EFFECT OF SIMULATION-BASED MENTORSHIP PROGRAM ON MATERNAL AND NEWBORN HEALTH CARE IN FOUR DISTRICTS OF NEPAL: AN IMPLEMENTATION STUDY

An End-line Report

May 2024

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Abbreviations

AMTSL	Active Management of Third Stage of Labor
ANC	Antenatal Care
ANM	Auxiliary Nurse Midwife
BAB	Bleeding After Birth
BC	Birthing Center
BEONC	Basic Emergency Obstetric and Neonatal Care
BN	Bachelor of Nursing
CEONC	Comprehensive Emergency Obstetric and Neonatal Care
COVID	Corona Virus Disease
DID	Difference in Difference
ECLB	Essential Care of Labor and Birth
FEP	Follow-up Enhancement Program
FP	Family Planning
FWD	Family Welfare Division
HA	Health Assistant
HBB	Helping Babies Breathe
HBS	Helping Babies Survive
HFOMC	Health Facility Operation and Management Committee
HMIS	Health Management Information System
HMS	Helping Mothers Survive
HNI	Hospital Nursing Inspector
HP	Health Post
IDI	In-Depth Interview
IP	Infection Prevention
IUCD	Intra Uterine Contraceptive Device
LDHF	Low Dose High Frequency

MNH	Maternal and Neonatal Health
NGO	Non-Government Organization
NHRC	Nepal Health Research Council
NHTC	National Health Training Center
OHW	One Heart Worldwide
OSCE	Objective Structured Clinical Examination
PCL	Proficiency Certificate Level
PNC	Postnatal Care
PPE	Personal Protective Equipment
PPH	Post-Partum Hemorrhage
PPIUCD	Post-Partum Intra Uterine Contraceptive Device
QI	Quality Improvement
QIP	Quality Improvement Process
REAIM	Reach, Effectiveness, Adoption, Implementation and Maintenance
RH	Reproductive Health
ROUSG	Rural Obstetric Ultrasonography
SANM	Senior Auxiliary Nurse Midwife
SBA	Skilled Birth Attendant
SBE	Simulation Based Education
SBMP	Simulation Based Mentorship Program
SD	Standard Deviation
SDG	Sustainable Development Goal
SN	Staff Nurse
TFS	Training Field Supervisor
TOT	Training of Trainers
VD	Vacuum Delivery
WHO	World Health Organization

Summary

The government of Nepal has been implementing several programs to reduce the country's maternal and neonatal mortalities. One of them is the Skilled Birth Attendant (SBA) program, a two-month in-service training program for nurses, doctors and midwives, based on a checklist of 27 core skills and abilities for safe birth. However, studies have shown critical gaps in the knowledge and skills of existing maternal and neonatal health service providers. Simulation has emerged over several years as a valued pedagogy of students and faculty and has gained acceptance by accrediting bodies and professional organizations throughout healthcare. The basic concept of simulation training is that through the creation of an artificial scenario of a real-world event, educational goals are achieved through experiential learning. The Simulation Based Mentorship Program (SBMP) was designed by One Heart Worldwide (OHW) in collaboration with the Family Welfare Division (FWD), National Health Training Center (NHTC), and Laerdal Global Health to bridge the gaps in the knowledge and skills of nurses and ANMs working in the birthing centers by providing a regular mentorship on 7 thematic areas/ modules of essential obstetric and newborn care using simulation based low dose high frequency approach. SBMP combined the existing package of continuum of care along with Helping Babies Survive (HBS) & Helping Mothers Survive (HMS), adopting a simulation-based learning method through onsite mentoring and coaching approach. After development of a mentorship package, program sites were selected. The program was implemented in 56 birthing centers of Dolakha, Myagdi, Sarlahi and Udayapur districts. Birthing centers were further divided into hub and sub-hub sites. District Hospitals and birthing centers having at least 60 deliveries in a year were assigned as hub birthing centers. Geographical location was also considered while selecting hub birthing centers.

The implementation research was conducted in 4 above mentioned SBMP implementation districts from January 2020 to December 2023. A mixed method, quasi-experimental study design was adopted for the Implementation Research. During the baseline, a total of 112 birthing centers were selected from 4 districts for the study. Among them, 56 were categorized as intervention sites (12 in Dolakha, 12 in Myagdi, 16 in Udayapur and 16 in Sarlahi), and remaining 56 were categorized as control sites (12 in Dolakha, 12 in Myagdi, 16 in Udayapur and 16 in Sarlahi). A census method was used to enroll 326 nurses (including ANMs) available in the selected health facilities during the baseline assessment. Among them, 120 were from the health facilities of the control group, and 206 were from the health facilities of the intervention group. During the intervention phase, 34 clinical mentors provided mentorship to the mentees. The mentors were developed by providing a 7 days District level Training of Trainers (DTOT) training. These mentors conducted sessions on 7 modules (infection prevention practices, antenatal care, and counseling, essential care of labor and birth, helping babies breathe, bleeding after birth, management of pre/eclampsia, and postnatal care and counseling), one every month (except for ANC and PNC modules which were combined), in their assigned health facilities using different methods of simulation based teaching and learning like briefing, roleplaying, demonstration and de-briefing. After completion of the monthly sessions, the intervention group

participants continued practicing that module every month, till the next monthly session started. This was a Low dose high frequency approach. The intervention group participants were also called mentees. The midline assessment was conducted immediately following the completion of all six monthly sessions in all the study sites, and the end-line assessments were done 4 to 6 months after completion of the program. All the participants enrolled in the baseline assessment were followed up during the midline and end-line assessments. However, there was attrition of 14 mentors, 73 mentees/ intervention group participants, and 32 control group participants till the end-line assessment. Overall, there were 20 mentors, 133 intervention group participants, ad 88 control group participants during the end-line assessment.

The knowledge, skills, and confidence of both the intervention and control group participants were assessed on the 7 thematic areas/ modules using quantitative tools (a multiple choice questionnaire for knowledge assessment, a 5-point Likert scale questionnaire for confidence assessment, and an Objective Structured Clinical Examination (OCSE) checklist was used to assess the skills of the participants on different clinical procedures under each 7 modules. Similarly, in-depth interviews were conducted with 14 mentors, 25 mentees, 10 staff, and 9 district level staff of OHW to know details about the reach, effectiveness, adoption, implementation, and maintenance of the program.

Key findings

1. **Reach**

   The SBMP was implemented in 51 out of 56 birthing centers selected during the baseline assessment. Five birthing centers were dropped because SBMP was not conducted after the drop-out of all the mentees. A total of 34 nurses received 7 days' mentor development training. Similarly, the program reached 153 nurses (and ANMs) working in different birthing centers of the four districts.

2. **Effectiveness**

   For measuring the effectiveness of the program, the knowledge, confidence, and skills of the mentees were compared before and after the completion of the program. The knowledge and confidence scores were also measured against the scores of control group participants using a Difference in Difference linear regression. Covariates adjusted in Adjusted DID were age, education, job position, type of contract, receipt of SBA training, number of deliveries conducted in past 3 months, and total years of work experience. Similarly, the skills scores were compared using a paired-t-test. Likewise, the readiness of health facilities was also compared before and after the program intervention using a Quality Improvement Process (QIP) method. The findings of the end-line assessment are as follows:

   2.1. Knowledge assessment findings:

The adjusted DID analysis revealed a 15% Difference in Difference in the mean knowledge scores, with increment in scores among intervention group by 23% and among control group by 9% only ($p<0.01$)

2.2. Confidence assessment findings:

The adjusted DID analysis revealed a 9% Difference in Difference in the mean confidence scores, with increment in scores among intervention group by 11% and among control group by 2% only ($p<0.01$)

2.3. Skills assessment findings:

A statistically significant ($p<0.01$) increment in mean scores was found in all modules and all procedures of intervention group participants. Overall, the skills scores increased from 42% to 92% among the intervention group ($p<0.01$). The cohen's d effect size was large (more than 0.8) in all the modules and procedures, meaning that the baseline and end-line mean scores are very different.

2.4. During the in-depth interviews, both mentors and mentees shared the positive effects of SBMP intervention on themselves and in their health facilities. Both the mentors and mentees shared that the SBMP helped increase their confidence while handling cases in their health facilities, improved their counseling skills and behavior towards the patients, they have been able to timely identify complicated cases like PPH, pre/eclampsia and refer to higher facilities after doing initial management, they learned to work in a team, health facility readiness to manage cases has increased, and they have been able to diagnose complications and make decisions quickly than before. They mentioned that these improvements eventually helped them in improving overall service delivery and better case management.

3. Adoption

SBMP was initiated by all 56 BCs selected for intervention, however 5 of them did not complete the SBMP implementation due to drop-out of mentees of those BCs. The percentage of mentees attending all six monthly sessions on the scheduled day was 53%. Similarly, the attendance in weekly sessions ranged from 65% (in ANC/PNC session) to 75% (in HBB session).

4. Implementation

- The planned duration between two monthly sessions was one month (i.e. 28 to 32 days). However, the actual average difference between two monthly sessions was almost 2 months (i.e. 55 days).
- The mentors and mentees acknowledged that the course content covered all the skills required for nurses and ANMs working in birthing centers, and the balance between theoretical and practical sessions was appreciated as it provided a holistic learning experience. The course content was commended for incorporating recent updates and

introducing new skills like one hand delivery technique, newborn assessment, double gloving, condom tamponade insertion, etc. The participants also mentioned that they got to practice the management of cases that are not received very often, like- PPH, birth asphyxia, and cervical tear repair.

- However, the mentees faced some difficulties due to slight variation from content of similar training like MNH update training, and SBA onsite coaching and mentoring training. They also felt that the contents taught in donning and doffing procedure were different when taught by different mentors. They suggested for uniformity in course content, the addition of topics like shoulder dystocia management, Post-partum IUCD insertion, handling RH negative cases, and Kangaroo Mother Care. They also proposed extending time duration of practice sessions, as they felt that the current timeframe for monthly sessions was not sufficient for practice.
- The teaching learning methodologies like the use of action cards, roleplaying, simulation, de-briefing were appreciated by the mentors and mentees. They felt that the manikins used during the training were realistic and durable. However, they suggested changing the font size and language (English) used in the action cards for ease of use to all the staff. They also recommended developing standard videos of each skill to ensure uniformity in teaching by the mentors.
- During the conduction of monthly and weekly sessions, different challenges were encountered. The mentors and mentees mentioned delays in conduction of sessions due to conflicts in program schedule, overlapping training sessions, COVID vaccination program, high patient load and delivery cases in the health facilities, weather disturbances, geographical challenges and travel difficulties, and other work prioritized by the local levels. Despite the challenges, some mentees adjusted their schedules, exchanged duties, and made use of spare time to accommodate the practice sessions.

5. Maintenance

- For the continuation of program in the intervened districts, the average cost of conducting one monthly session per health facility will be NRs. 9,952, and the average cost of conducting all six monthly sessions will be NRs. 59,711. The cost of SBMP per mentee per session was NRs. 2975.
- No statistically significant difference was found in the scores obtained by the mentees during the midline and end-line assessments, thus suggesting retention of learnings.
- The In-Depth Interview participants recommended increasing monitoring to ensure the conduction of weekly practice, conducting refresher training in the future for skills maintenance, and disseminating the study results/ evidence of effectiveness to local level stakeholders (including administrative officers, chairperson, health coordinators) to ensure the continuation of the program.

Conclusion

The Simulation Based Mentorship Program (SBMP) was effective in improving and retaining essential obstetric and newborn care related knowledge, skills, and confidence of nurses working in different birthing centers. SBMP could be a valid alternative for training the service providers to provide quality perinatal care.

1. Introduction

1.1. Background

Nepal made substantial progress in reducing maternal mortality from 539 to 151 per 100,000 live births from 1996 to 2022[1]. But, this progress is still not satisfactory in reaching the Sustainable Development Goal (SDG) target of reducing the maternal mortality ratio to 70 per 100,000 live births by 2030[2]. A systematic analysis of global causes of maternal deaths conducted by the World Health Organization (WHO) in 2014 identified hemorrhage, hypertensive disorders, and sepsis as the major causes of more than half of maternal mortalities worldwide[3], 75% of these deaths are preventable[4]. In Nepal, the leading causes of maternal deaths are PPH followed by hypertensive disorders and pregnancy-related infections[5]. Likewise, the major causes of neonatal deaths in Nepal are respiratory and cardio-vascular disorders of the perinatal period (31%), followed by complications of pregnancy, labor, and delivery (30%)[1].

The government of Nepal has been implementing different programs to reduce maternal and neonatal deaths. One of them is the Skilled Birth Attendant (SBA) program, a two-month in-service training program for nurses, doctors, and midwives, based on a checklist of 27 core skills and abilities for safe birth. It includes the management of normal and complicated deliveries. Although the SBA program has been implemented in Nepal since 2006, studies have shown critical gaps in the knowledge and skills of the SBAs. One study conducted to understand the quality of SBAs in Nepal reported that on average, SBAs fail to meet the 80-percent standard that is required to pass the training. The study participants of that study received 75% in knowledge assessment and only 48% in clinical skills assessment. The same paper reported the SBAs are conducting limited deliveries, where only 7% of them are meeting the minimum standards recommended by WHO requirement[6]. The National Health Training Center's (NHTC) Follow-up Enhancing Program (FEP) Report of 2013 recommended identifying clinical supervisors and providing continuous supportive supervision for the SBAs[7]. Another study conducted in Nepal also concluded that onsite mentoring programs can help in nurses' clinical competence and performance[8].

1.2. About Simulation Based Methodology

Simulation has emerged over several years as a valued pedagogy of students and faculty and has gained acceptance by accrediting bodies and professional organizations throughout healthcare. The basic concept of simulation training is that through the creation of an artificial scenario of a real-world event, educational goals are achieved through experiential learning. Simulation provides an opportunity to develop technical and non-technical skills: cognitive and social skills, critical thinking, teamwork, communication, and procedural skills in both students and teachers[9-11]. Several studies have revealed increments in satisfaction, self-confidence/ self-efficacy, and knowledge after receiving simulation-based training/ education among pre-service nursing and medical students[12-15]. One study conducted in Nigeria on

simulation-based low-dose high-frequency mobile mentoring vs traditional method among the health workers suggested that LDHF/m-mentoring was more effective than the traditional approaches in improving the skills acquisition and retention of health workers[16].

There are not many studies conducted in Nepal regarding the efficacy of simulation-based education. However, a workshop conducted in Nepal in 2018 for the faculties of educational institutes of Nepal showed significant differences regarding the perception of simulation-based education before and after the workshop. The participants of the workshop found the workshop effective in improving their knowledge and understanding of SBE[17]. Similarly, a mixed method conducted in Dhulikhel Hospital regarding in situ simulation-based medical education in the emergency department found an increment in the knowledge and confidence of staff after participating in the simulation sessions[18].

2. Overview of the Program

As the evidence showed gaps in knowledge and skills of existing SBAs, and a clear need for regular supervision, One Heart Worldwide designed a Simulation-Based Mentorship Program (SBMP) in collaboration with the Family Welfare Division (FWD), National Health Training Center (NHTC) and Laerdal Global Health. In this program, local level mentors were developed to provide regular mentorship on low-dose high-frequency approach in contrast to one-time coaching in a long gap. This program combined the existing package of the continuum of care along with Helping Babies Survive (HBS) & Helping Mothers Survive (HMS) guidelines, adopting a simulation-based onsite mentoring and coaching approach.

The main aim of this mentorship program was to improve the quality of essential obstetric and newborn care provided by the nurses and ANMs irrespective of their pre-service and in-service training exposure by identifying gaps, providing regular technical support on the site, building close relationships between mentors and mentees, and increasing communication, backed up by regular practice in simulation labs to help in skill retention. In this mentorship program, OHW provided mentorship to both the SBAs and non-SBAs in their workstations to capacitate them in promoting mother and newborn health outcomes.

2.1. Program sites and intervention time period

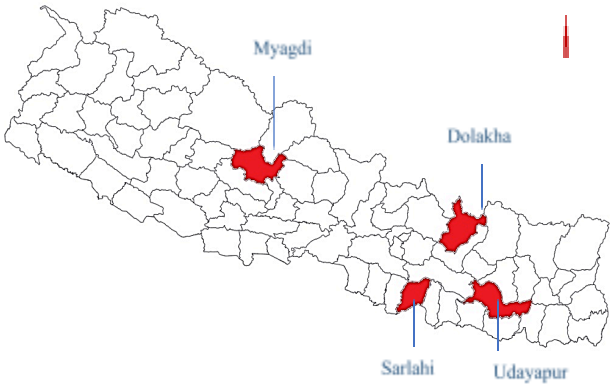


Figure 1: SBMP implemented districts

The Simulation Based Mentorship Program (SBMP) was implemented in four OHW working districts- Udayapur, Dolakha, Sarlahi, and Myagdi in two phases shown in Table 1.

Table 1: SBMP intervention time period

Phase	District	Number of intervention Birthing Center		SBMP intervention time period
		Planned	Intervened	
Phase 1	Udayapur	16	15	Baisakh 2078 to Asar 2079
	Dolakha	12	11	Baisakh 2078 to Kartik 2079
Phase 2	Sarlahi	16	14	Chaitra 2078 to Falgun 2079
	Myagdi	12	11	Chaitra 2078 to Jestha 2080

2.2. Program activities (The intervention)

The program activities were conducted in two phases- preparatory and implementation.

2.2.1. Preparatory phase

This phase included all preparatory activities conducted before the implementation of the intervention in the program districts. The following activities were conducted during the preparatory phase:

i. **Sharing of proposed program and research in Safe-motherhood sub-committee meeting of the Family Welfare Division, Ministry of Health and Population**:
The OHW team presented the proposed program and research to participants from the FWD Technical Working Group (TWG) and representatives from different non-government organizations working in the safe-motherhood sector in December 2019. The program and research commenced after approval from the Family Welfare Division.

ii. **Development of a mentorship package:**
Five national-level Maternal and Neonatal Health experts developed the mentorship package. Out of the five experts, four were national-level master SBA trainers (two OBGYN, and two nurses), and one consultant was from Laerdal Global Health. Three workshops were conducted (on December 9, 2020; January 29, 2021; and February 2, 2021) for finalizing the package.
The mentorship package was developed according to the SBA guidelines[19]; Helping Mothers Survive training manuals for Bleeding After Birth[20], Essential Care of Labor and Birth[21], Pre-eclampsia and Eclampsia[22], and Helping Babies Survive training manuals[23]. Action cards on all seven modules, which were used during monthly sessions were also developed along with mentorship package. The mentorship package included content for seven modules and guidelines for conducting the mentorship program and assessing essential obstetric and newborn care related knowledge, confidence, and skills of the participants. The seven modules were:

- Module 1: Infection prevention
- Module 2: Antenatal Care, Counseling, and Referral Procedure
- Module 3: Essential Care for Labor and Birth (ECLB)
- Module 4: Helping Babies Breathe (HBB)
- Module 5: Bleeding After Birth (BAB)
- Module 6: Pre-eclampsia and Eclampsia
- Module 7: Postnatal Care and Counseling

iii. Master Training of Trainers (MTOT)
The SBA trainers of five national SBA training sites (Paropakar Maternity and Women's Hospital, Koshi Hospital, Janakpur Hospital, Bharatpur Hospital, and Amda Hospital) were

approached to undergo MTOT training and become master trainers for SBMP. Ten mentors from the above mentioned training sites agreed, and they received MTOT training from the five MNH experts involved in mentorship package development. The MTOT training was a 3 days' event conducted from February 20, 2021 to February 22, 2021. The selected master trainers also reviewed and refined the mentorship package.

iv. **District and Palika level consultative meetings with stakeholders:**

The district-level program began with a series of consultative meetings. A total of 10 district and palika-level consultative meetings were held in four program implemented districts (one in Udayapur, three in Dolakha, two in Myagdi and Four in Sarlahi) to orient district, and palika-level stakeholders about the SBMP program and research, to select the hub, and sub-hub birthing centers and potential candidates for clinical mentors. The details of these meetings are provided in Table 2.

Table 2: Details of district and palika level meeting with stakeholders

S.N.	District	Date	Venue, Palika	Participants
1	Dolakha	January 21, 2021	Jiri Municipality	Total- 11 (Health coordinators- 3, Palika level stakeholders-3, health facility in-charge- 3, SBA mentor (nurse)- 1, others-1)
2	Dolakha	January 22, 2021	Bhimeshwor Municipality	Total- 13 (District stakeholder- 1, health coordinators- 3, Palika level stakeholders- 3, health facility in-charge-3, others-3)
3	Dolakha	January 23, 2021	Melung Rural Municipality	Total-8 (District stakeholder-1, health coordinator- 1, palika level stakeholders- 3, health facility in-charge- 3)
4	Udayapur	February 8, 2021	DCC meeting hall, Triyuga Municipality	Total- 45 (District stakeholders- 6, health coordinators- 8, palika level stakeholders- 11, health facility in-charge- 20)
5	Myagdi	January 18, 2022	Beni Municipality	Total- 16 (District stakeholders- 4, health coordinators- 4, palika level stakeholders- 5, health facility in-charge- 1, SBA mentor (nurse)-2)
6	Myagdi	January 18, 2022	Malika Rural Municipality	Total- 16 (District stakeholders- 1, health coordinators- 4, palika level stakeholders- 4, health facility in-charge- 6, SBA mentor (nurse)-1)
7	Sarlahi	January 10, 2022	Malangwa Municipality	Total- 13 (District stakeholders- 1, health coordinators- 4, palika level stakeholders- 4, health facility in-charge- 4)
8	Sarlahi	January 11, 2022	Barahathwa Municipality	Total- 14 (District stakeholders- 1, health coordinators- 4, palika stakeholders- 3, health facility in-charge- 3, SBA mentors (nurse)-1, non-SBA nursing staff-2)
9	Sarlahi	January 12, 2022	Lalbandi Municipality	Total- 12 (District stakeholders- 1, health coordinators- 4, palika stakeholders- 3, health facility in-charge- 4)
10	Sarlahi	January 13, 2022	Godaita Municipality	Total- 10 (Health coordinators- 3, palika stakeholders- 3, health facility in-charge- 4)

At the meeting, 42 sub-hubs and 14 hubs were chosen as program implementation sites. Hub birthing centers were chosen from among district hospitals and birthing centers with a minimum of 60 deliveries annually. When choosing the hub birthing centers, geographic location was also taken into account. Birthing centers in isolated places, where women face difficulties with referrals because transportation services are unavailable, were also classified as hub birthing centers even if they received very few deliveries. During the meeting, the selection criteria for mentors were also discussed. The criteria for mentors were: nurses having at least PCL Nursing education and have received SBA training. The meeting participants were asked to suggest nursing personnel from the intervention sites to serve as district clinical mentors for SBMP.

v. **Development of district level clinical mentors**:

Three to four hub birthing centers were established in each district. Most mentors were from hub-sites, and they received seven days District Level Training of Trainers (DTOT) training. The dates of DTOT training conduction are:

- Dolakha- September 30 to October 6, 2021
- Myagdi- April 6 to April 12, 2022
- Sarlahi- February 15 to February 21, 2022
- Udayapur- March 12 to March 18, 2021
- Sarlahi- November 4 to November 10, 2022

Overall, 34 clinical mentors were developed from the 4 study districts (28 were developed initially, but 6 left in between the program, and additional 6 mentors were trained). The mentors' roles were:

- Conducting pre and post assessment of mentees
- Conducting monthly sessions at their hub-site and assigned sub-hub sites
- Developing weekly practice plans for mentees
- Continuous physical and virtual monitoring and mentoring
- Taking care of manikins, and ensuring proper utilization of skills lab
- Recording and reporting of monthly sessions
- Coordinating with OHW, Palika and health facilities
- Facilitation of MNH refresher training (at control sites)

vi. **Establishment of simulation room/ lab at each hub birthing center**:

In all 14 hub birthing centers, a simulation lab/room was set up by providing equipment support in as per the national skills lab standard of the Family Welfare Division (FWD). At the hub sites, skills stations practicing Antenatal care, labor and delivery, newborn care, Postnatal care, and Infection Prevention (IP) skills were setup. A short orientation on

simulation room and its use was provided to Health Facility Operation and Management Committee (HFOMC) members and health workers of the respective health facilities.

vii. **Selection of mentees**:

All the nurses and ANMs (except the mentors) of all 56 intervention sites/ health facilities present during the baseline data collection received the intervention/ mentorship program. A total of 206 nurses and ANMs were enrolled in the program.

2.2.2. Implementation phase:

In this phase, district level clinical mentors provided mentorship training to the mentees of their own hub birthing centers and assigned sub-hub birthing centers. Low-dose high-frequency approach was used in the following way in this simulation-based mentorship program:

i. Monthly simulation based on-site coaching and mentoring sessions

The clinical mentors visited the assigned birthing center every month to conduct monthly sessions (training) on seven modules, one every month, except for the ANC and PNC module which were combined. Six sessions of monthly coaching and mentoring were conducted by the mentors, as shown in Table 3.

Table 3: Names of monthly sessions and session duration

S.N.	Sessions	Session duration
1	Module 1: Infection Prevention	1 day
2	Module 2: Antenatal care and counseling Module 7: Postnatal Care and Counseling	1 day
3	Module 3: Essential Care for Labor and Birth (ECLB)	2 days
4	Module 4: Helping Babies Breathe (HBB)	1 day
5	Module 5: Bleeding After Birth (BAB)	2 days
6	Module 6: Pre-eclampsia and eclampsia	1 day

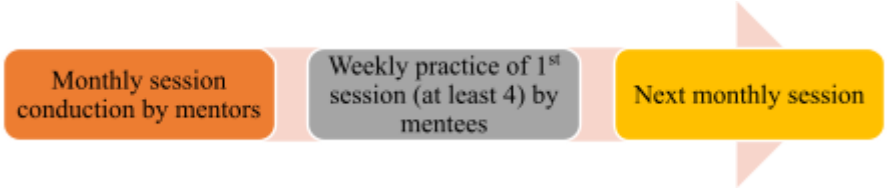
Only one topic (except ANC and PNC) was discussed in one session each month; altogether, six sessions were run in each hub and sub-hub birthing centers. The sessions were run as per the course outline/ schedule and monthly session plans using different teaching and learning methods like briefing, discussion, demonstration, scenario creation, simulation, role-playing, and debriefing, based on the nature of the session.

The assigned mentors developed a schedule for each session in coordination with the respective health facility in-charge and nursing staff.

Picture: Mentee practicing in a manikin during monthly session

2.2.3. Weekly practice:

Following the first monthly session, the mentees practiced the skills they had learned. One monthly session was divided into 4 short sessions, mentees practiced one short session every week. Each health facility selected a peer practice coordinator to facilitate the weekly practice sessions. The weekly sessions were led by the practice coordinator, who was also focal person of recording the sessions in the log books.



2.3. Program at control sites

During SBMP implementation at intervention sites:

The control sites received a three-day refresher course on maternal and neonatal health (MNH). We trained one to two nurses and ANMs from each control site on the ANC to PNC continuum of care, how to identify problems, and when to refer patients.

A discussion meeting was also conducted with the local level stakeholders (health coordinator/ sub health coordinator, palika chair/ deputy chair, health facility in-charge) of the control sites

alongside the MNH refresher training. They discussed about the gaps in maternal and neonatal health and created action items to remedy the gaps and strengthen the referral system.

After completion of end-data collection:

The modules in which the control site participants scored the lowest were identified by analyzing the midline knowledge assessment scores of each control site. A three-day event was scheduled for simulation-based onsite coaching and mentoring of specific modules following the completion of end-line data collection. Among the seven modules, the control site participants scored significantly lower on pre-eclampsia and eclampsia, helping babies breathe, bleeding after birth, and essential care for labor and child birth modules. Thus, the coaching and mentoring sessions were centered around these subjects.

