in two tertiary hospitals in Juba and Wau, South Sudan, to evaluate the effectiveness of an intervention aimed at reducing early newborn mortality due to asphyxia. Seventy healthcare workers were recruited for the

study: 40 were assigned to the intervention group, and 30 were assigned to the control group. Skills and competency were evaluated using a Neonatalie newborn simulator immediately following training and then again after a three-month period. The study demonstrated a significant reduction in early newborn mortality due to asphyxia within the intervention group when compared to the control group. These positive outcomes were accompanied by improvements in the healthcare workers' knowledge, psychomotor skills, and competency. By the end of the three-month period, early newborn mortality had been reduced by half in the intervention group(14).

A quasi-experimental one group pre-test post study was conducted among 40 staff nurses selected by total enumeration technique to evaluate the effect of supportive supervision on knowledge and practice of staff nurses regarding prevention of neonatal hypothermia in Purba & Paschim Medinipur, India. The result revealed that the mean post-test knowledge & practice scores (17.45 & 12.90 respectively) were higher than the mean pre-test score (14.05 & 11.05 respectively). These mean differences were found statistically significant as evident by t-test ($p < 0.0001$)(15).

A quasi-experimental study assessed the impact of neonatal training programs on NICU nurses' knowledge and practice in military and police hospitals in Khartoum State, Sudan. Forty-seven nurses meeting inclusion criteria were enrolled. The participants were predominantly female (100%), aged 20-30 years (mean 27.7 ± 5.3 years), and held a BSc in nursing (85.1%). Most had 1-5 years of experience (32%), followed by 6-10 years (29.8%). The training program significantly improved nurses' knowledge of temperature monitoring (pre-intervention: 73%, post-intervention: 94.3%, $p = 0.03$) and practice of placing babies under radiant warmers (pre-intervention: 72.3%, post-intervention: 93.6%, $p = 0.006$). While practice in cases of hypothermia improved (pre-intervention: 80.01%, post-intervention: 82.9%), this change was not statistically significant. The study concluded that implementing the training program on neonatal hypothermia was effective in enhancing nurses' knowledge and practices(16).

A pre- and post-test study evaluated the knowledge outcome of Essential Care for Every Baby (ECEB) training in two training centers in the Southern Nations, Nationalities, and Peoples' Region (SNNPR), Ethiopia. Data from 98 health professionals were analyzed. The mean

knowledge score significantly increased from 59.10 (SD $\pm$ 13.180) before the training to 73.73 (SD $\pm$ 14.173) after the training ($t(97) = 11.684$, CI = 12.147-17.118, $P < 0.001$). At both pre- and post-test, female trainees scored significantly higher than male trainees ($p = .017$ and $p = .004$, respectively). Similarly, at post-test, trainees from hospitals scored significantly higher than those from health centers ($p = .018$). The study concluded that ECEB training significantly improved the overall knowledge of the trainees(17).

3. Objective

3.1 General Objective

The aim of this study is to improve the knowledge of NICU nurses by training on common neonatal problems.

3.2 Specific Objective

To assess the current knowledge of NICU nurses on common neonatal problems

To improve the knowledge of NICU nurses at posttest compared to pretest

To assess the knowledge after 1 year of the training

4. Materials and Methods

4.1 Study Setting

The study was conducted at Tikur Anbessa Specialized Hospital(TASH) at the NICU, Addis Ababa, Ethiopia.

Tikur Anbessa specialised hospital, established in 1974, is the largest tertiary hospital in the country. The hospital is administered by Addis Ababa University and is the largest and oldest teaching hospital among all in Ethiopia providing teaching for about 300 medical students and 350 residents each year. TASH provides diagnosis and treatment for approximately 500,000 patients each year. The NICU has 44 beds and 2000 admissions per year. On a monthly basis around 150 to 200 neonates are admitted. Thermoregulation, IV hydration, mechanical ventilation, bCPAP, phototherapy, and KMC are some of the services being provided. There is one neonatologist, two neonatal fellows, and 40 neonatal nurses who treat the newborns on a daily basis.

4.2 Study Population

All nurses providing nursing care in the NICU at TASH.