3. About the Implementation research

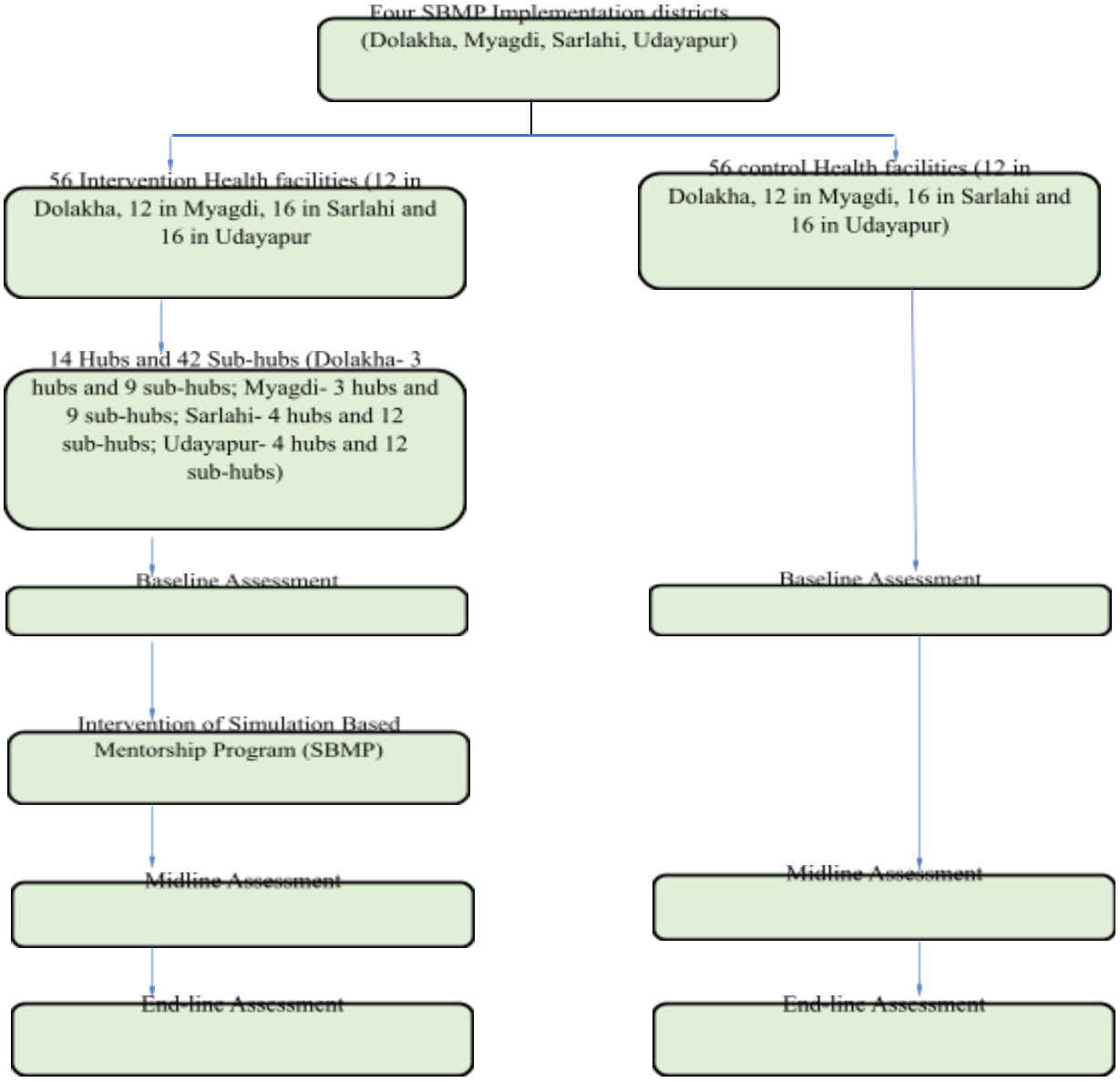
This implementation research was conducted in the four program districts from January 2020 to December 2023 to assess the reach, effectiveness, adoption, implementation and maintenance of the Simulation Based Mentorship Program (SBMP). The operational definition of the REAIM dimensions in this study are shown in Table 4.

Table 4: Operational definition of REAIM dimensions in the study

REAIM Dimensions	Operational definition
Reach	a. Number and percentage of Birthing center intervened in the district b. Number and percentage of nurses trained as district level mentors c. Number and percentage of nurses (and ANMs) receiving the intervention (simulation based mentorship) d. Perception regarding representativeness of participants in the program
Effectiveness	a. Immediate change in knowledge, skills, confidence (midline results)- compared with control group b. Changes in QIP score of health facilities after SBMP implementation- compared with control group c. Perceived reasons for program effectiveness
Adoption	a. Number and percentage of intervention sites completing all 6 monthly sessions b. Number and percentage of mentees participating in all 6 monthly sessions c. Number and percentage of mentees participating in weekly sessions d. Reasons for participation/ non-participation
Implementation	a. Plan Vs Actual implementation (duration between monthly sessions) b. Perception regarding various components of the program (content, teaching and learning methods, mentors) c. Challenges encountered during implementation, adaptations made/ mitigation measures adopted
Maintenance	a. Number and percentage of mentors and mentees remaining after 4 to 6 months of SBMP implementation (end-line) b. Retention of knowledge, skills, and confidence 4 to 6 months after completion of intervention (end-line results) compared with control group c. Capital cost and recurrent cost required for continuation at government level d. Application of learnings in real setting (during and after the program implementation) e. Willingness to implement the program in the health facilities of SBMP implemented local levels after completion of SBMP f. Continuation of mentoring/ learning in the simulation labs/ using manikins after completion of monthly sessions by mentors and mentees g. Challenges and recommendations for continuation

3.1. Study approach

The overall implementation research adopted a mixed method and a quasi-experimental study design. Health facilities were segregated into intervention and control groups in each program implementation districts (Annex I). Assessments were done at the baseline (before intervention), at the midline (immediately after completion of intervention) and at the end-line (4 to 6 months after completion of the intervention). The flow chart of the implementation research is given in Figure (2).



3.2. Approvals for conducting the study

This study received approvals from the Family Welfare Division, and the Nepal Health Research Council (NHRC) (Reg. no. 47/2021).

4. The End-Line Assessment

4.1. Objectives

The main objective of the end-line assessment was to assess the status of the study indicators 4 to 6 months' completion of the intervention (i.e., the SBMP), compare the end-line values against the baseline and midline values, and evaluate the program implementation using the RE-AIM framework[24].

4.2. Methodology

4.2.1. Study design

The overall assessment adopted a mixed method, quasi-experimental study design.

4.2.2. Study setting and sites

The study was conducted in 112 Birthing Centers of four districts (Udayapur, Dolakha, Sarlahi, and Myagdi). Among the 112 Birthing Centers, 56 were categorized as intervention sites (12 in Dolakha, 12 in Myagdi, 16 in Sarlahi and 16 in Udayapur), and remaining 56 were categorized as control sites (12 in Dolakha, 12 in Myagdi, 16 in Udayapur and 16 in Sarlahi). The Birthing Centers for implementation were selected based on recommendations from central, district and local level consultative meetings and the total number of deliveries in the Birthing Center.

At the implementation sites, there were 14 Hub Birthing Centers (3 in Dolakha, 3 in Myagdi, 4 in Sarlahi and 4 in Udayapur) and 42 Sub-Hub Birthing Centers (9 in Dolakha, 9 in Myagdi, 12 in Sarlahi and 12 in Udayapur). The details of study sites are given in Annex I.

All the participants enrolled in the baseline assessment were followed up during the midline and end-line assessments.

4.2.3. Study participants

All the nursing staff (including ANMs) working in the selected Birthing Centers of fours program implementation districts were recruited as study participants. The nurses and ANMs enrolled during the baseline assessment were followed up during the midline and end-line assessment in both intervention and control sites. At the intervention sites, the participants were also called mentees. Total 326 nursing staff (including ANMs) (206 in intervention group and 120 in control group). The number of participants per study district is shown in Table 5.

Table 5: Number of study participants (intervention and control group participants) enrolled at baseline

Type of participants	Dolakha	Myagdi	Sarlahi	Udayapur	Total

Intervention (mentees)	49	35	63	59	**206**
Control	33	24	40	23	**120**

For the qualitative assessment, 58 in-depth interviews were conducted. The participants were selected purposively- consulting the district level OHW staff. The background characteristics of these participants are shown in Table 6.

Table 6: Background characteristics of the in-depth interview participants

Characteristics of interviewees	Mentors	Mentees	Staff	Stakeholder
Number of in-depth interviews conducted	14	25	10	9
Age in years (mean ± SD)	31.6±5.9	31.7±6.2	42.3±10.5	33.2±77
Current working position				
Hospital Nursing Inspector (HNI)	2	-	-	-
Staff Nurse	5	2	-	-
SANM	5	10	-	-
ANM	2	13	-	-
Health Coordinator	-	-	-	6
Sub-health coordinator	-	-	-	1
Public Health Nurse	-	-	-	1
Public Health Inspector	-	-	-	1
District Coordinator, OHW	-	-	4	-
Training Field Supervisor (TFS), OHW	-	-	6	-
Highest level of education (health)				
Masters	-	-	3	2
Bachelors	6	3	6	5
PCL Nursing	8	5	1	1
ANM	-	17	-	-
Health Assistant	-	-	-	1
Mean years of working experience in current workplace (± SD)	5.1±4.4	5±4.5	1.8±1.7	3.4±2.1
Overall years of working experience (mean ± SD)	10.4±5.9	8.6±5.2	-	11.3±7.5

4.2.4. Sampling technique and sample size

Sampling technique: A census method was used in the baseline to enroll the study participants. This means, all the nursing and ANM staff working in the selected birthing centers at the time of baseline were enrolled in the study.

Sample size: A total of 326 participants were enrolled in the baseline assessment. Among them, 120 were from control group and 206 were the mentees from the intervention group (Table 5).

4.2.5. Data collection method (tools and techniques)

The following data collection tools and techniques used in the study along with the data collection time period is shown in Table 7.

Table 7: Data collection methodology and time period

Tools	Technique	Conduction of assessment	Data collection time period
Knowledge assessment questionnaire (Structured multiple choice questionnaire on all 7 modules)	Self-administration	Both intervention and control group participants	Phase 1: Udayapur and Dolakha- From February 9, 2021 to June 15, 2023 Phase 2: Sarlahi and Myagdi – From January 18, 2022 to December 7, 2023
Confidence assessment questionnaire (Five point Likert scale questionnaire divided into 7 modules)	Self-administration	Both intervention and control group participants	
Skills assessment- Observation Specific Skills Evaluation (OSCE) Checklist	Observation of mentees' skills by trained mentors in different simulated scenarios	Intervention group participants (mentees)	
Perception regarding SBMP (Five point Likert scale questionnaire)	Self-administration	Intervention group participants (mentees)	
Quality Improvement Process (QIP) tool	Observation and interview	Both Intervention and control health facilities	
In-Depth Interview (IDI) guidelines	Face to Face interview	Purposively selected mentors, mentees, stakeholders and OHW staff	
Cost data entry sheets	Review of cost vouchers	Intervention health facilities	
Log books	Review	Intervention health facilities	

The four national level MNH experts involved in developing the mentorship package developed the knowledge, skills, and confidence assessment tools by referring and modifying the Skilled Birth Attendant (SBA) reference manual 2006 and 2014; SBA onsite coaching and mentoring guideline 2074; Helping Mothers Survive Training Packages for Essential Care for Labor and Birth, Bleeding after Birth Complete, Pre-eclampsia and Eclampsia; Helping Babies Breathe, and Infection Prevention training guideline 2079[25]. The knowledge, confidence and skills assessment for vacuum delivery, and skills assessment for retained placenta was used only for SBA trained participants from CEONC sites.

For readiness and quality assessment of health facilities, Nepal government's MNH readiness for QI tool for Birthing Center[26] was used.

The in-depth interview guidelines were based on domains of REAIM and (Consolidated Framework for Implementation Research) CFIR framework[27]. Separate interview guidelines were developed for mentors, mentees, local level stakeholders, and OHW program staff from implementation districts. The guidelines were developed in English, and then translated to Nepali. Interviews were conducted in Nepali language.

For cost data-analysis, data entry sheets were developed in excel sheets. We entered the cost incurred in different headings during monthly coaching and mentoring sessions to calculate cost per mentor. The cost incurred during DTOT trainings were analyzed to calculate cost per mentor development (Annex III).

Similarly, the logbooks filled by mentees of each health facilities were reviewed. Time between the two monthly sessions, attendance of mentees during monthly and weekly sessions were entered in excel sheet for analysis.

The details of tools used in the study, maximum scores, and source is in Annex II.

4.2.6. Data Management and Analysis

Quantitative data analysis:

All the data were collected in paper format. The Knowledge, confidence, and skills assessment data were entered in mobile based Kobo application. Similarly, the QIP database was entered in google sheets. All the data were downloaded and cleaned first in Excel sheets. The database in Excel format were exported to Stata 18 for analysis. Data analysis was done in the following ways:

a. A simple descriptive analysis (frequency, mean, standard deviation, percentage, and cross-tabs) was performed for analyzing socio-demographic characteristics, experience with deliveries, and receipt of SBA training.

b. For assessing confidence, participants were asked to tick on a five-point Likert scale, with options – not at all confident (1 point), not very confident (2 points), somewhat confident (3 points), very confident (4 points) and extremely confident (5 points). There were statements mentioning the confidence in performing different skills in each of the 7 modules. The sum of points obtained in the statements in each module gave the obtained score for that module. The maximum obtainable score/ full marks for Module 1 (infection prevention) was 30, for Module 2 (ANC and counseling) was 25, for Module 3 (Essential care of labor and birth) was 25, for Module 3 (Vacuum delivery; only for district hospital participants) was 25, for Module 4 (Helping Babies Breathe) was 20, for Module 5 (Bleeding after birth) was 40, for Module 6 (Pre-eclampsia and eclampsia management) was 40 and for Module 7 (Post-natal care and counseling) was 20. The sum of scores obtained in all the modules (except vacuum delivery) gave the overall mean confidence assessment score. The maximum obtainable

overall confidence assessment score/ full mark was 210. The scores were calculated in both marks and percentages. Both unadjusted and adjusted difference in difference (DID) scores were calculated. For the adjusted DID, the covariates adjusted were age, education, job position, type of job contract, SBA training, number of deliveries conducted in the past 3 months and total years of work experience. A linear regression was used to test the significance, DID scores with p-values less than 0.05 ($p<0.05$) were considered statistically significant.

c. For assessing the knowledge, a multiple-choice questionnaire with questions in each 7 modules was administered to the participants. They were asked to read the questions and tick/ circle the correct answer/s for each question. Participants choosing the correct answers were given a score of 1 on each question. The sum of scores obtained in each module gave the obtained score for that module. The maximum obtainable score/ full marks for Module 1 (infection prevention) was 14, for Module 2 (ANC and counseling) was 16, for Module 3 (Essential care of labor and birth) was 19, for Module 3 (Use of Partograph) was 5, for Module 3 (Vacuum delivery; only for district hospital participants) was 5, for Module 4 (Helping Babies Breathe) was 18, for Module 5 (Bleeding after birth) was 21, for Module 6 (Preeclampsia and eclampsia management) was 19 and for Module 7 (Post-natal care and counseling) was 15. The sum of scores obtained in all the modules (except vacuum delivery) gave the overall knowledge assessment score. The maximum obtainable overall knowledge assessment score/ full mark was 127. The scores were calculated in both marks and percentages. Both unadjusted and adjusted difference in difference (DID) scores were calculated. For the adjusted DID, the covariates adjusted were age, education, job position, type of job contract, SBA training, number of deliveries conducted in the past 3 months and total years of work experience. A linear regression was used to test the significance, DID scores with p-values less than 0.05 ($p<0.05$) were considered statistically significant.

d. Skills assessment was done only in intervention group participants/ mentees. For assessing the skills, participants (mentees) were asked to demonstrate skills as mentioned in each of the modules by using simulation-based methodology. Participants correctly performing one step were given a score of 1 in each procedure. The sum of scores obtained in each module gave the obtained score for that module. The maximum obtainable score for Module 1 (infection prevention) was 97, for Module 2 (ANC and counseling) was 42, for Module 3 (Helping mothers survive) was 54, for Module 4 (Helping Babies Breathe) was 35, for Module 5 (Bleeding after birth) was 62, for Module 6 (Preeclampsia and eclampsia management) was 28 and for Module 7 (Post-natal care and counseling) was 22. The sum of scores obtained in all the modules (except vacuum delivery and retained placenta) gave the overall knowledge assessment score. The maximum obtainable overall skill assessment score was 340. The scores were calculated in both marks and percentages. A paired t-test was used to test the

differences in mean scores between the intervention group participants before and after the intervention. A p-value of <0.05 were considered significant.

e. Quality Improvement Process (QIP) assessment: A MNH readiness Quality Improvement (QI tool) for Birthing Center developed by the Government of Nepal was used to assess the quality of birthing centers before (baseline) and after the intervention (midline and end-line). In each item/criteria under the quality domains, a score '1' was given if the item was available/ function and was scored '0' if the criteria was unavailable/ non-functional. A composite score was calculated in each quality domain and was categorized into three traffic signal colors – green (meaning good), yellow (meaning average) and red (meaning poor), as per the QI guideline. The number and percentage of health facilities falling in these three color coded categories were calculated.

f. Cost data analysis: The costs incurred during each monthly session and DTOT training were entered in an Excel sheet. In order to calculate the program implementation cost from a government perspective, expenses done by OHW staff were excluded, as they only provided supportive roles. After the data entry, the cost of conducting one monthly session was calculated by dividing the total monthly session cost by the total number of monthly sessions conducted in each district. Similarly, the cost per mentee was calculated by dividing the total monthly session cost by the total number of mentees who attended the monthly sessions. Likewise, the cost per mentor development was calculated by dividing the cost of 10 DTOT trainings by the number of mentors trained.

g. Log-book data analysis: An excel sheet was developed for entering the date, and number of participants attending the monthly and weekly practice sessions. Average time period between two monthly sessions, percentage of mentees completing all 6 monthly sessions, and percentage of mentees doing weekly practice was calculated for each monthly session.

Qualitative data analysis

Face to face in-depth interviews were done to collect qualitative data. The interviews were audio recorded after taking written consent from the participants. The interviews were then translated into English for analysis. The translated transcripts were uploaded in NVivo software, where they were coded and themes were generated by grouping the relevant codes. The identified themes were presented in RE-AIM framework domains.

5. Findings of the End-line Assessment

This section presents overall findings of the study conducted at selected health facilities of four SBMP implementation districts.

5.1. REACH (R)

5.1.1. Number and percentage of Birthing Centers (BCs) reached

Table 8 shows the number of BCs where SBMP was intervened. The SBMP reached 32.28% BCs of the study districts. Out of the 56 BCs initially selected for the study, 5 BCs (1 from Myagdi, 1 from Udayapur, 1 from Dolakha, and 2 from Sarlahi) dropped in between the program intervention due to drop out (transfer or resignation from health facilities) of all the mentees enrolled at the baseline.

Table 8: Number and percentage of Birthing Center reached

District	Total number of BCs *	Number of BCs reached	% of BCs reached
Dolakha	45	11	24.45%
Myagdi	30	11	36.67%
Sarlahi	46	14	30.44%
Udayapur	37	15	40.54%
Total	**158**	**51**	**32.28%**

**Source DOHS/FWD*

5.1.2. Number and percentage of nurses trained as district level mentors for SBMP

A total of 34 nurses received 7 days DTOT training and became SBMP mentors in their respective districts.

Table 9: Number of nurses trained as district level mentors

District	Number of nurses enrolled in the training	Number of mentors completing mentorship training (%)
Dolakha	7	7 (100%)
Myagdi	8	8 (100%)
Sarlahi	10	10 (100%)
Udayapur	9	9 (100%)
Total	**34**	**34 (100%)**

5.1.3. Number and percentage of nurses (and ANMs) receiving the intervention

Receipt of intervention is defined as receiving monthly mentorship on all 7 modules, either on the day of the session conduction or learned later from their mentors/ peers. Before the program implementation, a total of 206 nurses and ANMs were enrolled in the program as mentees. However, only 153 (74.27%) of them completed the intervention. (Table 10).

Table 10: Number of nurses (and ANMs) receiving SBMP intervention

District	Number of nurses (and ANMs) enrolled in SBMP	Number of nurses (and ANMs) completing the intervention (%)
Dolakha	49	34 (69.39%)
Myagdi	35	27 (77.14%)
Sarlahi	63	42 (66.67%)
Udayapur	59	50 (84.75%)
Total	**206**	**153 (74.27%)**

5.1.4. Perception regarding selection of participants and involvement of mentors and mentees

The criteria for mentors' selection were SBA trained and have studied at least PCL nursing. But, the district level staff shared difficulties in selecting suitable mentors as criteria were not met:

" ... challenges were faced due to unavailability of mentors. Criteria should be revised because it's difficult to get such mentors in some health facilities, especially in difficult areas." (Staff 10)

The target population of this program were the nurses and ANMs working in birthing centers of the study sites, regardless of their SBA training. The inclusion of both SBA and non-SBA trained nursing staff was appreciated by the participants:

"We have 3 SBA trained staff and we also have one staff member who is a non SBA. Previously, the non-SBA could not handle complicated cases. Now, one heart has provided this training (SBMP) to all the nursing staff, be it SBA or non-SBA. This training has helped in developing skills of both SBA and non-SBA trained staff of our health post." (Mentor 10)

Some of the mentors also included paramedics and support staff during monthly sessions, and they played the same roles when managing the real cases. For instance, the mentor below shared how she involved participants during Eclampsia management session:

".....we had also involved the doctor and paramedics because they also have to manage cases if there's staff shortage. Even the office helpers were engaged in that session. So, after receiving the case, everybody knew their roles, even the office helpers knew their roles…We received two eclampsia after that training, and we were able to manage the case as practices during the training. (Mentor 13)

During the program implementation, new nursing staff joined some of health facilities. But, they were not included in the program. Participants felt that the new nursing staff should also receive the training:

"Here, I am the only mentee and another sister could not participate in the training as she came short time after the simulation program started. There is also another ANM sister who is missed. I do share what I learned in the simulation training to them, but it won't be like same as that provided in the actual training." (Mentee 14)

Although office helpers were not the primary participants, mentors were told to involve them whenever they were required, especially during the Infection Prevention module as most of the Infection Prevention activities are performed by office helpers in the health facilities. Some of the district level staff and stakeholders stressed on compulsory inclusion of office helpers during Infection Prevention training:

"Sterilization can be done by health workers but cleaning part is done by the office helper…. When I went for monitoring, the office helper who was mostly involved in infection prevention did not know about the need of infection prevention and the nursing staff had not shared the learnings to her." (Staff 6)

"The procedure like autoclaving and cleaning are done by done by the support staff or helpers. So they should get also get this three days training on infection prevention". (Stakeholder 7)

A few stakeholders requested for inclusion of nursing staff from non-birthing centers as those facilities also conduct deliveries despite of being a non-birthing center:

"Even the non-birthing centers receive maternal and neonatal cases. So, I request One Heart to also focus on the non-birthing centers." (Stakeholder 8)

"Your program is currently for the birthing center. But I request to scale up to non-birthing centers as well because delivery happens in non-birthing centers as well. In our ward number 8, it takes around 5 to 6 hours to reach the birthing center. But there is a non-birthing center there. All the women will get good services if the nurses of that area is also provided simulation training. Or you can also form a training center and call all the nurses to receive the training" (Stakeholder 9)

5.2. EFFECTIVENESS (E)

For assessing the effectiveness of the program, both the individual and facility level outcomes were compared with control group/ sites before and after the program intervention. In addition to the assessment of the mentees (intervention group participants), the knowledge, confidence and skills scores of mentors were also assessed.

5.2.1. Socio-demographic characteristics of the participants

The socio-demographic characteristics of mentors is presented in Table 11 and Table 12 shows the socio-demographic characteristics of two comparison groups (i.e. intervention group participants and control group participants). As shown in Table 11, the mean age of the mentors was 27.76 years at the baseline. Majority of the mentors were from PCL nursing background (79.41% in baseline, 75.86% in midline, and 75.00% in end-line), had a permanent job in their health facilities (76.47% in baseline, 82.76% in midline, and 80.00% in end-line) and were working in Senior ANM or ANM position (55.88% in baseline, 55.17% in midline, and 65.00% in end-line).

Table 11: Socio-demographic characteristics of mentors

Socio-demographic characteristics	**Number of mentors (%)**		
	Baseline n=34	**Midline n=29**	**End-line n=20**
Age in years (mean±SD)	27.76 ± 5.06	29.34 ± 5.27	29.20 ± 5.94
Years of work Experience (mean±SD)	6.15 ± 4.04	7.41 ± 4.43	7.00 ± 4.60
Education			
PCL	27(79.41)	22(75.86)	15 (75.00)
Bachelor in nursing	7(20.58)	7(24.14)	5 (25.00)
Job Position			
S/ANM	19(55.88)	16(55.17)	13 (65.00)
Staff nurse	13(38.23)	10(34.48)	6 (30.00)
Hospital Nursing Inspector (HNI)	2(5.88)	3(10.35)	1 (5.00)
Job type			
Permanent	26 (76.47)	24 (82.76)	16 (80.00)
Contract	8 (23.53)	5 (17.24)	4 (20.00)

Table 12 shows the socio-demographic characteristics of control and intervention group participants of all 4 study districts. As shown in the table, the mean age of mentees/ intervention group participants and control group participants was similar in all the study sites. Overall, the mean age of intervention group participants was 30.49 years and control group participants was 30.59 years at the baseline. Similar to the mentors, most of the intervention and control group participants were from ANM background, and were working in S/ANM position in their respective health facilities. However, more than half of the intervention group participants (59.23%) and half of control group participants (50.84%) were working on a contract/ temporary basis in their work station/ health facilities during the baseline assessment (Table 9).