4.3 Study Design and Study Period

A quasi-experimental, time-series pre-test/post-test without control group design was used to assess knowledge of NICU nurses. A structured knowledge questionnaire in the form of MCQs was administered to obtain data regarding the knowledge of NICU nurses on common neonatal problems. The nurses received a pretest exam of 10 questions prior to the start of the training. The pretest took about 2 minutes for each question and a total of 20 minutes was assigned. The nurses received 9 hours of lectures on common neonatal problems which includes Hypothermia, Hypoglycemia, Prematurity and preterm feeding, Perinatal Asphyxia, RDS and CPAP. The above topics were chosen for this study because these are the most commonly encountered cases in TASH NICU and the nurses are encountering these cases on a daily basis. The training was conducted with didactic lectures with powerpoint presentation and with active participation of the trainees. The hands-on part was 2.5 hours of neonatal resuscitation Program(NRP) with the

NeoNatalie Newborn simulator. The total duration of the training was two days of training and they received the post test exam with the same 10 questions at the end of the training. The MCQs consisted of three questions from NRP, two questions on Hypothermia, two questions on Hypoglycemia, and one question each on Perinatal Asphyxia(PNA), CPAP and newborn feeding. The training was conducted in two groups over two days for each group from November 13 to 16, 2023. The grouping was important because as one group is receiving the training the other group was taking care of the newborns at the NICU and also there were less number of nurses per group for the hands-on training part. The hands-on training on neonatal resuscitation program(NRP) was in small groups of 5 to 6 nurses for one trainer with a trainer to trainee ratio of 1:5 - 6. After one year of the training the same nurses received the same questionnaire to assess their knowledge from November 18 to 22, 2024. Similar duration was provided to finish the questionnaire.

Training Schedule and training topics

Neonatal ICU training on common neonatal problems

Day 1

Time	Topics	Remark
8:00 - 8:30 AM	Registration/ Pretest	
8:30 - 9:30 AM	Hypothermia	1 hour
9:30 - 10:15 AM	Hypoglycemia/ Hyperglycemia	45 minutes
10:15 - 10:45 AM	Tea Break	
10:45 - 11:45 AM	Prematurity	1 hour
11:46 - 12:30PM	Preterm feeding	45 minutes
12:30 - 2:00 PM	Lunch	
2:00 - 3:00 PM	Perinatal Asphyxia	1 hour
3:00 - 3:30 PM	Tea Break	
3:30 - 4:15 PM	RDS	45 minutes
4:15 - 5:00 PM	CPAP	45 minutes

Table 1a - Training schedule day 1

Neonatal ICU training on common neonatal problems

Day 2

Time	Topics	Remark
8:30 - 9:30 AM	Neonatal Resuscitation Program	1 hour
9:30 - 10:15 AM	NRP hands on training	45 minutes
10:15 - 10:45 AM	Tea Break	
10:45 - 11:45 AM	NRP hands on	1 hour
11:46 - 12:30PM	“ “ “	45 minutes
12:30 - 2:00 PM	Lunch	
2:00 - 3:00 PM	Fluid and medication preparation	1 hour
3:00 - 3:30 PM	Tea Break	
3:30 - 4:30 PM	Neonatal Seizure	1 hour
4:30 - 5:00 PM	Post-test	

Table 1b - Training schedule day 2

Trainers Profile

The team which delivered sessions during the training comprised 4 internal trainers from TASH

Name	Academic merit	Place of Work
Dr Asrat Demtse	Assistant Professor of Pediatrics and Child Health; Consultant Paediatrician and Neonatology	TASH
Dr Kullehe Haddis	MD, Expert Paediatrician, Neonatology Fellow	TASH
Dr Firehiwot Markos	MD, Senior Paediatrician, Neonatology Fellow	TASH
Bethlehem Lemma	Bsc. In Pharmacy	TASH

Table 2: Trainers profile

4.4 Sampling Methods

NICU nurses who fulfil the inclusion criteria were included.

4.5 Inclusion and Exclusion Criteria

Inclusion criteria

All NICU nurses with > 6 months of NICU nursing experience

NICU nurses who took the pretest, attend the training and who complete the posttest immediately after the training

NICU nurses who take the posttest at 1 year after the training.

Exclusion Criteria

Nurses who missed parts of the training for different reasons

Nurses who are new hires with less than 6 months of NICU experience.