Table 12: Socio-demographic characteristics of the intervention and control group participants

District	Type of participants	Assessment	Socio-demographic characteristics									
			Age in years (mean±SD)	Years of work experience (mean±SD)	Education [(Number of participants (%)]			Job position [(Number of participants (%)]			Job type [(Number of participants (%)]	
					ANM	PCL Nursing	BN/B.SC Nursing	S/ANM	Staff Nurse	Others	Permanent	Contract
Dolakha	Intervention	Baseline (n=49)	29.71±7.05	7.10±5.17	34 (69.39)	10 (20.41)	5 (10.20)	39 (79.59)	9 (18.37)	1 (2.04)	17 (34.69)	32 (65.31)
		Midline (n=33)	31.58±6.41	9.03±5.22	25 (75.76)	7(21.21)	1 (3.03)	28 (84.85)	5 (15.15)	0 (0.00)	13 (39.39)	20 (60.61)
		Endline (n=27)	32.11±5.81	9.00±4.57	20(74.07)	6(22.22)	1(3.70)	23(85.18)	4(14.81)	0(0.00)	11(40.74)	16 (59.26)
	Control	Baseline (n=33)	29.30±9.29	7.48±8.09	28 (84.85)	5 (15.15)	0 (0.00)	30 (90.91)	3 (9.09)	0 (0.00)	14 (42.42)	19 (57.58)
		Midline (n=24)	30.33±9.66	8.58±8.48	20 (83.33)	4 (16.67)	0 (0.00)	22 (91.67)	2 (8.33)	0 (0.00)	12 (50.00)	12 (50.00)
		Endline (n=21)	29.05±9.13	7.86±7.77	17(80.95)	4(19.05)	0(0.00)	18 (85.71)	3 (14.29)	0 (0.00)	9(42.85)	12(57.14)
Myagdi	Intervention	Baseline (n=35)	31.80±8.68	8.09±7.25	29(82.85)	6(17.14)	0 (0.00)	30(85.71)	5(14.28)	0 (0.00)	20(57.34)	15(42.66)
		Midline (n=25)	34.32±9.21	10.96±7.67	22(88.00)	3(12.00)	0 (0.00)	22(88.00)	2(8.00)	1(4.00)	18(72.00)	7(28.00)
		Endline (n=23)	34.87±9.40	11.43±7.83	20(87.00)	3(13.00)	0(0.00)	20 (86.96)	2(8.69)	1 (4.35)	16(69.56)	7(30.44)
	Control	Baseline (n=24)	31.88±8.31	10.63±7.11	19(79.16)	5(20.83)	0 (0.00)	24(100.00)	0 (0.00)	0 (0.00)	12(50.00)	12(50.00)
		Midline (n=20)	33.15±7.89	11.45±6.65	16(80.00)	4(20.00)	0(0.00)	20 (100.00)	0 (0.00)	0 (0.00)	11(55.00)	9(45.00)
		Endline (n=18)	34.11±7.83	12.22±6.60	14(77.88)	4(22.22)	0(0.00)	18 (100.00)	0 (0.00)	0 (0.00)	11(61.11)	7(38.89)
Sarlahi	Intervention	Baseline (n=63)	29.43±6.56	6.05±5.34	42(66.7)	18(28.6)	3(4.8)	48 (76.19)	15(23.81)	0 (0.00)	20(31.7)	43(68.3)
		Midline (n=42)	31.76±6.71	7.81±5.74	28(66.7)	11(26.2)	3(7.1)	31 (73.81)	11(26.19)	0 (0.00)	14(33.3)	28(66.7)
		Endline (n=36)	31.94±6.85	8.08±6.08	25(69.4)	9(25.0)	2(5.6)	29 (80.55)	7 (19.45)	0 (0.00)	13(36.1)	23(63.9)
	Control	Baseline (n=40)	30.00±7.53	7.65±7.03	31(77.5)	8(20.0)	1(2.5))	36 (90.00)	4 (10.00)	0 (0.00)	21(52.5)	19(47.5)
		Midline (n=30)	32.50±8.13	9.40±7.67	24(80.0)	6(20.0)	0(0.00)	29 (96.67)	1 (3.33)	0 (0.00)	15(50.0)	15(50.0)
		Endline (n=27)	32.81±8.40	9.89±8.28	22(81.5)	5(18.5)	0(0.00)	26 (96.30)	1 (3.70)	0 (0.00)	14(51.9)	13(48.1)
Udayapur	Intervention	Baseline (n=59)	31.49±7.17	6.83±5.49	39 (66.10)	14 (23.72)	6 (10.16)	46 (77.97)	12 (20.34)	1 (1.69)	27 (45.76)	32 (54.24)
		Midline (n=52)	33.06±6.86	8.40±5.57	37(71.15)	10 (19.23)	5(9.61)	43 (82.69)	8 (15.38)	1 (1.92)	25 (48.08)	27(51.92)
		Endline (n=47)	34.13±6.69	8.83±5.69	35(74.50)	8(17.00)	4(8.50)	41(87.23)	6(12.76)	0(0.00)	25(53.19)	22(46.81)
	Control	Baseline (n=23)	32.13±8.61	8.78±7.22	22 (95.65)	1 (4.35)	0 (0.00)	22 (95.65)	1 (4.35)	0 (0.00)	12 (52.17)	11 (47.83)
		Midline (n=23)	32.87±8.56	9.78±7.22	22 (95.65)	1 (4.35)	0 (0.00)	22 (95.65)	1 (4.35)	0 (0.00)	12 (52.17)	11 (47.83)
		Endline (n=22)	33.36±8.74	9.82±7.39	21(95.55)	1(4.55)	0(0.00)	21(95.55)	1(4.55)	0(0.00)	12(54.55)	10(45.55)
Overall	**Intervention**	**Baseline (n=206)**	**30.49±7.26**	**6.87±5.71**	**144(69.90)**	**48(23.30)**	**14(6.79)**	**163 (79.13)**	**41 (19.90)**	**2 (0.97)**	**84(40.77)**	**122(59.23)**
		Midline (n=152)	**32.59±7.16**	**8.80±5.97**	**112(73.68)**	**31(20.39)**	**9(5.92)**	**124 (81.58)**	**26 (17.10)**	**2 (1.32)**	**70(46.10)**	**82(53.90)**

		Endline (n=133)	**33.26±7.13**	**9.11±6.05**	**100(75.18)**	**26(19.54)**	**7(5.26)**	**113 (84.96)**	**19 (14.29)**	**1 (0.75)**	**65(48.87)**	**68(51.13)**
	Control	**Baseline (n=120)**	**30.59±8.38**	**8.42±7.39**	**100(83.33)**	**19(15.83)**	**1(0.83)**	**112 (93.33)**	**8(6.67)**	**0 (0.00)**	**59(49.16)**	**61(50.84)**
		Midline (n=97)	**32.19±8.52**	**9.71±7.53**	**82(84.50)**	**15(15.50)**	**0(0.00)**	**93 (95.88)**	**4 (4.12)**	**0 (0.00)**	**50(51.50)**	**47(48.50)**
		Endline (n=88)	**32.32±8.62**	**9.86±7.63**	**74(84.09)**	**14(15.91)**	**0(0.00)**	**83 (94.32)**	**5(5.68)**	**0 (0.00)**	**46(52.27)**	**42(47.73)**

Job position others of intervention group: Baseline- 2 Nursing officer; midline- 1 HNI (Hospital Nursing Inspector), 1 Nursing officer; end-line- 1HNI

5.2.2. Experience with deliveries and receipt of SBA training

The mentors' experience with deliveries is shown in Table 13, and the experience with deliveries and receipt of SBA training by intervention and control group participants is shown in Table 14.

Table 13: Mentors' experience with deliveries

Experience with deliveries	Number of mentors (%)		
	Baseline n=34	Midline n=29	End-line n=20
Conducted deliveries in Past three months	31 (91.17)	27 (93.10)	17 (85.00)
If yes, number of women in labor cared in past 3 months (mean±SD)	47.13±93.78	32.48±46.30	29.35±34.12
If yes, number of deliveries conducted in past 3 months (mean±SD)	25.00±36.03	24.07±29.19	15.65±20.58

Table 14: Intervention and control group participants' experience with deliveries and receipt of SBA training

District	Type of participants	Assessment	Conducted deliveries in past 3 months [n(%)]	If yes,		SBA training received [n(%)]
				Number of women in labor cared in past 3 months (mean± SD)	Number of deliveries conducted in past 3 months (mean ±SD)	
Dolakha	Intervention	Baseline (n=49)	37 (75.51)	17.49±30.89	12.78±18.89	24 (48.98)
		Midline (n=33)	23 (69.70)	16.96±19.00	10.78±11.19	23 (69.70)
		Endline (n=27)	23(85.18)	7.30±8.70	4.96±4.77	22(81.50)
	Control	Baseline (n=33)	22 (66.67)	3.68±2.78	2.91±1.74	16 (48.48)
		Midline (n=24)	16 (66.67)	6.56±9.69	4.50±5.06	15 (62.50)
		Endline (n=21)	9(42.85)	6.78±7.46	3.11±1.83	15(71.42)
Myagdi	Intervention	Baseline (n=35)	24(68.57)	14.08±29.89	7.08±10.50	28(80.00)
		Midline (n=25)	21(84.00)	9.52±7.83	5.43±5.54	23(92.00)
		Endline (n=)23	17(73.91)	9.06±9.30	6.06±6.69	21(91.30)
	Control	Baseline (n=24)	18(75.00)	3.28±2.14	2.56±2.14	19(79.16)
		Midline (n=20)	14(70.00)	3.93±3.20	2.14±1.61	19(95.00)
		Endline (n=18)	16(88.88)	2.50±1.37	1.19±1.22	17(94.44)
Sarlahi	Intervention	Baseline (n=63)	58(92.1)	36.50±30.19	25.98±22.16	36(57.1)
		Midline (n=42)	42(100.0)	88.19±83.66	45.14±28.35	36(85.7)
		Endline (n=36)	34(94.4)	55.85±33.60	39.18±27.57	32(88.9)
	Control	Baseline (n=40)	38(95.0)	17.29±18.88	15.26±16.55	21(52.5)
		Midline (n=30)	26(86.7)	18.08±18.24	19.12±21.45	20(66.7)
		Endline (n=27)	25(92.6)	21.08±24.48	11.08±7.65	19(70.4)
Udayapur	Intervention	Baseline (n=59)	44 (74.58)	23.36±30.21	15.30±20.35	27 (45.76)
		Midline (n=52)	45 (86.54)	18.36±19.03	12.29±12.40	28 (53.85)
		Endline (n=47)	40(85.10)	21.87±26.63	14.18±18.36	33(70.21)
	Control	Baseline (n=23)	20 (86.96)	5.05±6.66	4.35±5.17	14 (60.87)
		Midline (n=23)	21 (91.30)	9.14±11.75	6.14±6.68	15 (65.22)
		Endline (n=22)	18(81.81)	6.61±5.27	4.17±2.91	14(63.63)
Overall	**Intervention**	**Baseline (n=206)**	**163 (79.13)**	**25.34±31.20**	**17.32±20.84**	**115 (55.83)**
		Midline (n=152)	**131 (86.18)**	**39.08±59.63**	**21.46±24.56**	**110 (72.37)**
		Endline (n=133)	**114 (85.71)**	**27.16±31.44**	**18.56±23.35**	**108(81.20)**
	Control	**Baseline (n=120)**	**98 (81.67)**	**9.16±13.77**	**7.93±12.08**	**70 (58.33)**
		Midline (n=97)	**77 (79.38)**	**10.68±14.05**	**9.45±14.78**	**69 (71.13)**
		Endline (n=88)	**68(77.27)**	**10.99±17.07**	**5.87±6.40**	**65(73.86)**

All the mentors were SBA trained. However, 3 mentors in the baseline, 2 mentors in the midline, and 3 mentors in the end-line had not conducted any deliveries 3 months before the assessments. Among those who had conducted deliveries, the mean number of women in labor cared, and deliveries conducted decreased from baseline to end-line assessment (Table 13).

However, the number of deliveries conducted by the mentees/ intervention group participants were increased in midline and end-line assessments than the baseline assessment (Table 14). The number of SBA trained participants also increased. Among the intervention group participants, only 55.83% were SBA trained, but it was 81.20% during the end-line assessment. The number of SBA trained participants also increased in the control group from 58.33% in the baseline to 73.86% in the end-line assessment.

5.2.3. Knowledge assessment findings

The knowledge assessment findings of the mentors are shown in Table 15 and Table 16, the findings of intervention and control group participants are shown in Table 17 and Table 18. Paired analysis was done for the mentors, whereas Difference in Difference (DID) analysis was done to compare the knowledge scores obtained by the intervention and control group participants.

There was a statistically increment in knowledge assessment score of the mentors in all seven modules during the end-line assessment. As shown in Table 15, the overall mean score increased by 23.15 marks (i.e. 18.25%) during the midline assessment ($p<0.01$). There was a further 2.85 marks (i.e. 2.24%) increment in the knowledge score of the mentors during the end-line assessment. Overall, there was a 26 marks (i.e. 20.47%) increment in knowledge assessment score compared to the baseline ($p<0.01$).

Table 15: Knowledge assessment scores of mentors (expressed in marks) (n=20)

Module	Maximum obtainable score	Obtained mean score (mean±SD)			Difference		
		Baseline	Midline	Endline	M-B	E-M	E-B
Module 1: Infection prevention	14	12.15±1.76	13.35±0.88	13.55±0.76	1.20*	0.20	1.40**
Module 2: ANC Care & counselling	16	12.40±2.09	15.00±1.56	15.35±0.88	2.60**	0.35	2.95**
Module3: Essential Care for Labor and Birth (ECLB)	19	13.95±1.93	18.10±1.17	18.50±0.61	4.15**	0.40	4.55**
Module 3: Use of partograph	5	3.7±0.66	4.60±0.75	4.70±0.66	0.90**	0.10	1.00**
Module 3: Vacuum delivery (n=15)	5	4.33±0.82	4.87±0.35	4.93±0.26	0.53	0.07	0.60**
Module 4: Helping Baby Breathe	18	16.30±1.22	17.75±0.63	17.75±0.55	1.45**	0.00	1.45**
Module 5: Bleeding after birth	21	16.50±2.04	20.25±1.01	20.10±1.02	3.75**	-0.15	3.60**
Module 6: Pre-eclampsia &eclampsia	19	9.85±2.18	15.85±3.42	17.35±1.76	6.00**	1.50	7.50**
Module7: PNC	15	10.45±1.64	13.55±1.46	14.00±1.12	3.10**	0.45	3.55**
Overall (Except vacuum delivery)	**127**	**95.30±7.90**	**118.45±8.15**	**121.3±4.11**	**23.15****	**2.85**	**26.00****

**p<0.05, **p<0.01*

Table 16: Knowledge assessment scores of mentors (expressed in percentage) (n=20)

Module	Obtained mean score (mean±SD)			Difference		
	Baseline	Midline	End line	M-B	E-M	E-B
Module 1: Infection prevention	86.79±12.54	95.36±6.25	96.79±5.42	8.57*	1.43	10.00**
Module 2: ANC Care & counselling	77.50±13.05	93.75±9.72	95.94±5.47	16.25**	2.19	18.44**
Module3: Essential Care for Labor and Birth (ECLB)	73.42±10.17	95.26±6.13	97.37±3.19	21.84**	2.11	23.95**
Module 3: Use of partograph	74.00±13.14	92.00±15.08	94.00±13.14	18.00**	2.00	20.00**
Module 3: Vacuum delivery (n=15)	86.67±16.33	97.33±7.04	98.67±5.16	10.67	1.33	12.00**
Module 4: Helping Baby Breathe	90.56±6.77	98.61±3.55	98.61±3.06	8.06**	0.00	8.06**
Module 5: Bleeding after birth	78.57±9.71	96.43±4.85	95.71±4.86	17.86**	-0.71	17.14**
Module 6: Pre-eclampsia &eclampsia	51.84±11.49	83.42±18.01	91.31±9.24	31.58**	7.89	39.48**
Module7: PNC	69.67±10.92	90.33±9.79	93.33±7.49	20.67**	3.00	23.67**
Overall (except vacuum delivery)	**75.04±6.22**	**93.27±6.42**	**95.51±3.23**	**18.23****	**2.24**	**20.47****

**p<0.05, **p<0.01*

The results of Difference in Difference (DiD) analysis in mean knowledge assessment scores obtained by the intervention and control group participants of four study districts during the baseline and midline assessments are shown in Table 17 and Table 18. Table 17 shows the

obtained scores in marks whereas Table 18 shows the obtained scores in percentage. Overall, the mean scores obtained by the intervention group participants were slightly more than the control group participants in all modules during the baseline assessment. The baseline assessment score was least in Module 6: Pre-eclampsia and Eclampsia (41.18% in control group and 44.66% in intervention group) and highest in Module 4: Helping Babies Breathe (77.36% in control group and 81.82% in intervention group). After the intervention (midline), the mean knowledge assessment scores obtained was increased in both intervention and control groups in all 7 modules. However, the difference between the baseline, midline, and end-line scores were more in intervention group than the control group participants.

Among the control group participants, the overall mean knowledge assessment score increased from 80.26 marks (i.e. 63.20%) in the baseline to 87.07 marks (i.e. 68.56%) in the midline, and 91.10 marks (71.73%) during the end-line assessment. Similarly, among the intervention group participants, the overall mean knowledge assessment score increased from 84.83 marks (i.e. 66.80%) in the baseline to 112.76 marks (i.e. 88.79%) in the midline, and 114.14 marks (89.87%) during the end-line assessment.

The adjusted DiD analysis revealed a 21.27-marks [95% CI- 17.67, 24.86], i.e.16.75% [95% CI- 13.92%, 19.58%] difference in difference between the baseline and midline knowledge assessment of the intervention and control group participants ($p<0.01$). Similarly, the adjusted DiD between the baseline and end-line scores of the scores of the intervention and control group participant revealed an 18.55 marks [95% CI 14.71,22.38], i.e. 14.61% [95% CI- 11.59%, 17.62%] difference ($p<0.01$). There was no statistically significant difference in the midline and end-line score differences, thus depicting that the intervention participants retained their knowledge even after 4 to 6 months of completion of intervention. These findings were similar in all 4 intervention districts.

Among the seven modules, the end-line knowledge assessment score of the mentees/ intervention group participants was highest in Module 4: Helping Babies Breathe (95.32%), and least in Module 6: Pre-eclampsia and eclampsia (82.79%), followed by Module 7: Postnatal Care and Counseling (85.91%).

Table 17: Knowledge assessment scores of intervention and control group participants (expressed in marks)

District	Type of participants	Assessment	Obtained score in each module ± SD								
			Module 1: Infection Prevention	Module 2 : Antenatal care and counselling	Module 3: Essential care of labor and birth	Module 3: Clinical decision making skills	Module 4: Helping Babies Breathe	Module 5: Bleeding after birth complete	Module 6: Preeclampsia and eclampsia	Module 7: Postnatal Care and Counselling	Overall knowledge assessment score
			Full score: 14	Full score: 16	Full score: 19	Full score: 5	Full score: 18	Full score: 21	Full score: 21	Full score: 15	Full score: 127
Dolakha	Control	Baseline (n=33)	10.70±1.36	12.00±1.56	12.27±2.43	3.58±0.87	15.03±1.81	13.91±2.78	8.00±1.56	8.88±1.73	84.36±8.86
		Midline (n=24)	11.08±1.44	12.63±1.74	14.33±2.53	3.58±1.32	15.50±1.96	15.50±2.32	10.75±2.54	9.88±1.62	93.25±10.95
		Endline (n=21)	11.33±1.80	13.10±1.81	14.43±2.64	3.71±0.96	16.05±1.28	16.14±2.48	10.38±2.91	10.62±1.43	95.76±0.57
	Difference (Midline-Baseline)		0.39	0.62	2.06	0.01	0.47	1.59	2.75	1.00	8.89
	Difference (Endline-Midline)		0.25	0.47	0.10	0.13	0.55	0.64	-0.37	0.74	2.51
	Difference (Endline-Baseline)		0.64	1.10	2.16	0.14	1.02	2.23	2.38	1.74	11.40
	Intervention	Baseline (n=49)	10.65±1.64	11.94±2.04	12.86±2.78	3.35±1.03	15.04±1.94	14.24±3.36	8.96±3.25	9.63±1.93	86.67±13.07
		Midline (n=33)	12.73±1.51	14.58±1.44	17.06±2.18	4.21±0.82	17.33±0.89	19.15±2.24	14.64±3.17	11.73±1.86	111.42±10.50
		Endline (n=27)	12.67±1.92	14.44±1.76	17.37±2.40	4.30±0.99	17.30±1.03	19.22±2.55	15.74±2.82	12.59±2.02	113.63±12.54
	Difference (Midline-Baseline)		2.07	2.64	4.20	0.87	2.29	4.91	5.68	2.09	24.75
	Difference (Endline-Midline)		-0.06	-0.13	0.31	0.08	-0.04	0.07	1.10	0.87	2.21
	Difference (Endline-Baseline)		2.01	2.51	4.51	0.95	2.26	4.98	6.78	2.96	26.96
	DID (Baseline vs Midline)		1.69**	2.01**	2.14*	0.86*	1.82**	3.32**	2.93**	1.10	15.86**
	DID (Midline vs Endline)		-0.31	-0.60	0.21	-0.05	-0.58	-0.57	1.47	0.12	-0.31
	DID (Baseline vs Endline)		1.38*	1.41*	2.36*	0.81*	1.24*	2.74**	4.40**	1.22	15.56**
Myagdi	Control	Baseline (n=24)	10.42±1.61	11.75±1.87	11.38±2.87	2.75±1.33	13.54±1.53	14.25±2.09	7.92±2.28	9.54±1.47	81.54±9.07
		Midline (n=20)	10.65±1.46	12.25±1.74	13.05±2.76	2.95±1.15	15.20±1.82	14.75±3.24	8.55±3.07	9.25±1.62	86.65±11.13
		Endline (n=18)	10.50±1.58	12.44±1.46	12.94±2.62	3.33±1.14	15.27±1.32	15.17±2.96	9.94±1.89	9.61±2.03	89.22±10.80
	Difference (Midline-Baseline)		0.23	0.50	1.68	0.20	1.66	0.50	0.63	-0.29	5.10
	Difference (Endline-Midline)		-0.15	0.19	-0.11	0.38	0.08	0.42	1.39	0.36	2.57
	Difference (Endline-Baseline)		0.08	0.69	1.57	0.58	1.74	0.92	2.03	0.07	7.68
	Intervention	Baseline (n=35)	11.17±1.56	11.97±1.82	12.74±2.55	3.49±1.09	15.20±1.64	14.66±3.05	8.03±3.04	9.63±2.18	86.89±10.97
		Midline (n=25)	13.08±1.00	14.36±1.78	18.08±1.22	4.60±0.65	17.32±0.63	19.84±1.25	15.80±2.50	13.12±1.67	116.20±6.86
		Endline (n=23)	13.13±1.06	15.09±1.28	18.39±0.78	4.83±0.39	17.74±0.54	20.26±0.86	17.04±2.42	13.87±1.39	120.35±4.97
	Difference (Midline-Baseline)		1.91	2.39	5.34	1.11	2.12	5.18	7.77	3.49	29.31
	Difference (Endline-Midline)		0.05	0.73	0.31	0.23	0.42	0.42	1.24	0.75	4.15
	Difference (Endline-Baseline)		1.96	3.12	5.65	1.34	2.54	5.60	9.01	4.24	33.46
	DID (Baseline vs Midline)		1.68**	1.89**	3.66**	0.91*	0.46	4.68**	7.14**	3.78**	24.21**
	DID (Midline vs Endline)		0.20	0.53	0.42	-0.16	0.34	0.00	-0.15	0.39	1.58
	DID (Baseline vs Endline)		1.88**	2.42**	4.08**	0.76	0.80	4.69**	6.99**	4.17**	25.79**
Sarlahi	Control	Baseline (n=40)	9.75±1.82	11.55±1.81	11.30±2.93	2.93±1.02	13.20±2.77	12.40±3.16	7.88±2.07	8.28±2.60	77.28±13.80
		Midline (n=30)	9.60±2.04	11.80±2.20	11.30±3.57	3.13±1.04	14.70±2.08	14.20±2.88	8.27±2.29	10.37±2.16	83.37±13.71
		Endline (n=27)	9.93±1.64	11.70±1.90	12.41±3.09	3.48±1.19	14.89±2.20	14.26±3.30	9.37±2.59	9.63±1.84	85.67±13.30
	Difference (Midline-Baseline)		-0.15	0.25	0.00	0.21	1.50	1.80	0.39	2.09	6.09
	Difference (Endline-Midline)		0.33	-0.10	1.11	0.35	0.19	0.06	1.10	-0.74	2.30
	Difference (Endline-Baseline)		0.18	0.15	1.11	0.56	1.69	1.86	1.50	1.35	8.39
	Intervention	Baseline (n=63)	10.51±2.05	11.48±2.18	11.90±2.39	3.38±0.94	14.46±2.34	13.76±3.33	7.86±2.55	9.08±1.89	82.43±12.02
		Midline (n=42)	12.50±1.61	14.60±1.94	17.05±2.52	4.45±0.92	16.95±1.59	18.69±2.71	14.95±3.97	12.62±2.09	111.81±13.85
		Endline (n=36)	12.92±1.13	14.39±2.19	17.06±2.56	4.56±0.81	16.64±1.91	18.97±2.42	15.44±3.26	12.69±1.95	112.67±12.10
	Difference (Midline-Baseline)		1.99	3.12	5.14	1.07	2.49	4.93	7.10	3.54	29.38
	Difference (Endline-Midline)		0.42	-0.21	0.01	0.10	-0.31	0.28	0.49	0.08	0.86
	Difference (Endline-Baseline)		2.41	2.91	5.15	1.17	2.18	5.21	7.59	3.62	30.24
	DID (Baseline vs Midline)		2.14**	2.87**	5.14**	0.86**	0.99	3.13**	6.70**	1.45*	23.29**
	DID (Midline vs Endline)		0.09	-0.11	-1.10	-0.25	-0.50	0.22	-0.61	0.81	-1.44
	DID (Baseline vs Endline)		2.23**	2.76**	4.04**	0.62	0.49	3.35**	6.09**	2.26**	21.85**

District	Type of participants	Assessment	Obtained score in each module ± SD								
			Module 1: Infection Prevention	**Module 2 : Antenatal care and counselling**	**Module 3: Essential care of labor and birth**	**Module 3: Clinical decision making skills**	**Module 4: Helping Babies Breathe**	**Module 5: Bleeding after birth complete**	**Module 6: Preeclampsia and eclampsia**	**Module 7: Postnatal Care and Counselling**	**Overall knowledge assessment score**
			Full score: 14	**Full score: 16**	**Full score: 19**	**Full score: 5**	**Full score: 18**	**Full score: 21**	**Full score: 21**	**Full score: 15**	**Full score: 127**
Udayapur	Control	Baseline (n=23)	10.52±1.12	11.22±2.02	10.87±2.26	2.96±1.11	14.00±2.04	12.52±3.06	7.39±2.10	8.74±2.09	78.22±9.48
		Midline (n=23)	10.87±1.01	11.83±1.40	12.09±1.88	3.17±1.30	15.26±1.76	13.87±2.49	9.00±2.15	9.74±1.91	85.83±7.13
		Endline (n=22)	10.86±1.17	12.50±1.60	13.50±2.70	3.27±1.12	15.50±1.41	16.91±2.62	11.18±3.38	11.14±1.91	94.86±10.99
	Difference (Midline-Baseline)		0.35	0.61	1.22	0.22	1.26	1.35	1.61	1.00	7.61
	Difference (Endline-Midline)		-0.01	0.67	1.41	0.10	0.24	3.04	2.18	1.40	9.04
	Difference (Endline-Baseline)		0.34	1.28	2.63	0.32	1.50	4.39	3.79	2.40	16.65
	Intervention	Baseline (n=59)	10.42±1.85	11.90±2.23	12.02±3.12	3.34±1.25	14.47±2.19	14.08±2.91	9.03±3.13	9.37±2.16	84.64±14.39
		Midline (n=52)	12.75±1.55	14.62±1.67	16.83±2.65	4.21±0.80	16.92±1.43	19.52±1.65	14.98±2.63	12.90±2.30	112.73±10.53
		Endline (n=47)	12.79±1.44	14.40±1.87	17.02±2.68	4.28±1.02	17.19±1.23	18.81±2.37	15.30±2.90	12.72±2.32	112.51±12.58
	Difference (Midline-Baseline)		2.33	2.72	4.81	0.87	2.45	5.43	5.95	3.53	28.09
	Difference (Endline-Midline)		0.04	-0.21	0.19	0.07	0.27	-0.71	0.32	-0.18	-0.22
	Difference (Endline-Baseline)		2.36	2.51	5.00	0.94	2.72	4.72	6.26	3.35	27.87
	DID (Baseline vs Midline)		1.98**	2.11**	3.59**	0.66	1.19	4.09**	4.34**	2.53**	20.48**
	DID (Midline vs Endline)		0.04	-0.89	-1.22	-0.03	0.03	-3.75**	-1.86	-1.58*	-9.26**
	DID (Baseline vs Endline)		2.02**	1.22	2.37**	0.62	1.22	0.34	2.47*	0.95	11.22**
Overall	Control	Baseline (n=120)	10.29±1.57	11.65±1.80	11.50±2.68	3.08±1.10	13.93±2.27	13.21±2.93	7.83±1.98	8.78±2.11	80.26±11.17
		Midline (n=97)	10.48±1.67	12.10±1.83	12.60±3.02	3.22±1.20	15.13±1.92	14.56±2.77	9.11±2.65	9.87±1.89	87.07±11.66
		Endline (n=88)	10.61±1.63	12.39±1.77	13.27±2.86	3.45±1.10	15.40±1.69	15.56±3.02	10.18±2.81	10.24±1.90	91.10±12.22
	Intervention	Baseline (n=206)	10.63±1.83	11.79±2.10	12.31±2.75	3.38±1.08	14.73±2.11	14.12±3.17	8.49±3.01	9.39±2.03	84.83±12.97
		Midline (n=152)	12.73±1.48	14.56±1.71	17.14±2.35	4.34±0.82	17.09±1.28	19.26±2.10	15.03±3.14	12.61±2.10	112.76±11.09
		Endline (n=133)	12.86±1.41	14.53±1.86	17.34±2.40	4.45±0.89	17.16±1.38	19.19±2.28	15.73±2.94	12.89±2.05	114.14±11.72
	DID (Baseline vs Midline), 95% CI		1.91** [1.35,2.45]	2.31** [1.67,2.95]	3.74** [2.83,4.64]	0.82** [0.47,1.17]	1.15** [0.52,1.76]	3.79** [2.85,4.72]	5.26** [4.29,3.89]	2.13** [1.44,2.82]	21.12** [17.07,25.16]
	DID (Midline vs Endline), 95% CI		-0.00 [-0.57,0.56]	-0.32 [-0.98,0.34]	-0.48 [-1.45,0.48]	-0.13 [-0.49,0.23]	-0.19 [-0.76,0.37]	-1.08* [-1.99,-0.15]	-0.37 [-1.46,0.71]	-0.09 [-0.83,0.65]	-2.66 [-6.97,1.65]
	DID (Baseline vs Endline), 95% CI		1.90** [1.32,2.48]	2.00** [1.32,2.67]	3.26** [2.32-4.19]	0.69** [0.32,1.06]	0.96** [0.27,1.63]	2.72** [1.69,3.73]	4.89** [3.91,5.85]	2.04** [1.32,2.75]	18.46** [14.19,22.72]
	Adjusted DID (Baseline vs Midline), 95% CI		1.93** [1.40,2.46]	2.32** [1.70,2.96]	3.77** [2.94,4.60]	0.81** [0.47,1.15}	1.15** [0.52,1.77]	3.84** [2.96,4.73]	5.28** [4.38,6.18]	1.16** [1.48,2.84]	21.27** [17.67,24.86]
	Adjusted DID (Midline vs Endline), 95% CI		-0.00 [-0.53,0.53]	-0.33 [-0.98,0.31]	-0.51 [-1.39,0.38]	-0.13 [-0.48,0.22]	-0.22 [-0.76,0.32]	-1.07* [-1.93,-0.21]	-0.37 [-1.41,0.68]	-0.08 [-0.82,0.65]	-2.71 [-6.61,1.19]
	Adjusted DID (Baseline vs Endline), 95% CI		1.90** [1.36,2.45]	2.03** [1.37,2.69]	3.26** [2.41,4.12]	0.68** [0.33,1.03]	0.93** [0.28,1.58]	2.74** [1.78,3.70]	4.93** [4.00,5.86]	2.07** [1.37,2.77]	18.55** [14.71,22.38]

**p<0.05; **p<0.01*

Adjusted – Age, education, job, position, SBA training, work experience

Table 18: Knowledge assessment scores of intervention and control group participants (expressed in percentage)

District	Type of participants	Assessment	Obtained score in each module ± SD								
			Module 1: Infection Prevention	Module 2 : Antenatal care and counselling	Module 3: Essential care of labor and birth	Module 3: Clinical decision making skills	Module 4: Helping Babies Breathe	Module 5: Bleeding after birth complete	Module 6: Preeclampsia and eclampsia	Module 7: Postnatal Care and Counselling	Overall knowledge assessment score
Dolakha	Control	Baseline (n=33)	76.41±9.70	75.00±9.76	64.59±12.78	71.52±17.34	83.50±10.06	66.23±13.22	42.11±8.22	59.19±11.52	66.43±6.97
		Midline (n=24)	79.17±10.30	78.91±10.87	75.44±13.32	71.67±26.32	86.11±10.87	73.81±11.06	56.58±13.37	65.83±10.82	73.43±8.62
		Endline (n=21)	80.95±12.84	81.85±11.34	75.94±13.88	74.29±19.12	89.15±7.13	76.87±11.79	54.64±15.30	70.79±9.54	75.40±8.32
	Difference (Midline-Baseline)		2.76	3.91	10.85	0.15	2.61	7.58	14.47	6.64	7.00
	Difference (Endline-Midline)		1.79	2.94	0.50	2.62	3.04	3.06	-1.94	4.96	1.98
	Difference (Endline-Baseline)		4.55	6.85	11.35	2.77	5.65	10.64	12.53	11.60	8.98
	Intervention	Baseline (n=49)	76.09±11.71	74.62±12.72	67.67±14.61	66.94±20.64	83.56±10.76	67.83±16.02	47.15±17.12	64.22±12.89	68.25±10.29
		Midline (n=33)	90.91±10.75	91.10±8.98	89.79±11.47	84.24±16.40	96.30±4.94	91.20±10.66	77.03±16.69	78.18±12.39	87.74±8.27
		Endline (n=27)	90.48±13.73	90.28±11.01	91.42±12.65	85.93±19.86	96.09±5.73	91.53±12.13	82.85±14.86	83.95±13.49	89.47±9.87
	Difference (Midline-Baseline)		14.82	16.48	22.12	17.30	12.74	23.36	29.88	13.96	19.49
	Difference (Endline-Midline)		-0.43	-0.82	1.63	1.68	-0.21	0.34	5.81	5.77	1.74
	Difference (Endline-Baseline)		14.38	15.66	23.75	18.99	12.53	23.70	35.69	19.73	21.23
	DID (Baseline vs Midline)		12.06**	12.57**	11.28**	17.15**	10.13**	15.79**	15.41**	7.32	12.49**
	DID (Midline vs Endline)		-2.22	-3.76	1.13	-0.94	-3.25	-2.72	7.75	0.81	-0.24
	DID (Baseline vs Endline)		9.84*	8.82*	12.41**	16.22*	6.88*	13.06**	23.16**	8.13	12.25**
Myagdi	Control	Baseline (n=24)	74.40±11.52	73.44±11.69	59.87±15.11	55.00±26.54	75.23±8.51	67.86±9.95	41.67±12.01	63.61±9.83	64.21±7.15
		Midline (n=20)	76.07±10.43	76.56±10.90	68.68±14.54	59.00±22.92	84.44±10.13	70.24±15.44	45.00±16.15	61.67±10.79	68.23±8.77
		Endline (n=18)	75.00±11.29	77.78±9.15	68.13±13.80	66.67±22.75	84.88±7.33	72.22±14.07	52.34±9.97	64.07±13.55	70.25±8.51
	Difference (Midline-Baseline)		1.67	3.13	8.82	4.00	9.21	2.38	3.33	-1.94	4.02
	Difference (Endline-Midline)		-1.07	1.22	-0.56	7.67	0.43	1.98	7.34	2.41	2.03
	Difference (Endline-Baseline)		0.60	4.34	8.26	11.67	9.65	4.37	10.67	0.46	6.05
	Intervention	Baseline (n=35)	79.80±11.16	74.82±11.39	67.07±13.41	69.71±21.89	84.44±9.12	69.80±14.51	42.26±16.02	64.19±14.56	68.41±8.64
		Midline (n=25)	93.43±7.12	89.75±11.10	95.16±6.43	92.00±12.91	96.22±3.48	94.48±5.94	83.16±13.16	87.47±11.11	91.50±5.40
		Endline (n=23)	93.79±7.55	94.29±7.98	96.80±4.12	96.52±7.75	98.55±3.00	96.48±4.12	89.70±12.74	92.46±9.28	94.76±3.91
	Difference (Midline-Baseline)		13.63	14.93	28.09	22.29	11.78	24.68	40.90	23.28	23.08
	Difference (Endline-Midline)		0.36	4.54	1.64	4.52	2.33	2.00	6.54	5.00	3.27
	Difference (Endline-Baseline)		13.99	19.47	29.73	26.81	14.11	26.68	47.45	28.27	26.35
	DID (Baseline vs Midline)		11.97**	11.80**	19.27**	18.29*	2.56	22.30**	37.57**	25.22**	19.06**
	DID (Midline vs Endline)		1.43	3.33	2.19	-3.15	1.90	0.02	-0.79	2.59	1.24
	DID (Baseline vs Endline)		13.40**	15.13**	21.47**	15.14	4.46	22.32**	36.77**	27.81**	20.30**
Sarlahi	Control	Baseline (n=40)	69.64±13.02	72.19±11.32	59.47±15.41	58.50±20.45	73.33±15.37	59.05±15.09	41.45±10.87	55.17±17.34	60.85±10.87
		Midline (n=30)	68.57±14.60	73.75±13.77	59.47±18.81	62.67±20.83	81.67±11.59	67.62±13.72	43.51±12.04	69.11±14.38	65.64±10.80
		Endline (n=27)	70.90±11.71	73.15±11.86	65.30±16.27	69.63±23.77	82.72±12.26	67.90±15.72	49.32±13.63	64.20±12.29	67.45±10.48
	Difference (Midline-Baseline)		-1.07	1.56	0.00	4.17	8.33	8.57	2.06	13.94	4.80
	Difference (Endline-Midline)		2.33	-0.60	5.83	6.96	1.05	0.28	5.81	-4.91	1.81
	Difference (Endline-Baseline)		1.26	0.96	5.83	11.13	9.38	8.85	7.87	9.03	6.61
	Intervention	Baseline (n=63)	75.06±14.68	71.73±13.65	62.66±12.60	67.62±18.81	80.34±13.00	65.53±15.88	41.35±13.40	60.53±12.63	64.90±9.46
		Midline (n=42)	89.29±11.51	91.22±12.12	89.72±13.25	89.05±18.32	94.18±8.84	89.00±12.90	78.70±20.89	84.13±13.96	88.04±10.91
		Endline (n=36)	92.26±8.08	89.93±13.72	89.77±13.49	91.11±16.17	92.44±10.64	90.34±11.52	81.29±17.13	84.63±13.03	88.71±9.53
	Difference (Midline-Baseline)		14.23	19.49	27.07	21.43	13.84	23.47	37.34	23.60	23.13
	Difference (Endline-Midline)		2.98	-1.29	0.04	2.06	-1.74	1.34	2.59	0.50	0.67
	Difference (Endline-Baseline)		17.21	18.20	27.11	23.49	12.10	24.81	39.93	24.10	23.81
	DID (Baseline vs Midline)		15.30**	17.93**	27.07**	17.26**	5.51	14.90**	35.28**	9.65*	18.34**
	DID (Midline vs Endline)		0.65	-0.69	-5.79	-4.90	-2.79	1.06	-3.22	5.42	-1.14
	DID (Baseline vs Endline)		15.95**	17.24**	21.28**	12.36	2.72	15.96**	32.06**	15.07**	17.20**

District	Type of participants	Assessment	Obtained score in each module ± SD								
			Module 1: Infection Prevention	Module 2 : Antenatal care and counselling	Module 3: Essential care of labor and birth	Module 3: Clinical decision making skills	Module 4: Helping Babies Breathe	Module 5: Bleeding after birth complete	Module 6: Preeclampsia and eclampsia	Module 7: Postnatal Care and Counselling	Overall knowledge assessment score
Udayapur	Control	Baseline (n=23)	75.16±8.02	70.11±12.64	57.21±11.91	59.13±22.14	77.78±11.36	59.63±14.56	38.90±11.08	58.26±13.96	61.59±7.46
		Midline (n=23)	77.64±7.24	73.91±8.77	63.62±9.90	63.48±26.04	84.78±9.80	66.05±11.87	47.37±11.33	64.93±12.75	67.58±5.62
		Endline (n=22)	77.60±8.33	78.13±9.98	71.05±14.23	65.45±22.41	86.11±7.81	80.52±12.46	58.85±17.77	74.24±12.73	74.70±8.66
	Difference (Midline-Baseline)		2.48	3.80	6.41	4.35	7.00	6.42	8.47	6.67	5.99
	Difference (Endline-Midline)		-0.04	4.21	7.44	1.98	1.33	14.47	11.48	9.31	7.12
	Difference (Endline-Baseline)		2.44	8.02	13.84	6.32	8.33	20.89	19.95	15.98	13.11
	Intervention	Baseline (n=59)	74.46±13.21	74.36±13.91	63.25±16.43	66.78±25.08	80.41±12.18	67.07±13.85	47.55±16.47	62.49±14.38	66.65±11.33
		Midline (n=52)	91.07±11.04	91.35±10.44	88.56±13.93	84.23±16.01	94.02±7.92	92.95±7.86	78.85±13.85	86.03±15.35	88.76±8.29
		Endline (n=47)	91.34±10.31	90.03±11.70	89.59±14.12	85.53±20.30	95.51±6.82	89.56±11.31	80.52±15.24	84.82±15.46	88.59±9.91
	Difference (Midline-Baseline)		16.62	16.98	25.32	17.45	13.60	25.88	31.30	23.54	22.12
	Difference (Endline-Midline)		0.27	-1.32	1.02	1.30	1.49	-3.38	1.67	-1.20	-0.17
	Difference (Endline-Baseline)		16.88	15.66	26.34	18.75	15.09	22.49	32.97	22.34	21.94
	DID (Baseline vs Midline)		14.13**	13.18**	18.91**	13.10	6.60	19.46**	22.83**	16.87**	16.12**
	DID (Midline vs Endline)		0.31	-5.53	-6.41	-0.68	0.16	-17.86	-9.81	-10.52*	-7.29**
	DID (Baseline vs Endline)		14.44**	7.65	12.49**	12.43	6.76	1.60	13.02*	6.36	8.83**
Overall	Control	Baseline (n=120)	73.51±11.24	72.81±11.25	60.53±14.12	61.50±22.03	77.36±12.62	62.90±13.97	41.18±10.43	58.56±14.07	63.20±8.80
		Midline (n=97)	74.89±11.94	75.64±11.46	66.30±15.87	64.33±24.02	84.08±10.69	69.32±13.20	47.97±13.94	65.77±12.57	68.56±9.18
		Endline (n=88)	75.81±11.64	77.41±11.07	69.86±15.03	69.09±22.06	85.54±9.36	74.08±14.38	53.59±14.77	68.26±12.67	71.73±9.62
	Intervention	Baseline (n=206)	75.94±13.07	73.70±13.12	64.77±14.46	67.57±21.57	81.82±11.71	67.24±15.09	44.66±15.83	62.59±13.53	66.80±10.13
		Midline (n=152)	90.93±10.56	91.00±10.66	90.24±12.36	86.84±16.45	94.92±7.12	91.73±9.98	79.12±16.54	84.04±13.98	88.79±8.73
		Endline (n=133)	91.84±10.11	90.79±11.61	91.25±12.61	89.02±17.83	95.32±7.64	91.37±10.84	82.79±15.50	85.91±13.70	89.87±9.23
	DID (Baseline vs Midline), 95% CI		13.62** [9.67,17.55]	14.47** [10.47,18.45]	19.69** [14.92,24.44]	16.44** [9.44,23.43]	6.38** [2.93,9.82]	18.06** [13.61,22.51]	27.68** [22.61,32.74]	14.23** [9.62,18.83]	16.63** [13.44,19.81]
	DID (Midline vs Endline), 95% CI		-0.02 [-4.08,4.05]	-1.98 [-6.13,2.17]	-2.53 [-7.63,2.57]	-2.58 [-9.89,4.73]	-1.06 [-4.23,2.10]	-5.12* [-9.5,-0.72]	-1.96 [-7.68,3.76]	-0.60 [-5.57,4.36]	-2.09 [-5.48,1.30]
	DID (Baseline vs Endline), 95% CI		13.60** [9.45,17.74]	12.49** [8.25,16.72]	17.16** [12.21,22.10]	13.86** [6.50,21.21]	5.32** [1.54,9.08]	12.94** [8.08,17.79]	25.72** [20.60,30.83]	13.62** [8.85,18.39]	14.54** [11.17,17.89]
	Adjusted DID (Baseline vs Midline), 95% CI		13.77** [9.97,17.56]	14.54** [10.60,18.48}	19.83** [15.45,24.21]	16.24** [9.48,23.01]	6.38** [2.90,9.86]	18.30** [14.07,22.54]	27.80** [23.04,32.55]	14.41** [9.89,18.95]	16.75** [13.92,19.58]
	Adjusted DID (Midline vs Endline), 95% CI		-0.01 [-3.82,3.79]	-2.10 [-6.15,1.96]	-2.67 [-7.32,1.99]	-2.56 [-9.54,4.42]	-1.21 [-4.20,1.78]	-5.09* [-9.21,-0.98]	-1.92 [-7.44,3.59]	-0.56 [-5.45,4.32]	-2.13 [-5.20,0.94]
	Adjusted DID (Baseline vs Endline), 95% CI		13.60** [9.69,17.51]	12.68** [8.54,16.81]	17.17** [12.68,21.66]	13.61** [6.64,20.58]	5.19** [1.57,8.80]	13.05** [8.50,17.60]	25.95** [21.08,30.83]	13.79** [9.11,18.46]	14.61** [11.59,17.62]

**p<0.05; **p<0.01*

Adjusted – Age, education, job, position, SBA training, work experience

5.2.4. Confidence assessment findings

The confidence assessment findings of the mentors are shown in Table 19 and Table 20, the findings of intervention and control group participants are shown in Table 21 and Table 22. Paired analysis was done for the mentors, whereas Difference in Difference (DID) analysis was done to compare the confidence assessment scores obtained by the intervention and control group participants.

There was a statistically increment in confidence assessment score of the mentors in all seven modules during the end-line assessment. As shown in Table 19, the overall mean score increased by 18.23 marks (i.e. 19.30%) during the midline assessment ($p<0.01$). There was a further 2.84 marks (i.e. 8.10%) increment in the confidence score of the mentors during the end-line assessment. Overall, there was a 20.47 marks (i.e. 27.40%) increment in confidence assessment score compared to the baseline ($p<0.01$).

Table 19: Confidence assessment scores of mentors (expressed in marks) (n=20)

Module	Maximum obtainable score	Obtained mean score (mean±SD)			Difference		
		Baseline	Midline	Endline	M-B	E-M	E-B
Module 1: Infection prevention	30	24.30±3.37	25.35±3.75	26.80±2.53	1.05	1.45*	2.50*
Module 2: ANC Care & counselling	25	20.3±3.16	21.30±3.18	22.35±2.41	1.00*	1.05	2.05*
Module3: Essential Care for Labor and Birth (ECLB)	35	26.55±4.57	29.20±4.30	30.55±3.63	2.65*	1.35	4.00**
Module 3: Vacuum delivery (n=15)	20	14.67±3.15	17.00±2.33	17.13±2.39	2.33*	0.13	2.47*
Module 4: Helping Baby Breathe	20	15.20±2.17	16.85±2.43	17.85±2.18	1.65**	1.00*	2.65**
Module 5: Bleeding after birth	40	27.95±5.02	33.45±4.83	34.90±5.04	5.50**	1.45	6.95**
Module 6: Pre-eclampsia &eclampsia	40	28.35±5.06	33.95±4.83	35.05±4.17	5.60**	1.10	6.70**
Module7: PNC	20	15.25±2.53	17.10±2.53	17.80±2.31	1.85*	0.70	2.55**
Overall (Except vacuum delivery)	**210**	**157.90±22.90**	**177.20±24.78**	**185.30±21.01**	**19.30****	**8.10**	**27.40****

**p<0.05, **p<0.01*

Table 20: Confidence assessment scores of mentors (expressed in percentage) (n=20)

Module	Obtained mean score (mean±SD)			Difference		
	Baseline	Midline	End line	M-B	E-M	E-B
Module 1: Infection prevention	81.00±11.24	84.50±12.49	89.33±8.42	3.50	4.83*	8.33*
Module 2: ANC Care & counselling	81.20±12.66	85.20±12.72	89.40±9.65	4.00*	4.20	8.20*
Module3: Essential Care for Labor and Birth (ECLB)	75.86±13.06	83.43±12.28	87.29±10.38	7.57*	3.86	11.43**
Module 3: Vacuum delivery (n=15)	73.33±15.77	85.00±11.65	85.67±11.93	11.67*	0.67	12.33*
Module 4: Helping Baby Breathe	76.00±10.83	84.25±12.17	89.25±10.92	8.25**	5.00	13.25**
Module 5: Bleeding after birth	69.88±12.55	83.63±12.07	87.25±12.59	13.75**	3.63	17.38**
Module 6: Pre-eclampsia &eclampsia	70.88±12.65	84.88±12.07	87.63±10.43	14.00**	2.75	16.75**
Module7: PNC	76.25±12.65	85.50±12.66	89.00±11.54	9.25*	3.50	12.75**
Overall (except vacuum delivery)	75.19±10.90	84.38±11.80	88.24±10.00	9.19**	3.86	13.05**

**p<0.05, **p<0.01*

The results of Difference in Difference (DiD) analysis in mean confidence assessment scores obtained by the intervention and control group participants of four study districts during the

baseline and midline assessments are shown in Table 21 and Table 22. Table 21 shows the obtained scores in marks whereas Table 22 shows the obtained scores in percentage. Overall, the mean scores obtained by the intervention group participants were less than the control group participants in all modules during the baseline assessment. Among the control group participants, the overall mean confidence assessment score increased from 159.60 marks (i.e. 76.00%) in the baseline to 164.38 marks (i.e. 78.28%) in the midline, and 162.69 marks (77.47%) during the end-line assessment. Similarly, among the intervention group participants, the overall mean confidence assessment score increased from 145.75 marks (i.e. 69.40%) in the baseline to 165.35 marks (i.e. 78.49%) in the midline, and 168.40 marks (80.19%) during the end-line assessment.

The adjusted DiD analysis revealed a 13.95-marks [95% CI- 6.78, 21.12], i.e. 6.64 % [95% CI- 3.23%, 10.06%] difference in difference between the baseline and midline knowledge assessment of the intervention and control group participants ($p<0.01$). Similarly, the adjusted DiD between the baseline and end-line scores of the scores of the intervention and control group participant revealed a 17.98 marks [95% CI 10.10, 25.86], i.e. 8.56% [95% CI- 4.81%, 12.32%] difference ($p<0.01$). However, there was no statistically significant difference in the confidence assessment scores during baseline and end-line assessments in Sarlahi district, remaining three districts had statistically significant increments in confidence during the end-line assessment.

Similarly, there was no statistically significant difference in the midline and end-line score differences, thus depicting that the intervention group participants retained their confidence even after 4 to 6 months of completion of intervention.

Among the seven modules, the end-line confidence assessment score of the mentees/ intervention group participants was least in Module 5: Bleeding after Birth (77.67%), followed by Module 6: Pre-eclampsia and eclampsia (79.91%).

Table 21: Confidence assessment scores of intervention and control group participants (expressed in marks)

District	Type of participants	Assessment	Obtained score in each module ± SD							
			Module 1: Infection Prevention	Module 2 : Antenatal care and counselling	Module 3: Essential care of labor and birth	Module 4: Helping Babies Breathe	Module 5: Bleeding after birth complete	Module 6: Preeclampsia and eclampsia	Module 7: Postnatal Care and Counselling	Overall confidence assessment score
			Full score: 30	Full score: 25	Full score: 35	Full score: 20	Full score: 40	Full score: 40	Full score: 20	Full score: 210
Dolakha	Control	Baseline (n=33)	25.52±3.69	22.12±2.97	28.15±3.84	15.73±2.71	28.85±4.86	29.85±4.76	16.03±3.13	166.24±22.15
		Midline (n=24)	25.08±3.54	21.50±2.69	28.38±4.19	15.79±2.77	29.17±4.40	30.17±5.16	16.42±2.92	166.50±22.54
		Endline (n=21)	25.48±4.93	21.38±3.92	29.48±4.37	16.76±2.84	30.05±6.01	30.24±5.96	17.29±2.78	170.67±27.79
	Difference (Midline-Baseline)		-0.43	-0.62	0.22	0.06	0.32	0.32	0.39	0.26
	Difference (Endline-Midline)		0.39	-0.12	1.10	0.97	0.88	0.07	0.87	4.17
	Difference (Endline-Baseline)		-0.04	-0.74	1.32	1.03	1.20	0.39	1.26	4.42
	Intervention	Baseline (n=49)	21.82±3.82	19.82±2.86	24.29±4.79	13.61±2.61	25.24±5.80	25.96±6.38	14.43±2.46	145.16±24.60
		Midline (n=33)	23.97±2.21	20.70±1.88	27.52±3.56	15.67±2.07	29.85±3.81	30.30±3.84	15.67±2.15	163.67±16.76
		Endline (n=27)	24.78±3.30	21.11±2.85	28.37±4.07	16.48±2.50	31.85±4.80	32.15±5.10	16.63±2.42	171.37±22.22
	Difference (Midline-Baseline)		2.15	0.88	3.23	2.05	4.60	4.34	1.24	18.50
	Difference (Endline-Midline)		0.81	0.41	0.86	0.81	2.00	1.85	0.96	7.70
	Difference (Endline-Baseline)		2.96	1.29	4.08	2.87	6.61	6.19	2.20	26.21
	DID (Baseline vs Midline)		2.59*	1.50	3.01*	1.99*	4.29**	4.03*	0.85	18.24*
	DID (Midline vs Endline)		0.42	0.53	-0.25	-0.16	1.12	1.77	0.09	3.53
	DID (Baseline vs Endline)		3.00*	2.04	2.76	1.83	5.41**	5.80**	0.95	21.79**
Myagdi	Control	Baseline (n=24)	25.13±2.86	21.25±2.42	27.58±3.55	15.42±2.00	27.92±3.71	28.21±4.51	16.79±2.19	162.29±16.26
		Midline (n=20)	24.85±3.69	20.45±4.01	27.90±4.45	15.65±3.33	29.25±4.52	31.10±4.62	16.90±2.81	166.10±23.70
		Endline (n=18)	24.56±3.94	21.06±3.39	28.06±3.10	15.78±1.80	28.67±4.19	30.06±4.22	16.17±1.98	164.33±19.62
	Difference (Midline-Baseline)		-0.27	-0.80	0.32	0.23	1.33	2.89	0.11	3.81
	Difference (Endline-Midline)		-0.29	0.61	0.16	0.13	-0.58	-1.04	-0.73	-1.77
	Difference (Endline-Baseline)		-0.57	-0.19	0.47	0.36	0.75	1.85	-0.63	2.04
	Intervention	Baseline (n=35)	22.91±3.37	20.06±2.65	25.49±3.55	14.03±2.64	26.14±5.09	26.43±5.46	14.09±2.38	149.14±20.13
		Midline (n=25)	24.44±2.84	20.80±2.58	28.76±3.84	16.24±2.13	30.92±4.93	31.56±5.38	16.28±2.28	169.00±21.79
		Endline (n=23)	25.83±3.58	22.13±3.22	29.91±4.66	17.17±2.42	33.61±5.42	34.48±5.24	17.52±2.56	180.65±26.16
	Difference (Midline-Baseline)		1.53	0.74	3.27	2.21	4.78	5.13	2.19	19.86
	Difference (Endline-Midline)		1.39	1.33	1.15	0.93	2.69	2.92	1.24	11.65
	Difference (Endline-Baseline)		2.91	2.07	4.43	3.15	7.47	8.05	3.44	31.51
	DID (Baseline vs Midline)		1.80	1.54	2.96	1.98*	3.44	2.24	2.09*	16.05
	DID (Midline vs Endline)		1.68	0.72	1.00	0.81	3.27	3.96	1.98	13.42
	DID (Baseline vs Endline)		3.48**	2.27	3.96**	2.78**	6.72**	6.20**	4.06**	29.47**
Sarlahi	Control	Baseline (n=40)	23.00±4.01	19.33±3.38	25.58±4.30	14.25±2.46	26.58±5.26	27.63±5.86	15.25±2.77	151.60±22.58
		Midline (n=30)	25.00±4.14	21.47±2.61	27.93±3.53	15.80±2.07	29.43±4.85	29.97±5.17	16.30±2.02	165.90±19.92
		Endline (n=27)	23.63±4.86	20.22±3.96	26.63±5.86	15.07±3.05	28.56±6.36	28.89±6.86	15.78±2.97	158.78±29.34
	Difference (Midline-Baseline)		2.00	2.14	2.36	1.55	2.86	2.34	1.05	14.30
	Difference (Endline-Midline)		-1.37	-1.24	-1.30	-0.73	-0.88	-1.08	-0.52	-7.12
	Difference (Endline-Baseline)		0.63	0.90	1.05	0.82	1.98	1.26	0.53	7.18
	Intervention	Baseline (n=63)	23.03±3.42	19.52±2.77	25.98±4.61	14.75±2.55	26.98±4.86	27.40±5.47	15.10±2.22	152.76±22.48
		Midline (n=42)	24.55±3.45	20.55±3.04	28.43±4.03	15.93±2.45	31.57±4.48	32.21±4.82	16.10±2.38	169.33±23.17
		Endline (n=36)	23.92±3.17	20.00±2.99	27.75±2.94	15.75±2.16	31.14±3.83	31.39±3.85	15.47±1.90	165.42±17.72
	Difference (Midline-Baseline)		1.52	1.02	2.44	1.18	4.59	4.82	1.00	16.57
	Difference (Endline-Midline)		-0.63	-0.55	-0.68	-0.18	-0.43	-0.83	-0.62	-3.92
	Difference (Endline-Baseline)		0.88	0.48	1.77	1.00	4.15	3.99	0.38	12.65
	DID (Baseline vs Midline)		-0.48	-1.12	0.09	-0.37	1.73	2.48	-0.05	2.27
	DID (Midline vs Endline)		0.74	0.70	0.63	0.55	0.45	0.25	-0.10	3.21
	DID (Baseline vs Endline)		0.26	-0.42	0.71	0.18	2.17	2.73	-0.15	5.48