Nurses who did not participate in the pretest and post test for different reasons

Nurses who did not take the posttest after 1 year of the training

4.6 Study Variables

Independent variables

- Age/Sex
- Marital status
- Educational level
- Years of service
- Length of experience as a nurse
- Length of experience as a NICU nurse
- Attended similar training in the last 2 years
- Attended training prepared by MOH on newborn care

Dependent Variables

Knowledge of nurses at pre - and post - test

Knowledge of nurses 1 year after the training

4.7 Data Collection strategy

A structured data collection Questionnaire was created and used to collect demographic data from the nurses.

4.8 Data Management

The primary investigator checked for data cleanliness and completeness. The hard copies were converted into soft copies, stored on a hard drive, and were ready for analysis, and backup copies were stored on a separate drive.

4.9 Data Quality Assurance

During the data collection, regular and periodic supervision was made for completeness and quality of data by the primary investigator.

4.10 Data Analysis

The collected data was checked for completeness, coded, cleaned, and thoroughly examined by the principal investigator. It was then entered into the Statistical Package for Social Sciences (SPSS) version 27 software for analysis. Simple descriptive statistics, such as percentages, means, and SD, were used to characterize the variables. A p-value of < 0.05 was considered statistically significant. The analyzed data was presented using tables, graphs, and figures, as appropriate.

4.11 Ethical Consideration

Ethical clearance to conduct this study was obtained from the Paediatrics and Child Health Department's Research and Publications Committee of the School of Medicine, College of Health Sciences, Addis Ababa University. Confidentiality was fully maintained during Data collection and further analysis and dissemination of results.

4.12 Consent

After giving a clear and deep explanation about the aim of the study, all nurses who participated in the training were asked for their willingness and informed written consent was obtained from each respondent. Persons who are unwilling to respond will be exempted from the study.

4.13 Conflicts of Interest

The primary investigator declares that there are no conflicts of interest regarding the publication of this paper.

4.14 Dissemination of findings

The findings of the study will be presented to the Department of Paediatrics and Child Health and a formal report will be submitted with both soft and hard copies. The research output will also be published in local or international scientific journals.

4.15 Funding Sources

The training was funded by Marie Stopes International(MSI) Ethiopia and College of Health Sciences, Addis Ababa University.

5. RESULT

Sociodemographic characteristics

In the present study, the majority of respondents were female, comprising 29 (82.9%) of the sample. More than half of the participants 19 (54.3%) were aged between 31–40 years, while nearly one-third 11 (31.4%) were in the 21–30 years category. With respect to marital status, slightly more than half 18 (51.4%) of the participants were single. Regarding the highest level of education, 17 (48.6%) were Clinical Nurses (BSc), and more than one-third 14 (40.0%) of them held a Masters in Neonatal Nursing. Professional experience varied widely among the participants. The majority of them 14 (40.0%) had over 10 years of nursing experience, and interestingly, nearly half 17 (48.6%) had worked in the Neonatal Intensive Care Unit (NICU) for 0–2 years (Table3).

Table 3: Sociodemographic characteristics

Variables	Frequency (%)
Gender	
Male	6 (17.1)
Female	29 (82.9)
Age category	
21-30 years	11 (31.4)
31-40 years	19 (54.3)
41-50 years	5 (14.3)
Marital Status	
Single	18 (51.4)
Married	17(48.6)
Highest level of education attained	
Clinical Nurse (BSc)	17 (48.6)
Neonatal Nurse(BSc)	2 (5.7)
Master of Neonatal Nursing(MSc)	14 (40.0)
Masters of Nursing(MSc)	2 (5.7)
Year of Service as a nurse	

0 - 2 years	4 (11.4)
3 - 5 years	6 (17.1)
6- 10 years	11 (31.4)
> 10 years	14 (40.0)
Years working in the NICU	
0 -2 years	17 (48.6)
3 - 5 years	6 (17.1)
6 - 10 years	6 (17.1)
> 10 years	6 (17.1)

Training experiences of the participants

Only one-quarter 9 (25.7%) had undergone similar training in the last two years. Furthermore, only 6 (17.1%) of respondents reported receiving training facilitated by the Ministry of Health(MOH) on neonatal problems, with the remaining 82.9% having no such training (Table 4).