District	Type of participants	Assessment	Obtained score in each module ± SD							
			Module 1: Infection Prevention	Module 2 : Antenatal care and counselling	Module 3: Essential care of labor and birth	Module 4: Helping Babies Breathe	Module 5: Bleeding after birth complete	Module 6: Preeclampsia and eclampsia	Module 7: Postnatal Care and Counselling	Overall confidence assessment score
			Full score: 30	Full score: 25	Full score: 35	Full score: 20	Full score: 40	Full score: 40	Full score: 20	Full score: 210
Udayapur	Control	Baseline (n=23)	24.87±3.72	20.83±3.60	27.57±5.12	15.74±2.61	28.70±5.42	27.70±5.16	15.78±2.78	161.17±24.72
		Midline (n=23)	25.00±3.71	20.87±3.20	26.35±4.85	15.00±2.80	27.65±6.38	28.43±6.07	15.39±3.06	158.70±27.40
		Endline (n=22)	24.59±2.70	20.55±2.56	26.09±3.89	15.27±2.12	27.68±4.57	28.77±4.42	15.59±2.13	158.55±19.31
	Difference (Midline-Baseline)		0.13	0.04	-1.22	-0.74	-1.04	0.74	-0.39	-2.48
	Difference (Endline-Midline)		-0.41	-0.32	-0.26	0.27	0.03	0.34	0.20	-0.15
	Difference (Endline-Baseline)		-0.28	-0.28	-1.47	-0.47	-1.01	1.08	-0.19	-2.63
	Intervention	Baseline (n=59)	20.46±3.56	18.56±3.05	22.27±4.54	13.61±2.53	23.36±5.73	24.34±6.03	14.14±3.01	136.73±23.36
		Midline (n=52)	23.71±2.85	19.92±2.51	27.17±3.40	15.21±2.33	29.25±4.15	30.62±3.70	15.56±2.17	161.44±18.06
		Endline (n=47)	23.79±3.66	20.15±2.75	27.04±4.32	15.40±2.68	29.32±4.98	31.06±5.21	16.21±2.65	162.98±23.93
	Difference (Midline-Baseline)		3.25	1.36	4.90	1.60	5.89	6.28	1.42	24.71
	Difference (Endline-Midline)		0.08	0.23	-0.13	0.19	0.07	0.45	0.66	1.54
	Difference (Endline-Baseline)		3.33	1.59	4.77	1.79	5.96	6.72	2.08	26.25
	DID (Baseline vs Midline)		3.12**	1.32	6.12**	2.34**	6.94**	5.54**	1.81	27.19**
	DID (Midline vs Endline)		0.48	0.55	0.13	-0.08	0.04	0.11	0.46	1.69
	DID (Baseline vs Endline)		3.61**	1.87	6.25**	2.26**	6.98**	5.65**	2.27**	28.88**
Overall	Control	Baseline (n=120)	24.48±3.77	20.77±3.30	27.07±4.30	15.18±2.54	27.88±4.95	28.37±5.21	15.88±2.79	159.60±22.33
		Midline (n=97)	24.99±3.75	21.12±3.08	27.66±4.23	15.58±2.69	28.91±5.06	29.89±5.29	16.24±2.69	164.38±23.13
		Endline (n=88)	24.50±4.23	20.75±3.50	27.47±4.68	15.67±2.61	28.72±5.44	29.42±5.56	16.17±2.59	162.69±25.00
	Intervention	Baseline (n=206)	21.99±3.69	19.41±2.89	24.43±4.69	14.03±2.60	25.39±5.54	26.01±5.94	14.49±2.57	145.75±23.59
		Midline (n=152)	24.12±2.90	20.41±2.56	27.86±3.71	15.68±2.29	30.30±4.38	31.14±4.39	15.85±2.24	165.35±20.09
		Endline (n=133)	24.38±3.49	20.65±2.99	28.00±4.08	16.02±2.52	31.07±4.93	31.96±4.96	16.32±2.47	168.40±23.13
	DID (Baseline vs Midline), 95% CI		1.62* [0.39,2.84]	0.64 [-0.38,1.66]	2.83** [1.36,4.29]	1.25** [0.38,2.10]	3.88** [2.14,5.60]	3.61** [1.81,5.40]	1.00* [0.12,1.86]	14.82** [7.05,22.58]
	DID (Midline vs Endline), 95% CI		0.75 [-0.56,2.05]	0.61 [-0.49,1.72]	0.34 [-1.19,1.86]	0.25 [-0.67,1.18]	0.96 [-0.85,2.77]	1.28 [-0.56,3.13]	0.54 [-0.37,1.45]	4.74 [-3.64,13.12]
	DID (Baseline vs Endline), 95% CI		2.37** [1.04,3.68]	1.26* [0.16,2.35]	3.17** [1.59,4.73]	1.50** [0.59,2.40]	4.84** [2.99,6.68]	4.89** [2.96,6.82]	1.54** [0.62,2.45]	19.56** [11.31,27.80]
	Adjusted DID (Baseline vs Midline), 95% CI		1.53* [0.36,2.71]	0.60 [-0.38,1.59]	2.68** [1.29,4.06]	1.16** [0.33,1.99]	3.64** [2.06,5.23]	3.39** [1.72,5.07]	0.94* [0.09,1.79]	13.95** [6.78,21.12]
	Adjusted DID (Midline vs Endline), 95% CI		0.65 [-0.66,1.96]	0.52 [-0.58,1.62]	0.13 [-1.33,1.59]	0.14 [-0.76,1.04]	0.74 [-0.98,2.47]	1.08 [-0.69,2.86]	0.44 [-0.45,1.34]	3.71 [-4.39,11.80]
	Adjusted DID (Baseline vs Endline), 95% CI		2.18** [0.89,3.47]	1.45* [0.07,2.22]	2.83** [1.33,4.33]	1.37** [0.48,2.26]	4.42** [2.67,6.17]	4.57** [2.74,6.39]	1.47** [0.57,2.38]	17.98** [10.10,25.86]

**p<0.05; **p<0.01*

Adjusted – Age, education, job, position, SBA training, work experience

Table 22: Confidence assessment scores of intervention and control group participants (expressed in percentage)

District	Type of participants	Assessment	Obtained score in each module ± SD							
			Module 1: Infection Prevention	Module 2 : Antenatal care and counselling	Module 3: Essential care of labor and birth	Module 4: Helping Babies Breathe	Module 5: Bleeding after birth complete	Module 6: Preeclampsia and eclampsia	Module 7: Postnatal Care and Counselling	Overall confidence assessment score
Dolakha	Control	Baseline (n=33)	85.05±12.31	88.48±11.86	80.43±10.98	78.64±13.54	72.12±12.15	74.62±11.89	80.15±15.64	79.16±10.55
		Midline (n=24)	83.61±11.79	86.00±10.75	81.07±11.97	78.96±13.83	72.92±11.00	75.42±12.91	82.08±14.59	79.29±10.73
		Endline (n=21)	84.92±16.42	85.52±15.67	84.22±12.47	83.81±14.22	75.12±15.03	75.60±15.03	86.43±13.89	81.27±13.23
	Difference (Midline-Baseline)		-1.44	-2.48	0.64	0.32	0.80	0.80	1.93	0.12
	Difference (Endline-Midline)		1.31	-0.48	3.15	4.85	2.20	0.18	4.35	1.98
	Difference (Endline-Baseline)		-0.13	-2.96	3.78	5.17	3.00	0.97	6.28	2.11
	Intervention	Baseline (n=49)	72.72±12.74	79.27±11.45	69.39±13.69	68.06±13.06	63.11±14.49	64.90±15.96	72.14±12.29	69.13±11.71
		Midline (n=33)	79.90±7.38	82.79±7.52	78.61±10.18	78.33±10.36	74.62±9.52	75.76±9.59	78.33±10.73	77.94±7.98
		Endline (n=27)	82.59±10.99	84.44±11.39	81.06±11.62	82.41±12.51	79.63±12.00	80.37±12.76	83.15±12.10	81.60±10.58
	Difference (Midline-Baseline)		7.18	3.52	9.23	10.27	11.51	10.86	6.19	8.81
	Difference (Endline-Midline)		2.69	1.66	2.44	4.07	5.01	4.61	4.81	3.67
	Difference (Endline-Baseline)		9.87	5.18	11.67	14.35	16.52	15.47	11.01	12.48
	DID (Baseline vs Midline)		8.62*	6.01	8.59*	9.95*	10.71	10.06**	4.26	8.69*
	DID (Midline vs Endline)		1.38	2.13	-0.70	-0.78	2.81	4.43	0.47	1.68
	DID (Baseline vs Endline)		10.00*	8.14	7.89	9.17	13.52**	14.50**	4.73	10.37**
Myagdi	Control	Baseline (n=24)	83.75±9.55	85.00±9.67	78.81±10.14	77.08±9.99	69.79±9.26	70.52±11.28	83.96±10.93	77.28±7.74
		Midline (n=20)	82.83±12.30	81.80±16.02	79.71±12.71	78.25±16.64	73.13±11.29	77.75±11.55	84.50±14.04	79.10±11.28
		Endline (n=18)	81.85±13.15	84.22±13.55	80.16±8.85	78.89±9.00	71.67±10.47	75.14±10.55	80.83±9.89	78.25±9.34
	Difference (Midline-Baseline)		-0.92	-3.20	0.90	1.17	3.33	7.23	0.54	1.81
	Difference (Endline-Midline)		-0.98	2.42	0.44	0.64	-1.46	-2.61	-3.67	-0.84
	Difference (Endline-Baseline)		-1.90	-0.78	1.35	1.81	1.88	4.62	-3.13	0.97
	Intervention	Baseline (n=35)	76.38±11.24	80.23±10.58	72.82±10.15	70.14±13.20	65.36±12.72	66.07±13.64	70.43±11.90	71.02±9.59
		Midline (n=25)	81.47±9.48	83.20±10.33	82.17±10.98	81.20±10.63	77.30±12.33	78.90±13.45	81.40±11.41	80.48±10.38
		Endline (n=23)	86.09±11.92	88.52±12.89	85.47±13.32	85.87±12.12	84.02±13.54	86.20±13.10	87.61±12.78	86.02±12.46
	Difference (Midline-Baseline)		5.09	2.97	9.36	11.06	11.94	12.83	10.97	9.46
	Difference (Endline-Midline)		4.62	5.32	3.29	4.67	6.72	7.30	6.21	5.55
	Difference (Endline-Baseline)		9.71	8.29	12.65	15.73	18.66	20.12	17.18	15.00
	DID (Baseline vs Midline)		6.00	6.17	8.45	9.89*	8.61	5.60	10.43*	7.64
	DID (Midline vs Endline)		5.60	2.90	2.85	4.03	8.18	9.91	9.88	6.39
	DID (Baseline vs Endline)		11.60**	9.07	11.30**	13.92**	16.79**	15.51**	20.31**	14.03**
Sarlahi	Control	Baseline (n=40)	76.67±13.38	77.30±13.54	73.07±12.29	71.25±12.29	66.44±13.14	69.06±14.66	76.25±13.86	72.19±10.75
		Midline (n=30)	83.33±13.81	85.87±10.44	79.81±10.09	79.00±10.37	73.58±12.14	74.92±12.92	81.50±10.10	79.00±9.49
		Endline (n=27)	78.77±16.20	80.89±15.86	76.08±16.76	75.37±15.25	71.39±15.89	72.22±17.16	78.89±14.83	75.61±13.97
	Difference (Midline-Baseline)		6.67	8.57	6.74	7.75	7.15	5.85	5.25	6.81
	Difference (Endline-Midline)		-4.57	-4.98	-3.72	-3.63	-2.19	-2.69	-2.61	-3.39
	Difference (Endline-Baseline)		2.10	3.59	3.01	4.12	4.95	3.16	2.64	3.42
	Intervention	Baseline (n=63)	76.77±11.39	78.10±11.08	74.24±13.18	73.73±12.73	67.46±12.15	68.49±13.67	75.48±11.10	72.74±10.70
		Midline (n=42)	81.83±11.50	82.19±12.15	81.22±11.50	79.64±12.27	78.93±11.20	80.54±12.05	80.48±11.88	80.63±11.03
		Endline (n=36)	79.72±10.55	80.00±11.94	79.29±8.40	78.75±10.78	77.85±9.58	78.47±9.62	77.36±9.52	78.77±8.44
	Difference (Midline-Baseline)		5.05	4.10	6.98	5.91	11.47	12.04	5.00	7.89
	Difference (Endline-Midline)		-2.10	-2.19	-1.94	-0.89	-1.08	-2.06	-3.12	-1.87
	Difference (Endline-Baseline)		2.95	1.90	5.05	5.02	10.39	9.98	1.88	6.03
	DID (Baseline vs Midline)		-1.61	-4.47	0.25	-1.84	4.32	6.19	-0.25	1.08
	DID (Midline vs Endline)		2.46	2.79	1.79	2.74	1.11	0.63	-0.50	1.53

District	Type of participants	Assessment	Obtained score in each module ± SD							
			Module 1: Infection Prevention	Module 2 : Antenatal care and counselling	Module 3: Essential care of labor and birth	Module 4: Helping Babies Breathe	Module 5: Bleeding after birth complete	Module 6: Preeclampsia and eclampsia	Module 7: Postnatal Care and Counselling	Overall confidence assessment score
	DID (Baseline vs Endline)		0.85	-1.68	2.03	0.90	5.44	6.82	-0.75	2.61
Udayapur	Control	Baseline (n=23)	82.90±12.40	83.30±14.40	78.76±14.62	78.70±13.07	71.74±13.56	69.24±12.91	78.91±13.90	76.75±11.77
		Midline (n=23)	83.33±12.35	83.48±12.78	75.28±13.85	75.00±13.98	69.13±15.95	71.09±15.17	76.96±15.28	75.57±13.05
		Endline (n=22)	81.97±9.01	82.18±10.23	74.55±11.12	76.36±10.60	69.20±11.43	71.93±11.04	77.95±10.65	75.50±9.19
	Difference (Midline-Baseline)		0.43	0.17	-3.48	-3.70	-2.61	1.85	-1.96	-1.18
	Difference (Endline-Midline)		-1.36	-1.30	-0.73	1.36	0.07	0.84	1.00	-0.07
	Difference (Endline-Baseline)		-0.93	-1.12	-4.21	-2.33	-2.53	2.69	-0.96	-1.25
	Intervention	Baseline (n=59)	68.19±11.86	74.24±12.19	63.63±12.98	68.05±12.63	58.39±14.32	60.85±15.07	70.68±15.04	65.11±11.12
		Midline (n=52)	79.04±9.50	79.69±10.05	77.64±9.71	76.06±11.65	73.13±10.38	76.54±9.25	77.79±10.87	76.88±8.60
		Endline (n=47)	79.29±12.18	80.60±11.00	77.26±12.34	77.02±13.38	73.30±12.45	77.66±13.03	81.06±13.23	77.61±11.40
	Difference (Midline-Baseline)		10.85	5.46	14.01	8.01	14.74	15.69	7.11	11.77
	Difference (Endline-Midline)		0.25	0.90	-0.37	0.96	0.17	1.12	3.28	0.73
	Difference (Endline-Baseline)		11.10	6.36	13.63	8.97	14.91	16.81	10.39	12.50
	DID (Baseline vs Midline)		10.41**	5.28	17.48**	11.70**	17.34**	13.84**	9.07	12.95**
	DID (Midline vs Endline)		1.62	2.20	0.36	-0.40	0.10	0.28	2.28	0.80
	DID (Baseline vs Endline)		12.03**	7.48	17.84**	11.30**	17.44**	14.12**	11.34*	13.75**
Overall	Control	Baseline (n=120)	81.58±12.58	83.07±13.21	77.33±12.28	75.88±12.68	69.69±12.37	70.92±13.02	79.38±13.97	76.00±10.63
		Midline (n=97)	83.30±12.49	84.49±12.32	79.03±12.07	77.89±13.44	72.27±12.66	74.72±13.22	81.19±13.46	78.28±11.01
		Endline (n=88)	81.67±14.11	83.00±14.00	78.47±13.38	78.35±13.04	71.79±13.59	73.55±13.89	80.85±12.94	77.47±11.91
	Intervention	Baseline (n=206)	73.28±12.29	77.63±11.56	69.81±13.41	70.15±13.01	63.47±13.84	65.04±14.84	72.45±12.83	69.40±11.23
		Midline (n=152)	80.39±9.68	81.63±10.26	79.59±10.60	78.39±11.45	75.74±10.94	77.86±10.97	79.24±11.20	78.74±9.56
		Endline (n=133)	81.25±11.62	82.59±11.97	80.00±11.67	80.11±12.62	77.67±12.33	79.91±12.40	81.62±12.36	80.19±11.01
	DID (Baseline vs Midline), 95% CI		5.39* [1.30,9.48]	2.57 [-1.52,6.67]	8.09** [3.90,12.26]	6.23** [1.91,10.54]	9.69** [5.37,14.00]	9.03** [4.53,7.60]	4.98* [0.64,3.21]	7.06** [3.36,10.75]
	DID (Midline vs Endline), 95% CI		2.49 [-1.87,6.85]	2.45 [-1.98,6.88]	0.97 [-3.40,5.33]	1.26 [-3.39,5.90]	2.41 [-2.13,6.94]	3.21 [-1.41,7.82]	2.71 [-1.88,7.29]	2.26 [-1.73,6.24]
	DID (Baseline vs Endline), 95% CI		7.89** [3.48,12.28]	5.02* [0.64,9.40]	9.05** [4.56,13.54]	7.49** [2.97,12.00]	12.09** [7.47,16.71]	12.24** [7.40,17.06]	7.69** [3.11,12.25]	9.31** [5.38,13.24]
	Adjusted DID (Baseline vs Midline), 95% CI		5.10* [1.19,9.02]	2.41 [-1.53,6.35]	7.64** [3.69,11.60]	5.81** [1.65,9.97]	9.11** [5.15,13.07]	8.48** [4.29,12.67]	4.70* [0.44,8.96]	6.64** [3.23,10.06]
	Adjusted DID (Midline vs Endline), 95% CI		2.16 [-2.19,6.52]	2.09 [-2.32,6.49]	0.37 [-3.80,4.55]	0.69 [-3.81,5.20]	1.86 [-2.46,6.17]	2.71 [-1.73,7.14]	2.21 [-2.27,6.69]	1.77 [-2.09,5.62]
	Adjusted DID (Baseline vs Endline), 95% CI		7.26** [2.95,11.57]	4.58* [0.28,8.88]	8.08** [3.79,12.37]	6.85** [2.40,11.30]	11.05** [6.67,15.43]	11.42** [6.85,15.98]	7.37** [2.84,11.89}	8.56** [4.81,12.32]

**p<0.05; **p<0.01*

Adjusted – Age, education, job, position, SBA training, work experience

5.2.5. Skills assessment findings

The skills assessment findings of the mentors are shown in Tables 23, 24, 25, and 26. The findings of intervention and control group participants are shown in Tables 27, 28, 29, and 30. Paired analysis was done for mentors, and the intervention and control group participants.

There was a statistically increment in skills assessment score of the mentors in all seven modules during the end-line assessment. As shown in Table 23, the overall mean score increased by 130.20 marks (i.e. 38.29%) during the midline assessment ($p<0.01$). There was a further 0.40 marks (i.e. 0.12%) increment in the skills assessment score of the mentors during the end-line assessment. Overall, there was a 130.60 marks (i.e. 38.41%) increment in skills assessment score compared to the baseline ($p<0.01$).

Table 23: Skills assessment scores of mentors (expressed in marks) (n=20)

Module	Maximum obtainable score	Obtained mean score (mean±SD)			Difference		
		Baseline	Midline	End line	M-B	E-M	E-B
Module 1: Infection prevention	97	56.10±21.83	95.65±2.21	95.10±2.22	39.55**	-0.55	39.00**
Module 2: ANC Care & counselling	42	23.25±7.78	39.8±2.76	40.10±2.36	16.55**	0.30	16.85**
Module3: Essential Care for Labor and Birth (ECLB)	54	34.60±5.38	51.35±2.18	51.85±1.57	16.75**	0.50	17.25**
Module 4: Helping Baby Breathe	35	20.15±5.35	34.20±1.15	34.05±1.23	14.05**	-0.15	13.90**
Module 5: Bleeding After Birth	62	35.35±12.29	59.35±1.69	59.4±1.96	24.00**	0.05	24.05**
Module 6: Pre-eclampsia &eclampsia	28	17.90±7.82	26.80±2.55	27.45±0.83	8.90**	0.65	9.55**
Module7: PNC	22	10.75±5.17	21.15±1.14	20.75±1.25	10.40**	-0.40	10.00**
Overall (except vacuum delivery)	**340**	**198.10±51.40**	**328.3±10.01**	**328.70±7.89**	**130.20****	**0.40**	**130.60****

**p<0.05; **p<0.01*

Table 24: Skills assessment scores of mentors (expressed in percentage) (n=20)

Module	Maximum obtainable score	Obtained mean score (mean±SD)			Difference		
		Baseline	Midline	End line	M-B	E-M	E-B
Module 1: Infection prevention	97	57.84±22.51	98.61±2.28	98.04±2.29	40.77**	-0.57	40.21**
Module 2: ANC Care & counselling	42	55.36±18.52	94.76±6.58	95.48±5.62	39.40**	0.71	40.12**
Module3: Essential Care for Labor and Birth (ECLB)	54	64.07±9.97	95.09±4.04	96.02±2.90	31.02**	0.93	31.94**
Module 4: Helping Baby Breathe	35	57.57±15.30	97.71±3.29	97.29±3.53	40.14**	-0.43	39.71**
Module 5: Bleeding after birth	62	57.02±19.82	95.73±2.73	95.81±3.16	38.71**	0.08	38.79**
Module 6: Pre-eclampsia &eclampsia	28	63.93±27.93	95.71±9.09	98.04±2.95	31.79**	2.32	34.11**
Module7: PNC	22	48.86±23.50	96.14±5.17	94.32±5.69	47.27**	-1.82	45.45**
Overall (except vacuum delivery)	**340**	**58.26±15.11**	**96.56±2.94**	**96.68±2.32**	**38.29****	**0.12**	**38.41****

**p<0.05; **p<0.01*

Table 25 and 26 shows the scores obtained by mentors in each procedure, expressed in marks and percentage respectively. Statistically significant increment ($p<0.01$) in the skills score was found in all the procedures during both midline and end-line assessments.

Table 25: Skills assessment scores of mentors in each procedure (expressed in marks) (n=20)

Module	Maximum obtainable score	Obtained mean score (mean±SD)			Difference		
		Baseline	Midline	End line	M-B	E-M	E-B
Module 1: Infection prevention							
Hand washing	9	6.35±1.69	8.90±0.31	8.85±0.37	2.55**	-0.05	2.50**
Putting and removing gloves	12	9.50±2.42	12.00±0.00	11.90±0.31	2.50**	-0.10	2.40**
Donning of PPE	13	4.50±4.86	12.65±0.49	12.50±0.82	8.15**	-0.15	8.00**
Doffing of PPE	18	5.00±5.89	17.50±0.83	17.65±0.67	12.50**	0.15	12.65**
Preparing 0.5% chlorine solution	15	10.70±4.96	15.00±0.00	14.95±0.22	4.30**	-0.05	4.25**
Decontamination	8	5.35±2.89	8.00±0.00	8.00±0.00	2.65**	0.00	2.65**
Cleaning and drying instrument	9	6.45±3.12	9.00±0.00	9.00±0.00	2.55**	0.00	2.55**
Wrapping, sterilizing and storing for IP	13	8.25±3.54	12.60±1.09	12.25±1.16	4.35**	-0.35	4.00**
Module 2: ANC Care & counselling							
Antenatal care and counselling	31	16.75±5.92	29.20±2.24	29.40±2.14	12.45**	0.20	12.65**
Referral procedure	11	6.50±2.89	10.6±0.68	10.70±0.57	4.1**	0.10	4.20**
Module 3: Essential care for labor & birth							
Abdominal examination	12	6.15±2.91	11.45±1.00	11.55±0.61	5.3**	0.10	5.40**
Vaginal Examination	12	6.55±1.76	11.30±0.80	11.05±0.76	4.75**	-0.25	4.50**
Support during birth	17	12.40±2.42	16.25±1.21	16.55±0.61	3.85**	0.30	4.15**
Partograph (clinical decision-making skills)	13	9.50±3.01	12.35±0.67	12.70±0.47	2.85**	0.35*	3.20**
Vacuum delivery (n=15)	25	14.20±7.87	23.67±1.29	23.27±1.62	9.47**	-0.40	9.07**
Module 4: Helping Baby Breathe							
General evaluation of HBB	12	7.20±2.63	11.55±0.69	11.60±0.59	4.35**	0.05	4.40**
Neonatal resuscitation within Golden 1 minute	23	12.95±4.10	22.65±0.59	22.45±0.83	9.70**	-0.20	9.50**
Module 5: Bleeding after birth							
Active management of third stage of labor	12	9.60±1.96	11.75±0.72	11.65±0.59	2.15**	-0.10	2.05**
Retained placenta (n=15)	18	10.00±4.12	16.60±1.12	17.40±0.83	6.60**	0.40	7.40**
Management of atony	15	6.85±3.96	13.85±0.88	13.85±0.81	7.00**	0.00	7.00**
Uterine balloon tamponade	13	6.90±4.76	12.85±0.37	12.85±0.37	5.95**	0.00	5.95**
Repair of cervical tear	9	3.90±3.06	8.15±0.59	8.40±0.68	4.25**	0.25	4.50**
Shock management	13	8.10±3.33	12.75±0.64	12.65±0.59	4.65**	-0.10	4.55**
Module 6: Pre-eclampsia &eclampsia							
Administering loading dose	9	5.85±3.17	8.75±0.55	8.75±0.44	2.90**	0.00	2.90**
Care in convulsion	11	7.10±2.97	10.30±2.25	10.75±0.55	3.20**	0.45	3.65**
Monitoring magnesium sulphate toxicity	8	4.95±2.43	7.75±0.56	7.95±0.22	2.80**	0.20	3.00**
Module 7: Postnatal Care and Counseling							
Postnatal care and counseling	22	10.75±5.17	21.15±1.14	20.75±1.25	10.40**	-0.40	10.00**

*$p<0.05$; **$p<0.01$

Table 26: Skills assessment scores of mentors in each procedure (expressed in percentage) (n=20)

Module	Maximum obtainable score	Obtained mean score (mean±SD)			Difference		
		Baseline	Midline	End line	M-B	E-M	E-B
Module 1: Infection prevention							
Hand washing	9	70.56±18.83	98.89±3.42	98.33±4.07	28.33**	-0.56	27.78**
Putting and removing gloves	12	79.17±20.14	100.00±0.00	99.17±2.56	20.83**	-0.83	20.00**
Donning of PPE	13	34.62±37.39	97.31±3.76	96.15±6.36	62.69**	-1.15	61.54**
Doffing of PPE	18	27.78±32.74	97.22±4.60	98.06±3.73	69.44**	-0.83	70.28**
Preparing 0.5% chlorine solution	15	71.33±33.02	100.00±0.00	99.67±1.49	28.67**	-0.33	28.33**
Decontamination	8	66.88±36.11	100.00±0.00	100.00±0.00	33.13**	0.00	33.13**
Cleaning and drying instrument	9	71.67±34.67	100.00±0.00	100.00±0.00	28.33**	0.00	28.33**
Wrapping, sterilizing and storing for IP	13	63.46±27.21	96.92±8.43	94.23±8.96	33.46**	-2.69	30.77**
Module 2: ANC Care & counselling							
Antenatal care and counselling	31	54.03±19.09	94.19±7.22	94.84±6.89	40.16**	0.65	40.81
Referral procedure	11	59.09±26.30	96.36±6.19	97.27±5.19	37.27**	0.91	38.18
Module 3: Essential care for labor & birth							
Abdominal examination	12	51.25±24.22	95.42±8.32	96.25±5.04	44.17**	0.83	45.00**
Vaginal Examination	12	54.58±14.68	94.17±6.68	92.08±6.33	39.58**	-2.08	37.50**
Support during birth	17	72.94±14.20	95.59±7.11	97.35±3.56	22.65**	1.76	24.41**
Partograph (clinical decision-making skills)	13	73.08±23.21	95.00±5.16	97.69±3.62	21.92**	2.69*	24.62**
Vacuum delivery (n=15)	25	56.80±31.47	94.67±5.16	93.07±6.50	37.87**	-1.60	36.27**
Module 4: Helping Baby Breathe							
General evaluation of HBB	12	60.00±21.90	96.25±5.72	96.67±4.99	36.25**	0.42	36.67**
Neonatal resuscitation within Golden 1 minute	23	56.30±17.81	98.48±2.55	97.61±3.59	42.17**	-0.87	41.30**
Module 5: Bleeding after birth							
Active management of third stage of labor	12	80.00±16.31	97.92±5.97	97.08±4.89	17.92**	-0.83	17.08**
Retained placenta (n=15)	18	55.56±22.91	92.22±6.23	96.67±4.60	35.56**	4.44*	41.11**
Management of atony	15	45.67±26.43	92.33±5.83	92.33±5.42	46.67**	0.00	46.67**
Uterine balloon tamponade	13	53.08±36.59	98.85±2.82	98.85±2.82	45.77**	0.00	45.77**
Repair of cervical tear	9	43.33±33.99	90.56±6.52	93.33±7.56	47.22**	2.77	50.00**
Shock management	13	62.30±25.68	98.08±4.91	97.30±4.52	35.77**	-0.77	35.00**
Module 6: Pre-eclampsia &eclampsia							
Administering loading dose	9	65.00±35.19	97.22±6.11	97.22±4.94	32.22**	0.00	32.22**
Care in convulsion	11	64.55±27.02	93.64±20.46	97.73±5.00	29.09**	4.09	33.18**
Monitoring magnesium sulphate toxicity	8	61.88±30.48	96.88±6.88	99.38±2.80	35.00**	2.50	37.50**
Module 7: Postnatal Care and Counseling							
Postnatal care and counseling	22	48.86±23.50	96.14±5.17	94.32±5.69	47.27**	-1.82	45.45**

*$p<0.05$; **$p<0.01$

Assessment of skills assessment scores was done only among intervention group participants. A paired t-test was used to compare the difference in obtained mean skills assessment scores, so the participants dropped till the end-line assessment were removed from the analysis, and not included while analyzing the obtained mean scores.

The mean scores in marks and percentages obtained by the mentees/ intervention group participants during skills assessment are shown in Table 27, 28, 29, and 30 respectively. Table 29 and Table 30 depict the skills assessment mean scores obtained in each procedure.

As shown in the tables, statistically significant ($p<0.01$) increment in mean scores was found in all modules and all procedures among intervention group participants of all four study districts. Overall, the mean skills assessment score of the intervention group participants increased from 143.61 marks (i.e. 42.24%) in the baseline to 309.88 marks (i.e. 91.14%) in the midline, and 314.50 marks (92.50%) in the end-line assessment. The score difference between baseline and midline scores was 166.27 marks [95% CI: 158.14, 174.40] (i.e. 48.90%); and the difference between baseline and end-line score was 170.89 marks [162.78, 179.00] (i.e. 50.26%).

There was also a statistically significant increment (i.e. 1.36%) in the skills assessment score between the midline and end-line assessments, thus depicting that the SBMP not only retained the score, it in-fact increased the skills scores even though there was no program for about 4 to 6 months [95% CI: 0.55%, 2.16%].

The cohen's d effect size was large (more than 0.8) in all the modules and procedures, meaning that the baseline and end-line mean scores are very different. Overall, the end-line and baseline mean difference was 3.61 standard deviations apart.

Table 27: Skills assessment scores of intervention group participants in each modules (expressed in marks)

Districts	Assessments	Obtained mean scores±SD							
		Module 1: Infection prevention	Module 2: ANC care and counselling	Module 3: Essential Care of Labor and Birth (except VD)	Module 4: Helping baby breathe (HBB)	Module 5: Bleeding after birth complete (BAB) (except retained placenta)	Module 6: Preeclampsia and eclampsia	Module 7: PNC	Overall skill assessment (Except VD and retained placenta)
		Full marks: 97	Full marks: 42	Full marks: 54	Full marks: 35	Full marks: 62	Full marks: 28	Full marks: 22	Full marks: 340
Dolakha (n=27)	Baseline	52.30±21.23	17.15±7.76	29.56±9.86	15.19±7.84	22.33±12.02	14.44±7.23	7.74±4.61	158.70±56.90
	Midline	94.41±2.78	37.33±3.58	50.48±3.13	31.67±2.66	56.70±4.55	25.26±2.67	19.33±2.15	315.19±14.96
	Endline	93.67±3.54	37.44±3.79	48.56±3.73	33.19±2.63	56.48±4.48	25.74±2.09	20.15±1.66	315.22±18.17
	Diff (M-B)	42.11**	20.19**	20.93**	16.48**	34.37**	10.81**	11.59**	156.48**
	Diff (E-M)	-0.74	0.11	-1.93*	1.52**	-0.22	0.48	0.81	0.04
	Diff (E-B)	41.37**	20.30**	19.00**	18.00**	34.15**	11.30**	12.41**	156.52**
Myagdi (n=23)	Baseline(23)	40.48±15.44	17.65±7.07	28.78±10.29	12.57±8.93	21.78±10.26	10.48±6.73	8.87±3.92	140.61±49.99
	Midline(23)	90.65±7.35	37.39±4.61	48.09±4.82	32.48±2.47	57.04±3.54	27.04±1.22	19.87±1.58	312.57±17.53
	Endline(23)	95.39±3.29	39.00±5.57	51.52±1.65	33.48±1.16	59.04±1.94	26.78±2.32	20.35±1.23	325.57±9.64
	Diff (M-B)	50.17**	19.74**	19.30**	19.91**	35.26**	16.57**	11.00**	171.96**
	Diff (E-M)	4.74**	1.61	3.43**	1.00*	2.00*	-0.26	0.48	13.00**
	Diff (E-B)	54.91**	21.35**	22.74**	20.91**	37.26**	16.30**	11.48**	184.96**
Sarlahi (n=36)	Baseline(36)	41.14±17.75	13.14±5.06	26.56±9.05	13.22±6.86	19.94±9.18	9.22±6.59	6.08±3.64	129.31±44.97
	Midline(36)	93.94±3.13	37.81±2.83	50.53±3.63	32.53±3.25	58.64±3.78	25.22±2.46	19.53±2.02	318.19±16.62
	Endline(36)	91.83±5.73	38.50±2.38	49.94±2.84	31.86±2.00	57.86±3.92	25.56±2.83	19.36±1.99	314.92±16.08
	Diff (M-B)	52.81**	24.67**	23.97**	19.31**	38.69**	16.00**	13.44**	188.89**
	Diff (E-M)	-2.11*	0.69	-0.58	-0.67	-0.78	0.33	-0.17	-3.28
	Diff (E-B)	50.69**	25.36**	23.39**	18.64**	37.92**	16.33**	13.28**	185.61**
Udayapur (n=47)	Baseline	39.57±13.88	19.72±8.07	28.55±11.29	12.23±7.87	25.89±15.02	11.66±7.97	9.72±4.64	147.36±51.89
	Midline	93.60±3.04	35.62±4.47	45.83±4.52	29.77±4.18	52.87±6.47	22.66±3.38	18.81±2.60	299.15±20.41
	Endline	93.28±4.04	38.17±2.45	48.11±3.58	30.85±3.28	54.68±4.63	23.30±3.02	19.96±1.71	308.34±17.22
	Diff (M-B)	54.02**	15.89**	17.28**	17.53**	26.98**	11.00**	9.09**	151.79**
	Diff (E-M)	-0.32	2.55**	2.28**	1.09	1.81*	0.64	1.15**	9.19**
	Diff (E-B)	53.70**	18.45**	19.55**	18.62**	28.79**	11.64**	10.23**	160.98**
Overall (n=133)	Baseline	42.74±17.41	17.06±7.51	28.26±10.21	13.16±7.79	22.85±12.36	11.36±7.41	8.19±4.47	143.61±51.36
	Midline	93.35±4.24	36.86±4.01	48.44±4.57	31.37±3.58	55.93±4.49	24.64±3.13	19.29±2.22	309.88±19.51
	Endline	93.33±4.48	38.26±3.44	49.29±3.37	32.05±2.75	56.66±4.35	25.01±2.97	19.90±1.73	314.50±16.95
	Diff (M-B), 95% CI	50.61** [47.62,53.60]	19.80** [18.41,21.20]	20.18** [18.44,21.92]	18.21** [16.89,19.53]	33.08** [30.97,35.20]	13.28** [12.10,14.46]	11.11** [10.28,11.93]	166.27** [158.14,174.40]
	Diff (E-M), 95% CI	-0.02 [-0.99,0.96]	1.39** [0.64,2.14]	0.85* [0.05,1.65]	0.68* [0.06,1.31]	0.73 [-0.13,1.59]	0.37 [-0.13,0.86]	0.61** [0.24,0.98]	4.62** [1.87,7.36]
	Diff (E-B), 95% CI	50.59** [47.72,53.47]	21.20** [19.89,22.50]	21.03** [19.31, 22.75]	18.89** [17.65,20.14]	33.81** [31.71,35.91]	13.65** [12.44,14.85]	11.71** [10.98,12.44]	170.89** [162.78,179.00]
	Effect Size (E-B)	3.02	2.79	2.09	2.61	2.76	1.94	2.76	3.61

***p<0.01*

Table 28: Skills assessment scores of intervention group participants in each modules (expressed in percentage)

Districts	Assessments	Obtained mean scores (expressed in percentage) ±SD							
		Module 1: Infection prevention	Module 2: ANC care and counselling	Module 3: Essential Care of Labor and Birth (except VD)	Module 4: Helping baby breathe (HBB)	Module 5: Bleeding after birth complete (BAB) (except retained placenta)	Module 6: Preeclampsia and eclampsia	Module 7: PNC	Overall skill assessment (Except VD and retained placenta)
Dolakha (n=27)	Baseline	53.91±21.88	40.83±18.49	54.73±18.26	43.39±22.41	36.02±19.39	51.59±25.82	35.19±20.97	46.68±16.74
	Midline	97.33±2.86	88.89±8.53	93.48±5.80	90.48±7.60	91.46±7.33	90.21±9.53	87.88±9.77	92.70±4.40
	Endline	96.56±3.65	89.15±9.01	89.92±6.92	94.81±7.52	91.10±7.23	91.93±7.45	91.58±7.53	92.71±5.34
	Diff (M-B)	43.41**	48.06**	38.75**	47.09**	55.44**	38.62**	52.69**	46.02**
	Diff (E-M)	-0.76	0.26	-3.57*	4.34**	-0.36	1.72	3.70	0.01
	Diff (E-B)	42.65**	48.32**	35.19*	51.43**	55.08**	40.34**	56.40**	46.03**
Myagdi (n=23)	Baseline	41.73±15.92	42.03±16.85	53.30±19.06	35.90±25.51	35.13±16.54	37.42±24.05	40.32±17.83	41.36±14.70
	Midline	93.46±7.57	89.03±10.98	89.05±8.93	92.80±7.04	92.01±5.70	96.58±4.37	90.32±7.16	91.93±5.16
	Endline	98.34±3.39	92.86±13.26	95.41±3.05	95.65±3.32	95.23±3.13	95.65±8.27	92.49±5.59	95.75±2.84
	Diff (M-B)	51.73**	47.00**	35.75**	56.89**	56.87**	59.16**	50.00**	50.58**
	Diff (E-M)	4.89**	3.83	6.36**	2.86*	3.23*	-0.93	2.17	3.82**

	Diff (E-B)	56.61**	50.83**	42.11**	59.75**	60.10**	58.23**	52.17**	54.40**
Sarlahi (n=36)	Baseline	42.41±18.30	31.28±12.05	49.18±6.75	37.78±19.61	32.17±14.81	32.94±23.52	27.65±16.53	38.03±13.23
	Midline	96.85±3.23	90.01±6.73	93.57±6.75	92.94±9.28	94.58±6.10	90.08±8.79	88.76±9.19	93.59±4.89
	Endline	94.67±5.91	91.67±5.68	92.49±5.26	91.03±5.72	93.32±6.33	91.27±10.12	88.01±9.04	92.62±4.73
	Diff (M-B)	54.44**	58.73**	44.39**	55.16**	62.41**	57.14**	61.11**	55.56**
	Diff (E-M)	-2.18*	1.65	-1.08	-1.90	-1.25	1.19	-0.76	-0.96
	Diff (E-B)	52.26**	60.38**	43.31**	53.25**	61.16**	58.33**	60.35**	54.59**
Udayapur (n=47)	Baseline	40.80±14.31	46.96±19.21	52.88±20.92	34.95±22.48	41.76±24.23	41.64±28.46	44.20±21.10	43.34±15.26
	Midline	96.49±3.13	84.80±10.65	84.87±8.37	85.05±11.95	85.28±10.43	80.93±12.06	85.49±11.82	87.98±6.00
	Endline	96.16±4.17	90.88±5.84	89.09±6.62	88.15±9.36	88.19±7.46	83.21±10.79	90.72±7.76	90.69±5.06
	Diff (M-B)	55.69**	37.84**	31.99**	50.09**	43.51**	39.29**	41.30**	44.64**
	Diff (E-M)	-0.33	6.08**	4.22**	3.10	2.92*	2.28	5.22**	2.70**
	Diff (E-B)	55.36**	43.92**	36.21**	53.19**	46.43**	41.57**	46.52**	47.35**
Overall (n=133)	Baseline	44.06±17.95	40.62±17.89	52.33±18.90	37.59±22.26	36.85±19.94	40.57±26.45	37.22±20.30	42.24±15.11
	Midline	96.23±4.37	87.77±9.54	89.70±8.47	89.62±10.23	90.21±8.86	88.00±11.18	87.70±10.08	91.14±5.74
	Endline	96.22±4.62	91.08±8.19	91.27±6.25	91.58±7.84	91.39±7.01	89.31±10.62	90.46±7.85	92.50±4.99
	Diff (M-B), 95% CI	52.17** [49.09,52.26]	47.15** [43.84,50.46]	37.37** [34.15,40.59]	52.03** [48.25,55.81]	53.36** [49.95, 56.77]	47.42** [43.20,51.64]	50.48** [46.72,54.24]	48.90** [46.51,51.29]
	Diff (E-M), 95% CI	-0.02 [-1.02,0.99]	3.31** [1.52,5.10]	1.57* [0.09,3.05]	1.95* [0.16,3.75]	1.18 [-0.20,2.56]	1.32 [-0.45,3.08]	2.77** [1.07,4.46]	1.36** [0.55,2.16]
	Diff (E-B), 95% CI	52.16** [49.20,55.12]	50.47** [47.36,53.57]	38.94** [35.75, 42.14]	53.98** [50.43,57.53]	54.54** [51.14,57.93]	48.74** [44.43, 53.05]	53.25** [49.93,56.56]	50.26** [47.87, 52.65]

***p<0.01*

Table 29: Skills assessment scores of intervention group participants in each procedure (expressed in marks)

Modules and skills/ procedures	Full scores	Districts	Obtained mean score			Difference		
			Baseline	Midline	Endline	M-B	E-M	E-B
Module 1: Infection prevention practices								
Hand washing	9	Dolakha (n=27)	6.04±1.76	8.78±0.58	8.78±0.42	2.74**	0.00	2.74**
		Myagdi (n=23)	6.30±1.29	8.70 ± 0.70	8.87 ± 0.34	2.39**	0.17	2.57**
		Sarlahi (n=36)	5.47 ± 1.87	8.44 ± 0.69	8.61 ± 0.64	2.97**	0.17	3.14**
		Udayapur (n=47)	6.06±1.71	8.38±0.74	8.45±0.75	2.32**	0.06	2.38**
		Overall (n=133)	5.94 ± 1.71	8.53 ± 0.70	8.63 ± 0.62	2.59** [2.28,2.90]	0.10 [-0.04,0.24]	2.69** [2.39,3.00]
Putting and removing gloves	12	Dolakha (n=27)	9.19±2.92	11.81±0.62	11.78±0.64	2.63**	-0.04	2.59**
		Myagdi (n=23)	8.04±2.44	11.26 ± 1.10	11.91 ± 0.42	3.22**	0.65**	3.87**
		Sarlahi (n=36)	7.50 ± 3.33	11.64 ± 0.80	11.67 ± 0.68	4.14**	0.03	4.17**
		Udayapur (n=47)	8.26±3.18	11.57±0.65	11.89±0.37	3.32**	0.32**	3.64**
		Overall (n=133)	8.20 ± 3.08	11.59 ± 0.79	11.81 ± 0.54	3.39** [2.86,3.91]	0.22** [0.07,0.39]	3.61** [3.08, 4.13]
Donning of PPE	13	Dolakha (n=27)	4.63±4.04	12.48±0.80	12.44±0.89	7.85**	-0.04	7.81**
		Myagdi (n=23)	2.78±3.12	12.26 ± 1.32	12.70 ± 0.63	9.48**	0.43	9.91**
		Sarlahi (n=36)	1.33 ± 3.00	12.86 ± 0.35	11.81 ± 1.47	11.53**	-1.05**	10.48**
		Udayapur (n=47)	0.30±1.04	12.72±0.80	12.47±1.12	12.43**	-0.26	12.17**
		Overall (n=133)	1.89 ± 3.20	12.63 ± 0.85	12.32 ± 1.16	10.74** [10.18,11.31]	-0.31* [-0.56,-0.06]	10.43** [9.87,11.01]
Doffing of PPE	18	Dolakha (n=27)	6.96±6.07	17.41±0.93	17.33±1.11	10.44**	-0.07	10.37**
		Myagdi (n=23)	2.17±2.98	16.22 ± 3.13	17.57 ± 0.95	14.04**	1.35	15.39**
		Sarlahi (n=36)	1.36 ± 3.71	17.67 ± 0.83	16.28 ± 3.22	16.31**	-1.39*	14.92**
		Udayapur (n=47)	0.19±1.06	17.62±1.03	17.34±1.45	17.43**	-0.28	17.15**
		Overall (n=133)	2.23 ± 4.36	17.35 ± 1.62	17.09 ± 2.03	15.12** [14.34,15.90]	-0.26 [-0.71,0.20]	14.86** [14.07,15.66]
Preparing 0.5% chlorine solution	15	Dolakha (n=27)	9.41±4.67	14.89±0.42	14.48±0.75	5.48**	-0.41*	5.07**
		Myagdi (n=23)	8.04±5.02	14.57 ± 0.90	14.91 ± 0.29	6.52**	0.35	6.87**
		Sarlahi (n=36)	9.11 ± 4.90	14.81 ± 0.62	14.72 ± 0.70	5.70**	-0.09	5.61**
		Udayapur (n=47)	8.47±4.64	14.68±0.63	14.43±0.88	6.21**	-0.26	5.96**
		Overall (n=133)	8.76 ± 4.75	14.74 ± 0.65	14.60 ± 0.75	5.98** [5.16,6.80]	-0.14 [-0.30,0.03]	5.84** [5.04,6.65]
Decontamination	8	Dolakha (n=27)	4.93±2.22	8.00±0.00	7.93±0.27	3.07**	-0.07	3.00**
		Myagdi (n=23)	3.52±1.95	7.70 ± 0.88	8.00 ± 0.00	4.17**	0.30	4.48**
		Sarlahi (n=36)	4.78 ± 2.65	7.89 ± 0.32	7.81 ± 0.40	3.11**	-0.08	3.03**
		Udayapur (n=47)	4.81±2.28	7.85±0.55	7.83±0.43	3.04**	-0.02	3.02**
		Overall (n=133)	4.60 ± 2.35	7.86 ± 0.52	7.87 ± 0.36	3.26** [2.86,3.67]	0.01 [-0.11,0.12]	3.27** [2.86, 3.69]

Modules and skills/ procedures	Full scores	Districts	Obtained mean score			Difference		
			Baseline	Midline	Endline	M-B	E-M	E-B
Cleaning and drying instrument	9	Dolakha (n=27)	4.74±3.01	8.96±0.19	9.00±0.00	4.22**	0.04	4.26**
		Myagdi (n=23)	3.91±2.41	8.70 ± 0.63	8.87 ± 0.46	4.78**	0.17	4.96**
		Sarlahi (n=36)	5.94 ± 2.82	8.78 ± 0.64	8.69 ± 0.52	2.84**	-0.09	2.75**
		Udayapur (n=47)	5.30±2.72	8.81±0.58	8.83±0.60	3.51**	0.02	3.53**
		Overall (n=133)	5.12 ± 2.81	8.81 ± 0.55	8.83 ± 0.50	3.69** [3.20,4.18]	0.02 [-0.10,0.14]	3.71** [3.23,4.20]
Wrapping, sterilizing and storing for IP	13	Dolakha (n=27)	6.41±3.86	12.07±1.27	11.93±1.14	5.67**	-0.15	5.52**
		Myagdi (n=23)	5.70±3.17	11.26 ± 1.86	12.57 ± 0.95	5.57**	1.30**	6.87**
		Sarlahi (n=36)	5.64 ± 3.36	11.86 ± 1.33	12.25 ± 0.84	6.22**	0.39	6.61**
		Udayapur (n=47)	6.19±3.33	11.96±1.38	12.04±1.40	5.77**	0.09	5.85**
		Overall (n=133)	6.00 ± 3.40	11.83 ± 1.45	12.17 ± 1.15	5.83** [5.23,6.44]	0.34* [0.05,0.61]	6.17** [5.58,6.75]
Module 2: ANC, counseling and referral								
Antenatal care and counselling	31	Dolakha (n=27)	12.85±6.43	26.81±3.22	27.37±3.01	13.96**	0.56	14.52**
		Myagdi (n=23)	12.39 ± 5.13	27.09 ± 3.12	28.09 ± 5.58	14.70**	1.00	15.70**
		Sarlahi (n=36)	9.44 ± 4.36	28.14 ± 1.91	28.39 ± 2.10	18.70**	0.25	18.95**
		Udayapur (n=47)	14.19±6.55	25.62±3.58	27.85±1.94	11.43**	2.23**	13.66**
		Overall (n=133)	12.32 ± 6.01	26.80 ± 3.18	27.94 ± 3.10	14.47** [13.35,15.60]	1.14** [0.49,1.79]	15.62** [14.54,16.69]
Referral procedure	11	Dolakha (n=27)	4.30±2.40	10.52±0.80	10.07±1.14	6.22**	-0.44	5.78**
		Myagdi (n=23)	5.26 ± 2.45	10.30 ± 1.61	10.91 ± 0.29	5.04**	0.61	5.65**
		Sarlahi (n=36)	3.69 ± 2.05	9.67 ± 1.35	10.11 ± 0.62	5.98**	0.44	6.42**
		Udayapur (n=47)	5.53±2.77	10.00±1.35	10.32±0.66	4.47**	0.32	4.79**
		Overall (n=133)	4.74 ± 2.56	10.07 ± 1.33	10.32 ± 0.78	5.33** [4.86,5.80]	0.25 [0.00,0.50]	5.58** [5.15,6.01]
Module 3: Essential care for labor and birth								
Abdominal examination	12	Dolakha (n=27)	5.70±2.88	10.85±1.10	10.19±1.33	5.15**	-0.67*	4.48**
		Myagdi (n=23)	4.48 ± 2.73	10.52 ± 1.31	11.35 ± 0.65	6.04**	0.83**	6.87**
		Sarlahi (n=36)	4.47 ± 2.70	11.19 ± 1.01	11.00 ± 0.99	6.72**	-0.19	6.53**
		Udayapur (n=47)	5.11±3.19	10.26±1.48	10.43±1.21	5.15**	0.17	5.32**
		Overall (n=133)	4.95 ± 2.93	10.68 ± 1.31	10.69 ± 1.17	5.73** [5.18,6.28]	0.02 [-0.24,0.27]	5.74** [5.21,6.28]
Vaginal Examination	12	Dolakha (n=27)	6.33±2.39	11.07±1.00	9.96±1.16	4.74**	-1.11**	3.63**
		Myagdi (n=23)	5.00 ± 2.61	10.17 ± 1.50	10.96 ± 0.93	5.17**	0.78**	5.96**
		Sarlahi (n=36)	4.69 ± 2.68	10.94 ± 1.12	11.11 ± 1.01	6.25**	0.17	6.42**
		Udayapur (n=47)	5.83±2.71	9.87±1.51	10.26±1.31	4.04**	0.38	4.43**
		Overall (n=133)	5.48 ± 2.67	10.46 ± 1.41	10.55 ± 1.22	4.98** [4.47,5.48]	0.09 [-0.19,0.37]	5.07** [4.56,5.58]
Support during birth	17	Dolakha (n=27)	10.04±3.90	16.11±1.37	16.11±1.01	6.07**	0.00	6.07**
		Myagdi (n=23)	11.78 ± 4.23	16.09 ± 0.73	16.74 ± 0.45	4.31**	0.65**	4.96**
		Sarlahi (n=36)	10.06 ± 3.27	16.56 ± 0.94	16.00 ± 1.12	6.50**	-0.56	5.94**
		Udayapur (n=47)	10.02±4.42	15.64±1.13	16.00±0.88	5.62**	0.36*	5.98**
		Overall (n=133)	10.34 ± 4.01	16.06 ± 1.13	16.15 ± 0.96	5.72** [5.06,6.38]	0.09 [-0.15,0.33]	5.81** [5.14,6.49]
Partograph (clinical decision-making skills	13	Dolakha (n=27)	7.48±2.64	12.44±1.12	12.30±1.23	4.96**	-0.15	4.81**
		Myagdi (n=23)	7.52 ± 2.81	11.30 ± 2.20	12.48 ± 0.90	3.78**	1.18	4.96
		Sarlahi (n=36)	7.33 ± 3.32	11.83 ± 1.18	11.83 ± 0.85	4.50**	0.00	4.50**
		Udayapur (n=47)	7.60±3.74	10.06±1.48	11.43±0.88	2.47**	1.36**	3.83**
		Overall (n=133)	7.49 ± 3.24	11.24 ± 2.07	11.89 ± 1.51	3.75** [3.21,4.29]	0.65 [0.32,0.99]	4.41** [3.87,4.94]
Vacuum delivery	25	Dolakha (n=10)	11.70±5.74	23.80±1.14	23.70±2.11	12.10**	-0.10	12.00**
		Myagdi (n=5)	14.00 ± 5.70	23.20 ± 1.48	24.00 ± 1.00	9.20**	0.80	10.00*
		Sarlahi (n=5)	6.40 ± 6.11	24.60 ± 0.55	22.00 ± 0.00	18.20**	-2.60**	15.60**
		Udayapur (n=7)	5.71±9.76	21.86±2.19	22.43±2.07	16.15**	0.57	16.71**
		Overall (n=27)	9.59 ± 7.45	23.33 ± 1.71	23.11 ± 1.83	13.74** [10.81,16.67]	-0.22 [-1.19,-0.47]	13.52** [10.63,16.41]
Module 4: Helping babies breathe								
Checklist 1: Evaluation of HBB	12	Dolakha (n=27)	6.22±3.06	11.37±0.84	11.56±0.70	5.15**	0.19	5.33**
		Myagdi (n=23)	5.48 ± 3.51	11.52 ± 0.59	11.61 ± 0.58	6.04**	0.09	6.13**
		Sarlahi (n=36)	5.28 ± 2.60	11.56 ± 1.11	10.81 ± 0.92	6.28**	-0.75**	5.53**
		Udayapur (n=47)	5.45±2.95	10.89±1.32	11.02±1.17	5.45**	0.13	5.57**
		Overall (n=133)	5.56 ± 2.97	11.28 ± 1.10	11.17 ± 0.98	5.72** [5.20,6.23]	-0.11 [-0.36,0.15]	5.61** [5.10,6.12]
Checklist 2: Golden minute	23	Dolakha (n=27)	8.96±5.50	20.30±2.20	21.63±2.15	11.33**	1.33**	12.67**
		Myagdi (n=23)	7.09 ± 5.88	20.96 ± 2.25	21.87 ± 1.25	13.87**	0.91	14.78**
		Sarlahi (n=36)	7.94 ± 5.10	20.97 ± 2.56	21.06 ± 1.41	13.03**	0.09	13.12**