Table 4: Training experiences of the participants

Variables	Frequency (%)
Did you have similar training in the last 2 years?	
Yes	9 (25.7)
No	26 (74.3)
Have you received training facilitated by MOH on neonatal problems?	
Yes	6 (17.1)
No	29 (82.9)

Descriptive statistics for the pretest, post training test and follow-up test

The study evaluated participants' performance across three testing phases: pretest (before training), post-test (immediately after training), and a follow-up test conducted a year after the training. Participants demonstrated a wide range of initial performance, with scores ranging from 2 to 10, with a mean core of 6.97 ± 1.85). During the post training test, which was immediately

following the training, participants exhibited a notable improvement. Scores ranged from 6 to 10, with a mean score of 9.23 ± 1.09 . This increase in mean scores indicates the effectiveness of the training in enhancing participants' performance in the short term. Finally, in the follow-up test results, scores ranged from 3 to 9, with a mean score of 6.94 ± 1.51 . This result reflects a decline in performance compared to the immediate post-test, with mean scores closely resembling pretest levels. The reduction in performance suggests potential challenges in the retention of the knowledge gained during the training (Figure 1).

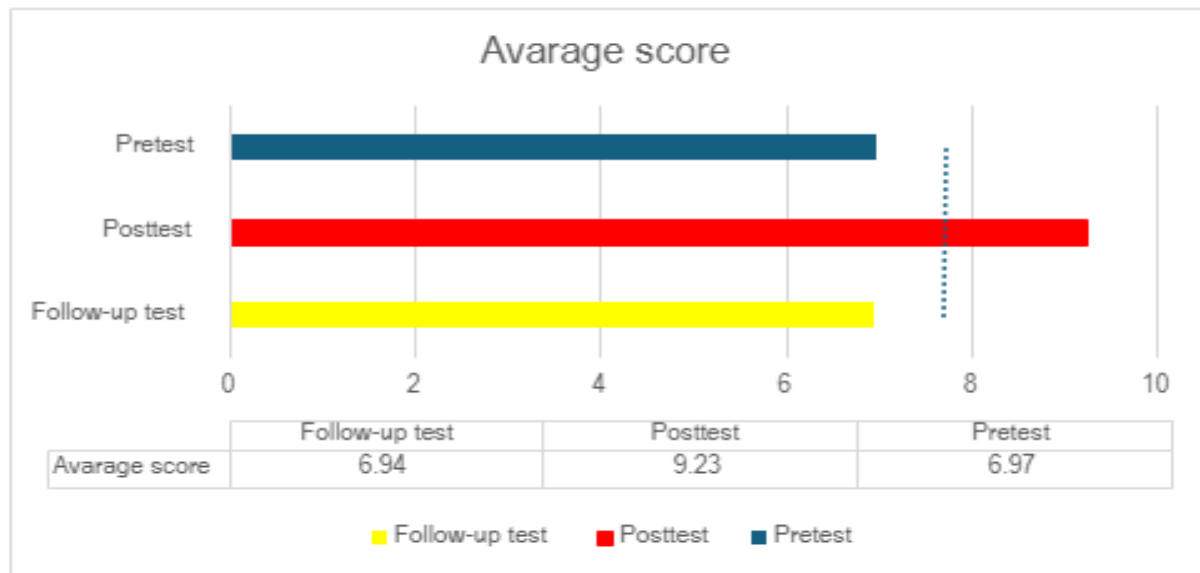


Figure1: Descriptive statistics for the pretest, post training test and follow-up test

6. DISCUSSION

This study investigated the effect of educational intervention to scale up the quality of care and the knowledge of nurses in a hospital in Ethiopia. Educational interventions for nurses are commonly viewed as the key strategy to promote their knowledge and practice, and this is emphasized in this study. Among the 35 participants, nearly half 17 (48.6%) of the respondents were BSc-qualified nurses, and 14 (40.0%) had a Master's degree in Neonatal Nursing. This finding was in contrast to the finding from a study from Military Police Hospital of Khartoum State, Sudan which revealed that more than two-third (85.1%) nurses had a BSc degree in nursing science and only 8.5 had MSc(16).

In our study, 29(82.9%) had not received any previous training in the care of newborns prepared by EPS even though they worked with newborns on a daily basis. As for recent similar training, only one-quarter 9 (25.7%) had undergone similar training in the last two years. A study done in Nepal showed, 11 (37%) participants had been trained in different types of newborn care but, importantly, 19 (63%) had not received any newborn care training(12). Another study on the effect of neonatal training programs on NICU nurses' knowledge and practice in the Military and Police Hospitals of Khartoum State, Sudan found that 91.5% of the nurses had never undertaken a training course in neonatal care(16).