Modules and skills/ procedures	Full scores	Districts	Obtained mean score			Difference		
			Baseline	Midline	Endline	M-B	E-M	E-B
		Udayapur (n=47)	6.79±5.23	18.87±3.40	19.83±2.50	12.09**	0.96	13.04**
		Overall (n=133)	7.59 ± 5.37	20.09 ± 2.90	20.88 ± 2.14	12.50** [11.57,13.43]	0.79** [0.31,1.27]	13.29** [12.43,14.15]
Module 5: Bleeding after birth								
Active management of third stage of labor	12	Dolakha (n=27)	7.41±3.20	11.44±0.93	11.63±0.84	4.04**	0.19	4.22**
		Myagdi (n=23)	7.61 ± 3.30	11.30 ± 0.82	11.91 ± 0.29	3.69**	0.61**	4.30**
		Sarlahi (n=36)	6.75 ± 2.18	11.78 ± 0.59	11.61 ± 0.77	5.03**	-0.17	4.86**
		Udayapur (n=47)	7.34±3.40	11.49±0.91	11.83±0.52	4.15**	0.34*	4.49**
		Overall (n=133)	7.24 ± 3.04	11.53 ± 0.83	11.74 ± 0.65	4.29** [3.78,4.80]	0.21* [0.05,0.39]	4.50** [3.97,5.03]
Retained placenta	18	Dolakha (n=10)	6.90±3.73	17.70±0.48	16.60±1.65	10..80**	-1.10	9.70**
		Myagdi (n=5)	9.40 ± 4.34	17.00 ± 0.71	16.40 ± 1.34	7.60**	-0.60	7.00**
		Sarlahi (n=5)	6.60 ± 3.65	18.00 ± 0.00	16.00 ± 1.00	11.40**	-2.00*	9.40**
		Udayapur (n=7)	11.57±3.65	16.14±1.78	16.29±1.11	4.57**	0.15	4.72**
		Overall (n=27)	8.52 ± 4.15	17.22 ± 1.19	16.37 ± 1.31	8.70** [6.82,10.59]	-0.85* [-1.54,-0.16]	7.85** [6.42,9.28]
Management of atony	15	Dolakha (n=27)	5.15±3.17	13.48±1.48	13.41±1.12	8.33**	-0.07	8.26**
		Myagdi (n=23)	5.13 ± 2.90	13.39 ± 1.08	13.87 ± 0.69	8.26**	0.48	8.74**
		Sarlahi (n=36)	4.19 ± 2.62	14.03 ± 1.30	13.58 ± 1.38	9.84**	-0.45	9.39**
		Udayapur (n=47)	6.72±3.52	12.51±2.00	12.55±1.35	5.79**	0.04	5.83**
		Overall (n=133)	5.44 ± 3.25	13.27 ± 1.68	13.23 ± 1.32	7.83** [7.21,8.45]	-0.04 [-0.36,0.28]	7.79** [7.20,8.38]
Uterine balloon tamponade	13	Dolakha (n=27)	2.11±4.05	12.07±0.96	12.15±1.63	9.96**	0.07	10.04**
		Myagdi (n=23)	2.04 ± 3.57	12.22 ± 1.04	12.65 ± 0.65	10.18**	0.43	10.61**
		Sarlahi (n=36)	3.00 ± 3.80	12.31 ± 0.98	11.83 ± 2.12	9.31**	-0.48	8.83**
		Udayapur (n=47)	3.21±4.53	10.81±2.25	11.30±1.82	7.60**	0.49	8.09**
		Overall (n=133)	2.73 ± 4.08	11.71 ± 1.68	11.85 ± 1.78	8.98** [8.25,9.72]	0.14 [-0.21,0.48]	9.12** [8.40,9.85]
Repair of cervical tear	9	Dolakha (n=27)	1.48±2.47	8.04±0.98	7.41±1.08	6.56**	-0.63*	5.93**
		Myagdi (n=23)	1.48 ± 2.29	7.78 ± 1.13	8.04 ± 0.71	6.30**	0.26	6.56**
		Sarlahi (n=36)	0.58 ± 1.46	8.25 ± 0.94	8.47 ± 0.56	7.67**	0.22	7.89**
		Udayapur (n=47)	2.43±2.65	7.09±1.92	7.57±1.02	4.66**	0.49	5.15**
		Overall (n=133)	1.57 ± 2.37	7.71 ± 1.47	7.86 ± 0.97	6.14** [5.70,6.59]	0.15 [-0.11,0.41]	6.29** [5.85,6.73]
Shock management	13	Dolakha (n=27)	6.19±2.43	11.67±1.59	11.89±0.97	5.48**	0.22	5.70**
		Myagdi (n=23)	5.52 ± 2.66	12.35 ± 1.15	12.57 ± 0.66	6.83**	0.22	7.05**
		Sarlahi (n=36)	5.42 ± 2.73	12.28 ± 1.03	12.36 ± 0.90	6.86**	0.08	6.94**
		Udayapur (n=47)	6.19±3.66	10.98±1.78	11.43±1.51	4.79**	0.45	5.23**
		Overall (n=133)	5.86 ± 3.02	11.71 ± 1.57	11.97 ± 1.22	5.85** [5.34,6.35]	0.26* [0.01,0.51]	6.11** [5.60,6.61]
Module 6: Pre-eclampsia and eclampsia management								
Administering loading dose	9	Dolakha (n=27)	4.19±3.39	8.33±0.78	8.59±0.64	4.15**	0.26	4.41**
		Myagdi (n=23)	3.39 ± 2.95	8.96 ± 0.21	8.78 ± 0.52	5.57**	-0.18	5.39**
		Sarlahi (n=36)	2.25 ± 2.79	8.33 ± 0.83	8.36 ± 0.72	6.08**	0.03	6.11**
		Udayapur (n=47)	3.87±3.03	7.77±1.35	8.00±1.27	3.89**	0.23	4.13**
		Overall (n=133)	3.41 ± 3.09	8.24 ± 1.06	8.35 ± 0.96	4.83** [4.28,5.38]	0.11 [-0.11,0.33]	4.94** [4.42,5.46]
Care in convulsion	11	Dolakha (n=27)	5.96±3.14	9.78±1.34	10.04±1.02	3.81**	0.26	4.07**
		Myagdi (n=23)	4.04 ± 3.08	10.35 ± 0.78	10.26 ± 2.12	6.31**	-0.09	6.22**
		Sarlahi (n=36)	4.25 ± 2.62	10.00 ± 0.89	10.08 ± 1.05	5.75**	0.08	5.83**
		Udayapur (n=47)	4.55±3.18	8.70±1.71	8.98±1.34	4.15**	0.28	4.43**
		Overall (n=133)	4.67 ± 3.06	9.56 ± 1.45	9.71 ± 1.47	4.89** [4.39,5.38]	0.15 [-0.13,0.45]	5.04** [4.50,5.60]
Monitoring magnesium sulphate toxicity	8	Dolakha (n=27)	4.30±2.38	7.15±0.99	7.11±0.93	2.85**	-0.04	2.81**
		Myagdi (n=23)	3.04 ± 2.38	7.74 ± 0.62	7.74 ± 0.45	4.70**	0.00	4.70**
		Sarlahi (n=36)	2.72 ± 2.49	6.89 ± 1.28	7.11 ± 1.47	4.17**	0.22	4.39**
		Udayapur (n=47)	3.23±2.59	6.19±1.24	6.32±1.25	2.96**	0.13	3.09**
		Overall (n=133)	3.28 ± 2.52	6.84 ± 1.24	6.94 ± 1.26	3.56** [3.16,3.97]	0.10 [-0.11.0.30]	3.66** [3.26,4.07]
Module 7: Postnatal Care and Counseling								
Postnatal care and counseling	22	Dolakha (n=27)	7.74±4.61	19.33±2.15	20.15±1.66	11.59**	0.81	12.41**
		Myagdi (n=23)	8.87 ± 3.92	19.87 ± 1.58	20.35 ± 1.23	11.00**	0.48	11.48**
		Sarlahi (n=36)	6.08 ± 3.64	19.53 ± 2.02	19.36 ± 1.99	13.45**	-0.17	13.28**
		Udayapur (n=47)	9.72±4.64	18.81±2.60	19.96±1.71	9.09**	1.15**	10.23**
		Overall (n=133)	8.19 ± 4.47	19.29 ± 2.22	19.90 ± 1.73	11.10** [10.28,11.93]	0.61** [0.24,0.98]	11.71** [10.99,12.44]

*P<0.05; **p<0.01

Table 30: Skills assessment scores of intervention group participants in each procedure (expressed in percentage)

Modules and skills/ procedures	Full scores	Districts	Obtained mean score (in percentage)			Difference		
			Baseline	Midline	Endline	M-B	E-M	E-B
Module 1: Infection prevention practices								
Hand washing	9	Dolakha (n=27)	67.08±19.61	97.53±6.42	97.53±4.71	30.45**	0.00	30.45**
		Myagdi (n=23)	70.05 ± 14.38	96.62±7.81	98.55±3.83	26.57**	1.93	28.50**
		Sarlahi (n=36)	60.80± 20.83	93.83±7.72	95.68±7.17	33.02**	1.85	34.88**
		Udayapur (n=47)	67.38±19.02	93.14±8.21	93.85±8.29	25.77**	0.71	26.48**
		Overall (n=133)	66.00 ± 19.04	94.82±7.80	95.91±6.90	28.82** [25.38,32.26]	1.09 [-0.47,2.64]	29.91** [26.56,33.26]
Putting and removing gloves	12	Dolakha (n=27)	76.54±24.35	98.46±5.19	98.15±5.34	21.91**	-0.31	21.60**
		Myagdi (n=23)	67.03 ± 20.33	93.84±9.13	99.28±3.48	26.81**	5.43**	32.25**
		Sarlahi (n=36)	62.50 ± 27.78	96.99±6.65	97.22±5.63	34.49**	0.23	34.72**
		Udayapur (n=47)	68.79±26.49	96.45±5.42	99.11±3.12	27.66**	2.66**	30.32**
		Overall (n=133)	68.36 ± 25.66	96.55±6.58	98.43±4.49	28.20** [23.80,32.59]	1.88** [0.54,3.22]	30.08** [25.70,34.45]
Donning of PPE	13	Dolakha (n=27)	35.61±31.07	96.01±6.17	95.73±6.86	60.40**	-0.28	60.11**
		Myagdi (n=23)	21.4 ± 23.99	94.31±10.17	97.66±4.88	72.91**	3.34	76.25**
		Sarlahi (n=36)	10.26 ± 23.04	98.93±2.70	90.81±11.31	88.68**	-8.12**	80.56**
		Udayapur (n=47)	2.29±8.01	97.87±6.16	95.91±8.62	95.58**	-1.96	93.62**
		Overall (n=133)	14.52 ± 24.63	97.17±6.52	94.79±8.91	82.65** [78.30,87.00]	-2.37* [-4.29,-0.46]	80.28** [75.90,84.65]
Doffing of PPE	18	Dolakha (n=27)	38.68±33.70	96.71±5.17	96.30±6.16	58.02**	-0.41	57.61**
		Myagdi (n=23)	12.08 ± 16.55	90.10±17.4	97.58±5.25	78.02**	7.49	85.51**
		Sarlahi (n=36)	7.56 ± 20.62	98.15±4.60	90.43±17.90	90.59**	-7.72*	82.87**
		Udayapur (n=47)	1.06±5.87	97.87±5.74	96.34±8.05	96.81**	-1.54	95.27**
		Overall (n=133)	12.36 ± 24.24	96.37±9.02	94.95±11.29	84.00** [79.68,88.32]	-1.42 [-3.95,1.11]	82.58** [78.16,87.00]
Preparing 0.5% chlorine solution	15	Dolakha (n=27)	62.72±31.12	99.26±2.82	96.54±5.02	36.54**	-2.72*	33.83**
		Myagdi (n=23)	53.62 ± 33.48	97.10±5.97	99.42±1.92	43.48**	2.32	45.80**
		Sarlahi (n=36)	60.74 ± 32.65	98.70±4.16	98.15±4.68	37.96**	-0.56	37.41**
		Udayapur (n=47)	56.45±30.95	97.87±4.19	96.17±5.86	41.42**	-1.70	39.72**
		Overall (n=133)	58.40 ± 31.70	98.25±4.33	97.34±4.99	39.85** [34.38,45.32]	-0.90 [-2.01,0.21]	38.95 [33.60,44.30]
Decontamination	8	Dolakha (n=27)	61.57±27.72	100.00±0.00	99.07±3.34	38.43**	-0.93	37.50**
		Myagdi (n=23)	44.02 ± 24.39	96.20±10.95	100.00±0	52.17**	3.80	55.98**
		Sarlahi (n=36)	59.72 ± 33.15	98.61±3.98	97.57±5.02	38.89**	-1.04	37.85**
		Udayapur (n=47)	60.11±28.51	98.14±6.89	97.87±5.42	38.03**	-0.27	37.77**
		Overall (n=133)	57.52 ± 29.39	98.31±6.49	98.40±4.46	40.79** [35.72,45.86]	0.09 [-1.31,1.50]	40.88** [3.70,46.07]
Cleaning and drying instrument	9	Dolakha (n=27)	52.67±33.42	99.59±2.14	100.00±0.00	46.91**	0.41	47.33**
		Myagdi (n=23)	43.48 ± 26.78	96.62±7.06	98.55±5.09	53.14**	1.93	55.07**
		Sarlahi (n=36)	66.05 ± 31.31	97.53±7.08	96.60±5.83	31.48**	-0.93	30.56**
		Udayapur (n=47)	58.87±30.20	97.87±6.40	98.11±6.68	39.01**	0.24	39.24**
		Overall (n=133)	56.89 ± 31.25	97.91±6.14	98.16±5.50	41.02** [35.55,46.49]	0.25 [-1.09,1.59]	41.27** [35.89,46.65]
Wrapping, sterilizing and storing for IP	13	Dolakha (n=27)	49.29±29.66	92.88±9.76	91.74±8.78	43.59**	-1.14	42.45**
		Myagdi (n=23)	43.81 ± 24.37	86.62±14.33	96.65±7.27	42.81**	10.03**	52.84**
		Sarlahi (n=36)	43.38 ± 25.88	91.24±10.26	94.23±6.47	47.86**	2.99	50.85**
		Udayapur (n=47)	47.63±25.59	91.98±10.63	92.64±10.75	44.35**	0.65	45.01**
		Overall (n=133)	46.15 ± 26.15	91.04±11.17	93.58±8.84	44.88** [40.26,49.50]	2.54* [0.39,4.70]	47.43** [42.92,51.94]
Module 2: ANC, counseling and referral								
Antenatal care and counselling	31	Dolakha (n=27)	41.46±20.73	86.50±10.40	88.29±9.72	45.04**	1.79	46.83**
		Myagdi (n=23)	39.97 ± 16.56	87.38±10.06	90.60±17.98	47.41**	3.23	50.63**
		Sarlahi (n=36)	30.47 ± 14.06	90.77±6.18	91.58±6.78	60.30**	0.81	61.11**
		Udayapur (n=47)	45.78±21.14	82.64±11.54	89.84±6.27	36.86**	7.21**	44.06**
		Overall (n=133)	39.75 ± 19.38	86.44±10.25	90.13±9.99	46.69** [43.06,50.31]	3.69** [1.60,5.78]	50.38** [46.91,53.85]
Referral procedure	11	Dolakha (n=27)	39.06±21.81	95.62±7.29	91.58±10.37	56.57**	-4.04	52.53**
		Myagdi (n=23)	47.83 ± 22.30	93.68±14.62	99.21±2.62	45.85**	5.53	51.38**
		Sarlahi (n=36)	33.59 ± 18.67	87.88±12.29	91.92±5.66	54.29**	4.04	58.33**

Modules and skills/ procedures	Full scores	Districts	Obtained mean score (in percentage)			Difference		
			Baseline	Midline	Endline	M-B	E-M	E-B
		Udayapur (n=47)	50.29±25.14	90.91±12.28	93.81±6.03	40.62**	2.90	43.52**
		Overall (n=133)	43.06 ± 23.23	91.52±12.11	93.78±7.11	48.46** [44.15,52.77]	2.26 [-0.03,4.55]	50.72** [46.80,54.63]
Module 3: Essential care for labor and birth								
Abdominal examination	12	Dolakha (n=27)	47.53±24.00	90.43±9.16	84.88±11.09	42.90**	-5.56*	37.35**
		Myagdi (n=23)	37.32 ± 22.73	87.68±10.91	94.57±5.39	50.36**	6.88**	57.25**
		Sarlahi (n=36)	37.27 ± 22.49	93.29±8.41	91.67±8.21	56.02**	-1.62	54.40**
		Udayapur (n=47)	42.55±26.59	85.46±12.34	86.88±10.09	42.91**	1.42	44.33**
		Overall (n=133)	41.23 ± 24.41	88.97±10.88	89.10±9.74	47.74** [43.16,52.33]	0.13 [-1.03,2.28]	47.87** [43.43,52.31]
Vaginal Examination	12	Dolakha (n=27)	52.78±19.88	92.28±8.31	83.02±9.66	39.51**	-9.26**	30.25**
		Myagdi (n=23)	41.67 ± 21.76	84.78±12.48	91.30±7.74	43.12**	6.52**	49.64**
		Sarlahi (n=36)	39.12 ± 22.34	91.20±9.33	92.59±8.40	52.08**	1.39	53.47**
		Udayapur (n=47)	48.58±22.54	82.27±12.60	85.46±10.92	33.69**	3.19	36.88**
		Overall (n=133)	45.68 ± 22.23	87.16±11.72	87.91±10.18	41.48** [37.27,45.69]	0.75 [-1.60,5.78]	42.23** [37.96,46.50]
Support during birth	17	Dolakha (n=27)	59.04±22.93	94.77±8.05	94.77±5.96	35.73**	0.00	35.73**
		Myagdi (n=23)	69.31 ± 24.89	94.63±4.31	98.47±2.64	25.32**	3.84**	29.16**
		Sarlahi (n=36)	59.15 ± 19.23	97.39±5.53	94.12±6.60	38.24**	-3.27	34.97**
		Udayapur (n=47)	58.95±25.98	91.99±6.65	94.12±5.20	33.04**	2.13*	35.17**
		Overall (n=133)	60.81 ± 23.56	94.47±6.63	95.00±5.63	33.66** [29.76,37.56]	0.53 [-0.87,1.93]	34.19** [30.23,38.15]
Partograph (clinical decision-making skills	13	Dolakha (n=27)	57.55±20.28	95.73±8.62	94.59±9.50	38.18**	-1.14	37.04**
		Myagdi (n=23)	57.86 ± 21.62	86.96±16.95	95.99±6.91	29.10**	9.03*	38.13**
		Sarlahi (n=36)	56.41 ± 25.55	91.03±9.10	91.03±6.50	34.62**	0.00	34.62**
		Udayapur (n=47)	58.43±28.77	77.41±18.25	87.89±15.86	18.99**	10.47**	29.46**
		Overall (n=133)	57.61 ± 24.92	86.47±15.90	91.50±11.61	28.86** [24.68,33.04]	5.03** [2.44,7.62]	33.89** [29.78,38.01]
Vacuum delivery	25	Dolakha (n=10)	46.80±22.94	95.20±4.54	94.00±8.44	48.40**	-1.20	47.20**
		Myagdi (n=5)	56.00 ± 22.80	92.80±5.93	96.00±4.00	36.80**	3.20	40.00**
		Sarlahi (n=5)	25.60 ± 24.43	98.40±2.19	88.00±0.00	72.80**	-10.40**	62.40**
		Udayapur (n=7)	22.86±39.04	87.43±8.78	89.71±8.28	64.57**	2.28	66.85**
		Overall (n=27)	38.37 ± 29.82	93.33±6.84	92.44±7.30	54.96** [43.23,66.69]	-0.89 [-4.77,2.99]	54.07** [42.52,65.63]
Module 4: Helping babies breathe								
General Evaluation of HBB	12	Dolakha (n=27)	51.85±25.46	94.75±6.99	96.30±5.82	42.90**	1.54	44.44**
		Myagdi (n=23)	45.65 ± 29.29	96.01±4.94	96.74±4.86	50.36**	0.72	51.09**
		Sarlahi (n=36)	43.98 ± 21.70	96.30±9.22	90.05±7.67	52.31**	-6.25**	46.06**
		Udayapur (n=47)	45.39±24.56	90.78±11.02	91.84±9.75	45.39**	1.06	46.45**
		Overall (n=133)	46.37 ± 24.77	93.98±9.19	93.11±8.17	47.62** [43.30,51.93]	-0.88 [-3.01,1.26]	46.74** [42.52,65.63]
Resuscitation within Golden 1 minute	23	Dolakha (n=27)	38.97±23.92	88.24±9.56	94.04±9.35	49.28**	5.80**	55.07**
		Myagdi (n=23)	30.81 ± 25.59	91.12±9.76	95.08±5.45	60.30**	3.97	64.27**
		Sarlahi (n=36)	34.54 ± 22.17	91.18±11.12	91.55±6.14	56.64**	0.36	57.00**
		Udayapur (n=47)	29.51±22.75	82.05±14.78	86.22±10.89	52.54**	4.16	56.71**
		Overall (n=133)	33.02 ± 23.36	87.35±12.62	90.78±9.30	54.33** [50.29,58.28]	3.43** [1.34,5.53]	57.76** [54.02,61.50]
Module 5: Bleeding after birth								
Active management of third stage of labor	12	Dolakha (n=27)	61.73±26.68	95.37±7.78	96.91±6.99	33.64**	1.54	35.19
		Myagdi (n=23)	63.41 ± 27.49	94.20±6.85	99.28±2.40	30.80**	5.07**	35.87**
		Sarlahi (n=36)	56.25 ± 18.19	98.15±4.92	96.76±6.39	41.90**	-1.39	40.51**
		Udayapur (n=47)	61.17±28.35	95.74±7.55	98.58±4.37	34.57**	2.84*	37.41**
		Overall (n=133)	60.34 ± 25.32	96.05±6.93	97.87±5.39	35.71** [31.46,39.96]	1.82* [0.41,3.23]	37.53** [33.11,41.95]
Retained placenta	18	Dolakha (n=10)	38.33±20.70	98.33±2.68	92.22±9.15	60.00**	-6.11	53.89**
		Myagdi (n=5)	52.22 ± 24.09	94.44±3.93	91.11±7.45	42.22**	-3.33	38.89**
		Sarlahi (n=36)	36.67 ± 20.26	100.00±0.00	88.89±5.56	63.33**	-11.11*	52.22**
		Udayapur (n=7)	64.29±20.25	89.68±9.85	90.48±6.18	25.39**	-0.80	26.19**
		Overall (n=27)	47.33 ± 23.03	95.68±6.60	90.95±7.25	48.35** [37.87,58.84]	-4.73* [-8.57,-0.89]	43.62** [35.68,51.56]
Management of atony	15	Dolakha (n=27)	34.32±21.14	89.88±9.85	89.38±7.46	55.56**	-0.49	55.06**
		Myagdi (n=23)	34.20 ± 19.31	89.28±7.17	92.46±4.63	55.07**	3.19	58.26**
		Sarlahi (n=36)	27.96 ± 17.44	93.52±8.65	90.56±9.21	65.56**	-2.96	62.59**
		Udayapur (n=47)	44.82±23.46	83.40±13.32	83.69±8.99	38.58**	0.28	38.87**
		Overall (n=133)	36.29 ± 21.66	88.47±11.23	88.22±8.80	52.18**	-0.25	51.93**

Modules and skills/ procedures	Full scores	Districts	Obtained mean score (in percentage)			Difference		
			Baseline	Midline	Endline	M-B	E-M	E-B
						[48.06,56.30]	[-2.38,1.88]	[48.00,55.86]
Uterine balloon tamponade	13	Dolakha (n=27)	16.24±31.16	92.88±7.37	93.45±12.57	76.64**	0.57	77.21**
		Myagdi (n=23)	15.72 ± 27.49	93.98±8.02	97.32±4.98	78.26**	3.34	81.61**
		Sarlahi (n=36)	23.08 ± 29.25	94.66±7.54	91.03±16.29	71.58**	-3.63	67.95**
		Udayapur (n=47)	24.71±34.84	83.14±17.32	86.91±13.98	58.43**	3.76	62.19**
		Overall (n=133)	20.99 ± 31.35	90.11±12.97	91.15±13.70	69.12** [63.46,74.77]	1.04 [-1.59,3.67]	70.16** [64.58,75.73]
Repair of cervical tear	9	Dolakha (n=27)	16.46±27.45	89.30±10.89	82.30±12.04	72.84**	-7.00*	65.84**
		Myagdi (n=23)	16.43 ± 25.49	86.47±12.52	89.37±7.84	70.05**	2.90	72.95**
		Sarlahi (n=36)	6.48 ± 16.24	91.67±10.41	94.14±6.22	85.19**	2.47	87.65**
		Udayapur (n=47)	26.95±29.47	78.72±21.34	84.16±11.29	51.77**	5.44	57.21**
		Overall (n=133)	17.46 ± 26.35	85.71±16.33	87.39±10.75	68.25** [63.28,73.23]	1.67 [-1.23,4.57]	69.92 [64.99,74.86]
Shock management	13	Dolakha (n=27)	47.58±18.73	89.74±12.26	91.45±7.49	42.17**	1.71	43.87**
		Myagdi (n=23)	42.47 ± 20.47	94.98±8.86	96.66±5.10	52.51**	1.67	54.18**
		Sarlahi (n=36)	41.67 ± 21.00	94.44±7.93	95.09±6.92	52.78**	0.64	53.42**
		Udayapur (n=47)	47.63±28.13	84.45±13.66	87.89±11.65	36.82**	3.44	40.26**
		Overall (n=133)	45.11 ± 23.23	90.05±12.04	92.08±9.37	44.94** [41.06,48.82]	2.02* [0.09,3.96]	46.96** [43.06,46.96]
Module 6: Pre-eclampsia and eclampsia management								
Administering loading dose	9	Dolakha (n=27)	46.50±37.62	92.59±8.72	95.47±7.07	46.09**	2.88	48.97**
		Myagdi (n=23)	37.68 ± 32.78	99.52±2.32	97.58±5.76	61.84**	-1.93	59.90**
		Sarlahi (n=36)	25.00 ± 31.02	92.59±9.20	92.90±8.04	67.59**	0.31	67.90**
		Udayapur (n=47)	43.03±33.62	86.29±15.05	88.89±14.09	43.26**	2.60	45.86**
		Overall (n=133)	37.93 ± 34.30	91.56±11.78	92.82±10.61	53.63** [47.51,59.75]	1.25 [-1.18,3.69]	54.89** [49.14,60.63]
Care in convulsion	11	Dolakha (n=27)	54.21±28.58	88.89±12.18	91.25±9.26	34.68**	2.36	37.04**
		Myagdi (n=23)	36.76 ± 28.02	94.07±7.05	93.28±19.23	57.31**	-0.79	56.52**
		Sarlahi (n=36)	38.64 ± 23.84	90.91±8.13	91.67±9.57	52.27**	0.76	53.03**
		Udayapur (n=47)	41.39±28.92	79.11±15.51	81.62±12.21	37.72**	2.51	40.23**
		Overall (n=133)	42.45 ± 27.79	86.88±13.21	88.31±13.41	44.43** [39.91,48.95]	1.44 [-1.18,3.69]	45.86** [40.86,50.87]
Monitoring magnesium sulphate toxicity	8	Dolakha (n=27)	53.70±29.79	89.35±12.36	88.89±11.67	35.65**	-0.46	35.19**
		Myagdi (n=23)	38.04 ± 29.79	96.74±7.74	96.74±5.61	58.70**	0.00	58.70**
		Sarlahi (n=36)	34.03 ± 31.14	86.11±16.03	88.89±18.37	52.08**	2.78	54.86**
		Udayapur (n=47)	40.43±32.37	77.39±15.56	78.99±15.66	36.97**	1.60	38.56**
		Overall (n=133)	40.98 ± 31.51	85.53±15.53	86.75±15.75	44.55** [39.52,49.58]	1.22 [-1.36,3.81]	45.77** [40.69,50.85]
Module 7: Postnatal Care and Counseling								
Postnatal care and counseling	22	Dolakha (n=27)	35.19±20.97	87.88±9.77	91.58±7.53	52.69**	3.70	56.40**
		Myagdi (n=23)	40.32 ± 17.83	90.32±7.16	92.49±5.59	50.00**	2.17	52.17**
		Sarlahi (n=36)	27.65 ± 16.53	88.76±9.19	88.01±9.04	61.11**	-0.76	60.35**
		Udayapur (n=47)	44.20±21.10	85.49±11.82	90.72±7.76	41.30**	5.22**	46.52**
		Overall (n=133)	37.22 ± 20.30	87.70±10.08	90.46±7.85	50.48** [46.72,54.24]	2.77** [1.07,4.46]	53.25** [49.93,56.56]

**P<0.05; **p<0.01*

5.2.6. Quality Improvement Process (QIP) scores of BEONC sites

All 13 quality domains were assessed using the Government of Nepal's MNH readiness QI tool for the Birthing Center. In the control group, there were 56 BEONC sites, and the intervention group consisted of 49 BEONC sites during the baseline assessment. Remaining 6 BCs were CEONC sites, so excluded from the analysis. Out of the 49 BEONC sites, 5 BEONC sites of the intervention group were dropped in the midline as no interventions were conducted due to the absence of mentees. So, only 45 BEONC sites in the intervention group were considered for data analysis. Table 31 and Table 32 show the number of health facilities in the traffic light categories of intervention and control health facilities, respectively. As shown in the tables, the percentage of health facilities in the green category is higher in the intervention arm than in the control arm in patient respect and dignity and all signal function domains. However, the percentage of intervention health facilities in the green category is lower in domains related to supplies and equipment (8.9% during the end-line), emergency drugs and supplies (35.6%), delivery services (6.7% during the end-line), and infection prevention (26.7% during the end-line). These findings show that only increasing the knowledge, confidence, and skills of the nursing staff is not sufficient to improve the overall quality of service provided by the health facility or birthing center. There is also no statistically significant difference in the quality domains between the control and intervention health facilities (Tables 33 and 34). In the delivery services domain, the number of intervention health facilities having all 8 standard protocols and guidelines were only 6.67% during end-line assessment (Table 35). Similarly, all 3 colored buckets for waste disposal were available in 75.56% intervention health facilities during end-line assessment (Table 35).