This study revealed the participants' mean score increased from a mean score of 6.97 to 9.23 immediately following the training which indicates the effectiveness of the training in enhancing participants' performance in the short term. This is similar to the findings from Nepal and Tanzania, where the mean knowledge score was significantly improved immediately after the training(12,13). Another study from South Sudan on training intervention on helping babies breath(HBB) among health workers found that there was significant increase in terms of knowledge between the pretest and immediate post intervention(14). Another study from Ethiopia on knowledge outcomes of essential care for every baby training in Southern Nations, Nationalities, and People's Region showed the overall mean (standard deviation) knowledge score of the trainees increased from 59.10 before the training to 73.73 after the training. This difference was statistically significant(17).

A similar study from India on prevention of hypothermia with supportive supervision revealed that mean post-test knowledge & practice score (17.45 & 12.90, respectively) were higher than the mean pre-test score (14.05 & 11.05, respectively) and the mean differences were found statistically significant as evident by t-test ($p < 0.0001$)(15).

In our study the follow up test which was done after 1 year of the training revealed decline in performance compared to the immediate post-test. Similar findings were reported from the studying from Nepal and South Sudan where the scores decreased slowly over the duration of the study. These statistically significant differences indicated that there was an effect of time on knowledge and practice scores, but also suggested that this intervention had a short-term effect on knowledge and practice(12, 14). This finding is in contrast to the finding from a study from Somalia on effectiveness of clinical training on improving essential newborn care practices found the knowledge and newborn resuscitation practice was retained at 18 months post training(18).

Our study revealed the mean knowledge score was not significantly varied with the highest education level attained or level of experience of the nurses. This is in contrast to a study that showed knowledge of the staff nurses was influenced only by their working experience but not by age, qualification, and in service training(15).

7. Conclusion

Based on the findings of this study, We conclude that training programs are effective and significantly improve knowledge of nurses on common neonatal problems in the short term. Due to the small number of sample sizes it was difficult to find significant associations between socio demographic characteristics and results of the tests. The loss of the knowledge after one year can be attributed to loss of knowledge over time. This shows that the nurses working in the NICU need supportive supervision and refresher training to keep their knowledge and stay updated on evidence - based interventions and preventive aspects of neonatal medicine.

8. Limitation of the Study

Several limitations of the study should be noted. First, the study was conducted with a small sample size, involving only NICU nurses from a single hospital in Ethiopia. Second, the knowledge of the nurses was assessed using only 10 multiple-choice questions (MCQs). A more comprehensive evaluation with standardized questions covering a broader range of topics, including some easier questions and case-based scenarios, could have provided deeper insights into the nurses' understanding and their ability to apply knowledge in clinical practice

Additionally, the study only assessed the theoretical knowledge of the nurses, leaving the hands-on component of training unexamined. Another limitation was the duration of the training, which spanned just two days and covered numerous topics. This limited time frame may have resulted in an overwhelming amount of information, making it difficult for participants to retain and fully understand the material.

9. Recommendation

Based on the findings of this study, We recommend that continuous educational programs for nurses working in the NICU will enhance retention of knowledge and impact patient care on a daily basis.

Another recommendation is conducting a comparative study between intervention and control groups with larger sample size and assessment of the skills in addition to knowledge.

10. References

1. WHO: Newborn mortality, 14 March, 2024
2. World Data Atlas - Ethiopia/Health <https://knoema.com/atlas/Ethiopia/Neonatal-mortality-rate>
3. Yaya Y, Eide KT, Norheim OF, Lindtjorn B. Maternal and neonatal mortality in south-west Ethiopia: estimates and socio-economic inequality. *PLoS One*. 2014;9:e96294.
4. Weldemariam, T. D., Kebede, Z., Ababor, S., Bogale, F., Solomon, D., and Gebreyohannes, Y. (2023). Reducing neonatal mortality in Ethiopia: a call for urgent action! An evidence brief for policy. *Population Medicine*, 5(Supplement), A1021. <https://doi.org/10.18332/popmed/164827>
5. Rachel Raber, Aksana Waskosky, Shannon Moore, An educational initiative in the neonatal intensive care unit for the novice nurse on thermoregulation, *Journal of Neonatal Nursing*, Volume 30, Issue 6, 2024, Pages 747-764, ISSN 1355-1841, <https://doi.org/10.1016/j.jnn.2024.05.001>.
6. Amieva, S. and Ferguson, S. (2012), Moving forward: nurses are key to achieving the United Nations Development Program's Millennium Development Goals. *International Nursing Review*, 59: 55-58. <https://doi.org/10.1111/j.1466-7657.2011.00944.x>
7. Zhao Y, Hu Y, Liang J, Xu Q. A pilot study on the simulation-based training for Ethiopia skilled birth attendants. *Nurse Educ Pract*. (2019) 34:130–138. doi:10.1016/j.nepr.2018.12.001
8. Woods J, Gagliardi L, Nara S, Phally S, Varang O, Viphou N, Grundmann C, Liljestrand J. An innovative approach to in-service training of maternal health staff in Cambodian hospitals. *Int J Gynaecol Obstet*. 2015 May;129(2):178-83. doi: 10.1016/j.ijgo.2014.10.034. Epub 2015 Jan 6. PMID: 25593108.
9. Eblovi D, Kelly P, Afua G, Agyapong S, Dante S, Pellerite M. Retention and use of newborn resuscitation skills following a series of helping babies breathe trainings for midwives in rural Ghana. *Glob Health Action*. (2017) 10:1387985. doi: 10.1080/16549716.2017.1387985
10. Reisman J, Arlington L, Jensen L, Louis H, Suarez-Rebling D, Nelson BD. Newborn resuscitation training in resource-limited settings: A systematic literature review. *Pediatrics*. (2016) 138:e20154490. doi: 10.1542/peds.2015-4490

11. Soomro, Rufina. "Impact of Training on Nurses Performance and Productivity at Neonatal Intensive Care Unit (NICU)." *JOJ Nursing & Health Care* (2018): n. pag.
12. Shrestha S, Petrini M, Turale S. Newborn care in Nepal: the effects of an educational intervention on nurses' knowledge and practice. *Int Nurs Rev.* 2013 Jun;60(2):205-11. doi: 10.1111/inr.12017. Epub 2013 Apr 21. PMID: 23692004.
13. Ding X, Wang L, Msellem MI, Hu Y, Qiu J, Liu S, Zhang M, Zhu L and Latour JM (2021) Evaluation of a Neonatal Resuscitation Training Programme for Healthcare Professionals in Zanzibar, Tanzania: A Pre-post Intervention Study. *Front. Pediatr.* 9:693583. doi: 10.3389/fped.2021.693583
14. Draiko, Christopher & Yamarat, Khemika & Panza, Alessio & Draleru, Judith & Taban, Martin & Onyango, Joseph & Akur, Regina & Omega, Rose. (2018). Training interventions on Helping Babies Breathe among health workers in tertiary hospitals of the Republic of South Sudan: A non-randomized quasi-experimental study. *Healthcare in Low-resource Settings.* 6. 10.4081/hls.2018.7276.
15. Dey S, Kundu P. Health-Related Quality of Life of Backward Caste Workers in Selected Small Hospitals in Purba Bardhaman district of West Bengal. *J West Bengal Univ Health Sci.* 2023; 3(4):29-36.
16. Rabab.Mohamed Adam* and Buthina Bassyonie Elssayed (2022) "The Effect of Neonatal Training Programs on NICU Nurses' Knowledge and Practice in the Military and Police Hospitals of Khartoum State, Sudan," *Sudan Journal of Medical Sciences*, vol. 17, Issue no. 1, pages 28–38. DOI 10.18502/sjms.v17i1.10683
17. Gamtessa LC, Kebede KM, Deyas Y. Knowledge Outcome of Essential Care for Every Baby Training in Southern Nations, Nationalities, and People's Region, Ethiopia: A Pre- and Post-Test Study. *Glob Pediatr Health.* 2021 Apr 27;8:2333794X211012983. doi: 10.1177/2333794X211012983. PMID: 33997126; PMCID: PMC8107926.
18. Amsalu, R., Morris, C.N., Hynes, M. *et al.* Effectiveness of clinical training on improving essential newborn care practices in Bossaso, Somalia: a pre and postintervention study. *BMC Pediatr* 20, 215 (2020). <https://doi.org/10.1186/s12887-020-02120-x>

Annexes

Annex I

Information Sheet

You are being asked to be a part of the study titled:

A Quality Improvement Project Proposal to Scale up the Quality of care and the knowledge of Nurses Working at Tikur Anbessa Specialized Hospital Neonatal Intensive Care Unit,

Because you are one of the healthcare providers at Tikur Anbessa Specialized Hospital Neonatal ICU. This study is being conducted at Tikur Anbessa Specialized Hospital, Addis Ababa University to improve the quality of care being provided to newborn babies. The study will consist of a two day training on common neonatal topics and a hands on training on Neonatal resuscitation program. The study will assess your knowledge and practice currently and after the completion of the training. The study will also assess your recall after 6 months of the training.

If you have any questions or concerns about this study and want to contact the PI or advisor:

Primary Investigator:

Dr Firehiwot Markos

Phone - +251912003790

Email - firehiwot.markos@aau.edu.et

Advisor - Dr Asrat Demtse

Phone - +251911407009

Email - asratdg@yahoo.com

Annex II

Consent form

I have read the information sheet provided by the primary investigator for the study titled:

A Quality Improvement Project Proposal to Scale up the Quality of care and the knowledge of Nurses Working at Tikur Anbessa Specialized Hospital Neonatal Intensive Care Unit.

I am also informed about the study in detail and I am willing to participate in this study. I have participated in this study on a voluntary basis and I was informed that I can withdraw from the study anytime. There is no risk involved with participating in the study because it is about assessing my knowledge about the care of the newborns I treat on a daily basis.

I agree ☐

I disagree ☐

Thank you!

Name & signature of Health professional

Date: ____ / ____ / ____
Day month year

Name of data collector

Date: ____ / ____ / ____
Day month year

Annex III

Sociodemographic data

Gender	Female
	Male
Age	21-30
	31-40
	41-50
	> 50
Marital status	Single Married Divorced Widowed
Job Designation	Diploma in nursing Bsc Nursing Master of Neonatal Nurse
Educational attainment	Diploma in nursing Bachelors Masters
Years of service as a nurse	0-2 years 3-5 years 6-10 years

	 >10 years
Years of working in the NICU	0-2 years 3-5 years 6-10 years >10 years

1. Did you have similar training in the last 2 years?
 - A. YES
 - B. NO
2. Have you received training facilitated by MOH on neonatal problems?
 - A. YES
 - B. NO

Annex IV

Pretest and Posttest Questions

1. What is the rate of ventilation in a newborn whose HR > 100 but no spontaneous breathing?

A. 3 breathes in 10 seconds

B. 40-60 breaths per min

C. 30 - 40 breaths per min

D. None

2. What is the ratio of compression to ventilation in a newborn whose HR is less than 60?

A. 3: 1

B. 15: 1

C. 1: 1

D. 1: 2

3. If you encounter a newborn who has focal seizure and on determination of the random blood glucose, you found that it is 20 mg/dl. What would be your immediate action?

A. Start with a loading dose of Phenobarb

B. Give 10% glucose as 4 ml/kg

C. Give 10% glucose as 2 ml/kg

D. Give IV Diazepam

4. While you are making a round, in a newborn who had been diagnosed as having stage II PNA but feeding well, started to have multifocal seizure. What do you like to do?

A. Determine the serum Calcium level and give calcium gluconate as 2 ml/kg if low

B. Load with Phenobarbitone as 20 mg/kg loading

C. Give IV Diazepam

D. Give 10% dextrose IV push

5. The greatest loss of heat from the body in a newborn immediately after birth is:

A. Conduction

B. Evaporation

C. Radiation

D. Convection

6. What are indications to keep a newborn NPO?

A. Persistent Vomiting

B. GA <32weeks

C. A 2 hours old baby who is just transferred from delivery

D. A newborn who has a respiratory rate of 70 per min

7. In a newborn who is just born and with no breathing and a heart of less than 60, the first step in resuscitation would be

A. Provide vigorous stimulation

B. Start Positive pressure ventilation and chest compression

C. Remove excess secretion from the mouth

D. Start Positive pressure ventilation

E. A & C

8. Incubator provide warmth through

A. Radiation

B. Convection

C. Conduction

D. None

9. The mechanism of action of CPAP in RDS pts is

A. Increasing the forced residual capacity

B. Splinting the upper airways

C. Maintaining the chest wall structure

D. All

10. How much ml of 40% will be needed to prepare a 25% dextrose for anti pain in a 3kg newborn who is about to undergo circumcision?

(the amount of Dextrose to be given is 2 ml/kg and will be prepared from 5% DW and 40% dextrose)?

A. 3.4ML

B. 2.6ml

C. 4

D. 5