Table 31: Traffic light scores of the Birthing Centers in intervention arm

Domains	number of health facilities (%)								
	Intervention (n= 45)								
	Baseline			Midline			Endline		
	Red	Yellow	Green	Red	Yellow	Green	Red	Yellow	Green
Quality domains									
Management demand	2 (4.4)	5 (11.1)	38 (84.4)	0 (0)	0 (0)	45 (100)	1 (2.2)	1 (2.2)	43 (95.6)
Referral	1 (2.2)	10 (22.2)	34 (75.6)	3 (6.7)	0 (0)	42 (93.3)	0 (0.0)	2 (4.4)	43 (95.6)
Electricity	1 (2.2)	8 (17.8)	36 (80.0)	0 (0)	8 (17.8)	37 (82.2)	0 (0.0)	13 (28.9)	32 (71.1)
Water and sanitation	7 (15.6)	13 (28.9)	25 (55.6)	3 (6.7)	9 (20.0)	33 (73.3)	4 (8.9)	9 (20.0)	32 (71.1)
Patient's respect and dignity	5 (11.1)	20 (44.4)	20 (44.4)	1 (2.2)	17 (37.8)	27 (60.0)	4 (8.9)	13 (28.9)	28 (62.2)
Management	28 (62.2)	17 (37.8)	0 (0)	22 (48.9)	22 (48.9)	1 (2.2)	17 (37.8)	27 (60.0)	1 (2.2)
Staff	7 (15.6)	9 (20.0)	29 (64.4)	3 (6.7)	9 (20.0)	33 (73.3)	0 (0.0)	13 (28.9)	32 (71.1)
Supplies and equipment	0 (0.0)	40 (88.9)	5 (11.1)	0 (0.0)	41 (91.1)	4 (8.9)	0 (0.0)	41 (91.1)	4 (8.9)
Emergency drugs and supply	21 (46.7)	17 (37.8)	7 (15.6)	12 (26.7)	27 (60.0)	6 (13.3)	9 (20.0)	20 (44.4)	16 (35.6)
Delivery service	15 (33.3)	28 (62.2)	2 (4.4)	2 (4.4)	40 (88.9)	3 (6.7)	0 (0.0)	42 (93.3)	3 (6.7)
Partograph	3 (6.7)	10 (22.2)	32 (71.1)	1 (2.2)	5 (11.1)	39 (86.7)	0 (0.0)	9 (20.0)	36 (80.0)
Family planning service	7 (15.6)	0 (0.0)	38 (84.4)	18 (40.0)	0 (0.0)	27 (60.0)	15 (33.3)	0 (0.0)	30 (66.7)

Domains	number of health facilities (%)								
	Intervention (n= 45)								
	Baseline			Midline			Endline		
Infection prevention	11 (24.4)	22 (48.9)	12 (26.7)	5 (11.1)	26 (57.8)	14 (31.1)	4 (8.9)	29 (64.4)	12 (26.7)
Signal functions									
Parenteral antibiotics	22 (48.9)	-	23 (51.1)	22 (48.9)	-	23 (51.1)	14 (31.1)	-	31 (68.9)
Uterotonic drugs	10 (22.2)	-	35 (77.8)	17 (37.8)	-	28 (62.2)	20 (44.4)	-	25 (55.6)
Parenteral anticonvulsants	21 (46.7)	-	24 (53.3)	17 (37.8)	-	28 (62.2)	11 (24.4)	-	34 (75.6)
Removal of retained products	22 (48.9)	-	23 (51.1)	20 (44.4)	-	25 (55.6)	11 (24.4)	-	34 (75.6)
Newborn resuscitation	8 (17.8)	-	37 (82.2)	8 (17.8)	-	37 (82.2)	8 (17.8)	-	37 (82.2)

Note: Traffic light indicators: *Red- needs improvement; Yellow- average; Green- Good*

Table 32: Traffic light scores of the Birthing Centers in control arm

Domains	number of health facilities (%)								
	Control (n= 56)								
	Baseline			Midline			Endline		
	Red	Yellow	Green	Red	Yellow	Green	Red	Yellow	Green
Quality domain									
Management demand	5 (8.9)	3 (5.4)	48 (85.7)	1 (1.8)	0 (0)	55 (98.2)	3 (5.4)	2 (3.6)	51 (91.1)
Referral	2 (3.6)	8 (14.3)	46 (82.1)	4 (7.1)	2 (3.6)	51 (89.3)	1 (1.8)	0 (0.0)	55 (98.2)
Electricity	1 (1.8)	16 (28.6)	39 (69.6)	0 (0)	12 (21.4)	44 (78.6)	0 (0.0)	7 (12.5)	49 (87.5)
Water and sanitation	11 (19.6)	19 (33.9)	26 (46.4)	5 (8.9)	14 (25.0)	37 (66.1)	17 (30.4)	15 (26.8)	24 (42.9)
Patient's respect and dignity	9 (16.1)	23 (41.1)	24 (42.9)	4 (7.1)	19 (33.9)	33 (58.9)	5 (8.9)	30 (53.6)	21 (37.5)
Management	43 (76.8)	12 (21.4	1 (1.8)	32 (57.1)	24 (42.9)	0 (0)	30 (53.6)	23 (41.1)	3 (5.4)
Staff	9 (16.1)	13 (23.2)	34 (60.7)	9 (16.1)	8 (14.3)	39 (69.6)	3 (5.4)	11 (19.6)	42 (75.0)
Supplies and equipment	5 (8.9)	41 (73.2)	10 (17.9)	1 (1.8)	51 (91.1)	4 (7.1)	2 (3.6)	53 (94.6)	1 (1.8)
Emergency drugs and supply	33 (59..9)	16 (29.6)	7 (12.5)	21 (37.5)	27 (48.2)	8 (14.3)	20 (35.7)	35 (62.5)	1 (1.8)
Delivery service	22 (39.3)	30 (53.6)	4 (7.1)	2 (3.6)	49 (87.5)	5 (8.9)	6 (10.7)	48 (85.7)	2 (3.6)
Partograph	7 (12.5)	9 (16.1)	40 (71.4)	3 (5.4)	2 (3.6)	51 (91.1)	5 (8.9)	17 (30.4)	34 (60.7)
Family planning service	7 (12.5)	0 (0.0)	50 (87.5)	30 (53.6)	0 (0.0)	26 (46.4)	39 (69.6)	0 (0.0)	17 (30.4)
Infection prevention	15 (26.8)	29 (51.8)	12 (21.4)	11 (19.6)	33 (58.9)	12 (21.4)	11 (19.6)	42 (75.0)	3 (5.4)
Signal functions									
Parenteral antibiotics	30 (53.6)	-	26 (46.4)	26 (46.4)	-	30 (53.6)	29 (51.8)	-	27 (48.2)
Uterotonic drugs	22 (39.3)	-	34 (60.7)	24 (42.9)	-	32 (57.1)	37 (66.1)	-	19 (33.9)
Parenteral anticonvulsants	30 (53.6)	-	26 (46.4)	31 (55.4)	-	25 (44.6)	32 (57.1)	-	24 (42.9)
Removal of retained products	31 (55.4)	-	25 (44.6)	35 (62.5)	-	21 (37.5)	27 (48.2)	-	29 (51.8)

Domains	number of health facilities (%)								
	Control (n= 56)								
	Baseline			Midline			Endline		
Newborn resuscitation	11 (19.6)	-	45 (80.4)	11 (19.6)	-	45 (80.4)	11 (19.6)	-	39 (69.6)

Note: Traffic light indicators: *Red- needs improvement; Yellow- average; Green- Good*

Table 33: Mean scores obtained by health facilities in quality domains and signal functions during baseline, midline, and endline assessments

Quality Domains and Signal functions applicable	Maximum obtainable score	Assessment	Mean score obtained (expressed in marks)											
			Dolakha		Myagdi		Sarlahi		Udayapur		All districts			
			Control	Intervention	Control	Intervention	Control	Intervention	Control	Intervention	Control (n= 56)	Intervention (n=45)	DiD² midline	DiD² Endline
Water and sanitation	4	Baseline	3.33±0.88	3.66±0.7	3.66±0.88	3.6±0.84	2.62±1.25	3.23±0.72	2.75±1.48	3±1.22	3.04±1.24	3.33±0.93		
		Midline	3.83±0.38	3.66±0.7	3.75±0.62	3.9±0.31	3.31±0.79	3.38±0.76	3.43±0.81	3.76±0.43	3.55±0.71	3.67±0.60		
		Endline	3.16±0.71	3±0.86	3.33±0.77	4±0	2.06±1.52	3.46±1.19	3.37±0.95	3.69±0.63	2.95±1.19	3.56±0.86	-0.19	0.32
		M-B	0.50	0.00	0.08	0.30	0.69	0.15	0.69	0.77	0.51	0.34		
		E-B	-0.17	-0.67	-0.33	0.40	-0.56	0.23	0.63	0.69	-0.09	0.23		
Patient's respect and dignity	9	Baseline	7.66±1.66	8.22±1.71	7.66±2.1	8.4±0.69	6.06±1.91	7.23±1.53	7.62±1.96	6.53±2.53	7.20±2.00	7.49±1.90		
		Midline	8.75±0.86	8.66±0.7	7.66±2.7	8.8±0.42	6.75±1.8	6.84±1.86	8.31±1.19	8.53±0.96	7.82±1.87	8.13±1.42		
		Endline	7.5±1.88	6.55±2.65	7.83±1.33	9±0	6.31±2.3	7.84±1.72	7.68±2.18	8.46±1.39	7.29±2.05	8.02±1.82	0.02	0.44
		M-B	1.08	0.44	0.00	0.40	0.69	-0.38	0.69	2.00	0.62	0.64		
		E-B	-0.17	-1.67	0.17	0.60	0.25	0.62	0.06	1.92	0.09	0.53		
Supply and equipment	22	Baseline	18.33±2.42	18.88±3.44	17.16±3.56	18.6±2.91	15±3.01	18.23±2.61	17.43±5.61	17.61±4.19	16.88±4.04	18.27±3.28		
		Midline	18.5±1.83	18.66±1.8	19.25±2.22	19.7±1.7	15.87±2.72	18.07±2.56	20.00±2.00	19.84±2.44	18.34±2.75	19.07±2.28		
		Endline	19.41±1.72	18.88±2.52	19.16±1.58	20.4±1.26	13.56±3.16	19.23±2.65	19.62±1.36	19.92±1.38	17.75±3.39	19.62±2.05	-0.66	0.48
		M-B	0.17	-0.22	2.08	1.10	0.88	-0.15	2.56	2.23	1.46	0.80		
		E-B	1.08	0.00	2.00	1.80	-1.44	1.00	2.19	2.31	0.87	1.35		
Emergency drugs and supply	7	Baseline	4.75±1.28	4.55±1.5	4.41±1.56	4.4±1.64	3.81±1.16	5.15±1.28	4.81±1.9	4.38±2.06	4.43±1.53	4.64±1.63		
		Midline	5.66±1.15	5.11±1.45	5.5±0.67	5.5±0.7	3.68±1.53	4.76±1.36	5±1.63	5.31±1.43	4.88±1.54	5.15±1.28		
		Endline	5.08±0.51	5.33±1.11	5.41±0.79	6.9±0.31	3.81±1.51	5.61±1.55	4.68±0.87	5.00±1.00	4.68±1.17	5.67±1.29	0.06	0.78
		M-B	0.92	0.56	1.08	1.10	-0.13	-0.38	0.19	0.92	0.45	0.51		
		E-B	0.33	0.78	1.00	2.50	0.00	0.46	-0.12	0.62	0.25	1.03		
Delivery service	8	Baseline	6.16±1.74	6.22±1.09	5.5±1.78	6.3±1.63	3.81±1.93	4.92±1.18	4.31±2.98	3.15±2.23	4.82±2.36	4.98±2.05		
		Midline	6.75±0.86	6.44±1.01	6.5±0.9	6.3±0.94	5.37±1.62	6±0.7	6.62±1.02	6.38±2.02	6.27±1.29	6.27±1.29		
		Endline	6.83±0.38	6.88±0.33	6.91±0.51	7.3±0.48	5.06±2.14	6.61±0.5	6.06±1.38	6.38±0.76	6.13±1.56	6.77±0.64	-0.16	0.48
		M-B	0.58	0.22	1.00	0.00	1.56	1.08	2.31	3.23	1.45	1.29		
		E-B	0.67	0.67	1.42	1.00	1.25	1.69	1.75	3.23	1.31	1.79		
Partograph	3	Baseline	2.66±0.88	2.88±0.33	2.58±0.99	2.9±0.31	2.56±0.81	2.53±0.87	2.25±1.06	2.3±0.75	2.50±0.93	2.62±0.69		
		Midline	2.75±0.86	2.88±0.33	3±0	2.7±0.94	2.81±0.75	2.92±0.27	2.75±0.57	2.76±0.43	2.82±0.64	2.82±0.54		
		Endline	2.58±0.51	2.66±0.5	2.75±0.45	3±0	2.06±0.92	2.61±0.5	2.68±0.6	2.92±0.27	2.50±0.71	2.80±0.4	-0.12	0.18
		M-B	0.08	0.00	0.42	-0.20	0.25	0.38	0.50	0.46	0.32	0.20		
		E-B	-0.08	-0.22	0.17	0.10	-0.50	0.08	0.44	0.62	0.00	0.18		
Infection prevention	8	Baseline	6.75±1.21	6.88±1.69	5.66±1.66	5.7±1.94	4.75±1.48	5.53±2.02	5.31±2.84	5.76±1.92	5.54±2.05	5.91±1.92		
		Midline	7.25±0.96	7.11±0.92	5.83±2.2	6.6±0.84	4.68±1.4	5.92±1.89	6.12±1.58	6.92±1.32	5.89±1.80	6.60±1.41		
		Endline	5.91±0.66	6.11±0.6	6.83±0.57	8±0	3.68±1.74	6±1.63	6.12±1.02	5.69±1.25	5.54±1.66	6.38±1.41	0.34	0.47
		M-B	0.50	0.22	0.17	0.90	-0.06	0.38	0.81	1.15	0.35	0.69		
		E-B	-0.83	-0.78	1.17	2.30	-1.06	0.46	0.81	-0.08	0.00	0.47		
Parenteral antibiotics	3	Baseline	2.41±0.79	2.33±0.86	2.16±0.71	2.1±0.73	1.93±0.92	2.46±0.66	2.5±0.81	2.61±0.5	2.25±0.84	2.40±0.69		
		Midline	2.83±0.38	2.55±0.72	2.41±0.66	2.3±0.48	1.56±1.2	1.92±1.11	2.31±0.94	2.61±0.65	2.23±0.99	2.33±0.83		
		Endline	2.75±0.45	2.44±0.72	2.58±0.51	2.9±0.31	2.12±1.02	2.61±0.65	1.87±0.88	2.53±0.66	2.29±0.84	2.62±0.61	-0.05	0.18
		M-B	0.42	0.22	0.25	0.20	-0.38	-0.54	-0.19	0.00	-0.02	-0.07		
		E-B	0.33	0.11	0.42	0.80	0.19	0.15	-0.63	-0.08	0.04	0.22		
Uterotonic drugs	3	Baseline	2.08±0.79	2.66±0.5	2.83±0.38	2.9±0.31	2.37±0.8	2.69±0.63	2.62±0.61	2.76±0.43	2.48±0.71	2.76±0.48		
		Midline	2.83±0.38	2.77±0.44	2.66±0.49	2.6±0.51	2±0.81	2.3±0.75	2.43±0.72	2.69±0.48	2.45±0.71	2.58±0.58	-0.15	0.01
		Endline	2.58±0.51	2.22±0.83	2.33±0.77	2.7±0.48	1.93±0.68	2.38±0.65	2.06±0.68	2.61±0.5	2.20±0.69	2.49±0.62		

Quality Domains and Signal functions applicable	Maximum obtainable score	Assessment	Mean score obtained (expressed in marks)											
			Dolakha		Myagdi		Sarlahi		Udayapur		All districts			
			Control	Intervention	Control	Intervention	Control	Intervention	Control	Intervention	Control (n= 56)	Intervention (n=45)	DiD² midline	DiD² End line
		M-B	0.75	0.11	-0.17	-0.30	-0.38	-0.38	-0.19	-0.08	-0.03	-0.18		
		E-B	0.50	-0.44	-0.50	-0.20	-0.44	-0.31	-0.56	-0.15	-0.28	-0.27		
Parenteral anticonvulsants	5	Baseline	4.41±0.66	4±1.11	3.75±1.6	3.8±1.61	3.25±1.61	4.23±1.16	4±1.5	4.15±1.06	3.82±1.45	4.07±1.21		
		Midline	4.41±0.66	4.33±0.86	4.58±0.9	4.9±0.31	3.18±1.6	3.53±1.85	4.06±1.06	4.23±1.23	4.00±1.25	4.20±1.33		
		Endline	4.41±0.9	3.77±1.2	4.16±0.71	5±0	3.43±1.59	4.69±0.63	4.12±1.08	4.69±0.63	4.00±1.19	4.58±0.81	-0.05	0.33
		M-B	0.00	0.33	0.83	1.10	-0.06	-0.69	0.06	0.08	0.18	0.13		
		E-B	0.00	-0.22	0.42	1.20	0.19	0.46	0.13	0.54	0.18	0.51		
Removal of retained products	3	Baseline	2.58±0.51	2.44±0.88	2.58±0.51	2.6±0.51	2±0.63	2.3±0.63	2.25±0.85	2.15±0.98	2.32±0.69	2.36±0.77		
		Midline	2.25±0.75	2.66±0.5	2.75±0.45	2.5±0.7	1.75±0.57	2.07±0.75	2.25±0.68	2.61±0.65	2.21±0.7	2.44±0.69		
		Endline	2.33±0.65	2.55±0.72	2.83±0.38	2.9±0.31	1.31±0.87	2.53±0.77	2.75±0.44	2.76±0.43	2.27±0.88	2.69±0.59	0.19	0.38
		M-B	-0.33	0.33	0.17	-0.10	-0.25	-0.23	0.00	0.46	-0.11	0.08		
		E-B	-0.25	-0.22	0.25	0.30	-0.69	0.23	0.50	0.62	-0.05	0.33		
Newborn resuscitation	3	Baseline	2.91±0.28	2.77±0.44	2.91±0.28	3±0	2.81±0.4	2.61±0.76	2.5±0.73	2.69±0.63	2.77±0.50	2.76±0.57		
		Midline	2.41±0.66	2.55±0.52	2.91±0.28	2.9±0.31	2.81±0.4	2.92±0.27	2.93±0.25	2.84±0.37	2.77±0.46	2.82±0.39		
		Endline	2.83±0.38	2.66±0.5	2.75±0.45	3±0	2±0.96	2.76±0.43	2.93±0.25	2.84±0.37	2.61±0.7	2.82±0.38	0.06	0.22
		M-B	-0.50	-0.22	0.00	-0.10	0.00	0.31	0.44	0.15	0.00	0.06		
		E-B	-0.08	-0.11	-0.17	0.00	-0.81	0.15	0.44	0.15	-0.16	0.06		
Overall practice score	20	Baseline	16.58±2.67	16.88±2.61	14.66±4.22	15.8±3.61	11.93±3.53	13.76±3.39	12.68±6.37	12.07±4.42	13.73±4.77	14.36±3.98		
		Midline	17.33±1.92	17±2.12	15.58±3.08	16±2.05	13.31±3.53	15.53±2.43	16.06±2.71	16.76±3.53	15.45±3.21	16.29±2.65		
		Endline	15.41±1.16	15.88±1.26	16.58±1.37	19.3±0.48	11.43±4.44	16.23±1.78	15.18±2.53	15.38±1.75	14.46±3.43	16.60±2.07	0.21	1.51
		M-B	0.75	0.11	0.92	0.20	1.38	1.77	3.38	4.69	1.72	1.93		
		E-B	-1.17	-1.00	1.92	3.50	-0.50	2.46	2.50	3.31	0.73	2.24		
Overall signal function score	17	Baseline	14.41±2.15	14.22±2.99	14.25±2.73	14.4±2.87	12.37±3.11	14.3±2.92	13.87±3.36	14.38±2.87	13.64±2.98	14.33±2.81		
		Midline	14.75±1.54	14.88±1.45	15.33±2.26	15.2±1.47	11.31±3.53	12.76±3.83	14±2.98	15±2.27	13.68±3.13	14.38±2.71		
		Endline	14.91±2.02	13.66±3.31	14.66±1.55	16.5±0.7	10.81±3.86	15±1.68	13.75±2.2	15.46±1.33	13.36±3.08	15.20±2.06	0.01	1.15
		M-B	0.33	0.67	1.08	0.80	-1.06	-1.54	0.13	0.62	0.04	0.05		
		E-B	0.50	-0,56	0.42	2.10	-1.56	0.69	-0.12	1.08	-0.28	0.87		

**p<0.05; **p<0.01*

Overall signal function score (Parenteral antibiotics+ uterotonic drugs+ anticonvulsants+ removal of retained products+ newborn resuscitation)

Overall practice score (Delivery services+ Partograph+ infection prevention+ Family planning)

Table 34: Mean scores obtained by health facilities in quality domains and signal functions during baseline, midline, and endline assessments (expressed in percentage)

Quality Domains and Signal functions applicable	Maximum obtainable score	Assessment	Mean score obtained (expressed in percentage)											
			Dolakha		Myagdi		Sarlahi		Udayapur		All districts			
			Control (12)	Intervention (9)	Control (12)	Intervention (10)	Control (16)	Intervention (13)	Control (16)	Intervention (13)	Control (n= 56)	Intervention (n=45)	DiD[2] midline	DiD[2] End line
Water and sanitation	4	Baseline	83.33±22.19	91.66±17.67	91.66±22.19	90±21.08	65.62±31.45	80.76±18.12	68.75±37.08	75.00±30.61	75.89±30.88	83.33±23.23	-4.61	7.79
		Midline	95.83±9.73	91.66±17.67	93.75±15.53	97.5±7.9	82.81±19.83	84.61±19.19	85.93±20.34	94.23±10.96	88.84±17.79	91.67±15.08		
		Endline	79.16±17.94	75±21.65	83.33±19.46	100±0	51.56±38.15	86.53±29.95	84.37±23.93	92.3±15.76	73.66±29.93	88.89±21.69		
		M-B	12.5	0.00	2.08	7.5	17.1875	3.8462	17.18	19.23	12.95	8.34		
		E-B	-4.16	-16.66	-8.33	10	-14.0625	5.7693	15.62	17.30	-2.23	5.56		
Patient's respect and dignity	9	Baseline	85.18±18.55	91.35±19.06	85.18±23.37	93.33±7.76	67.36±21.26	80.34±17.06	84.72±21.8	72.64±28.18	79.96±22.26	83.21±21.14	0.22	4.94
		Midline	97.22±9.62	96.29±7.85	85.18±30.08	97.5±7.9	75±20.08	76.06±20.71	92.36±13.28	94.87±10.74	86.90±20.77	90.37±15.82		
		Endline	83.33±20.92	72.83±29.45	83.33±19.46	100±0	70.13±25.56	87.17±19.16	85.41±24.24	94.01±15.45	80.95±22.79	89.14±20.31		
		M-B	12.03	4.93	0.00	4.44	7.64	-4.27	7.63	22.22	6.94	7.16		
		E-B	-1.85	-18.51	1.86	6.67	2.78	6.84	0.69	21.37	0.99	5.93		
Supply and equipment	22	Baseline	83.33±11.02	85.85±15.65	78.03±16.19	84.54±13.24	68.18±13.68	82.86±11.9	79.26±25.49	80.06±19.06	76.70±18.39	83.03±14.93	-3.02	2.18
		Midline	84.09±8.33	84.84±8.19	87.5±10.09	89.54±7.74	72.15±12.4	82.16±11.65	90.9±9.09	90.2±11.11	83.36±12.48	86.67±10.37		
		Endline	88.25±7.86	85.85±11.46	87.12±7.2	92.72±5.74	61.64±14.37	87.41±12.04	89.2±6.18	90.55±6.28	80.68±15.41	89.19±9.36		
		M-B	0.75	-1.01	9.47	5.00	3.98	-0.70	11.64	10.13	6.66	3.64		
		E-B	4.92	0.00	9.09	8.18	-6.53	4.55	9.94	10.49	3.98	6.16		
Emergency drugs and supply	7	Baseline	67.85±18.4	65.07±21.56	63.09±22.34	62.85±23.52	54.46±16.67	73.62±18.3	68.75±27.21	62.63±29.47	63.27±21.94	66.35±23.43	0.93	11.03
		Midline	80.95±16.49	73.01±20.75	78.57±9.63	78.57±10.1	52.67±21.95	68.13±19.47	71.42±23.32	75.82±20.52	69.64±21.97	73.65±18.26		
		Endline	72.61±7.35	76.19±15.97	77.38±11.32	98.57±4.51	54.46±21.64	80.21±22.23	66.96±12.47	71.42±14.28	66.84±16.82	80.95±18.53		
		M-B	13.09	7.93	15.48	15.71	-1.79	-5.50	2.68	13.19	6.37	7.30		
		E-B	4.76	11.11	14.29	35.71	0.00	6.60	-1.79	8.79	3.57	14.60		
Delivery service	8	Baseline	77.08±21.86	77.77±13.66	68.75±22.29	78.75±20.45	47.65±24.24	61.53±14.84	53.9±37.28	39.42±27.87	60.27±29.49	62.22±25.63	-1.97	5.93
		Midline	84.37±10.82	80.55±12.67	81.25±11.3	78.75±11.85	67.18±20.34	75±8.83	82.81±12.8	79.8±25.27	78.35±16.08	78.33±16.08		

Quality Domains and Signal functions applicable	Maximum obtainable score	Assessment	Mean score obtained (expressed in percentage)											
			Dolakha		Myagdi		Sarlahi		Udayapur		All districts			
			Control (12)	Intervention (9)	Control (12)	Intervention (10)	Control (16)	Intervention (13)	Control (16)	Intervention (13)	Control (n= 56)	Intervention (n=45)	DiD² midline	DiD² End line
		Endline	85.41±4.86	86.11±4.16	86.45±6.43	91.25±6.03	63.28±26.79	82.69±6.32	75.78±17.36	79.8±9.59	76.56±19.52	84.44±8.06		
		M-B	7.29	2.77	12.50	0.00	19.53	15.63	28.91	40.38	18.08	16.11		
		E-B	8.33	8.33	17.71	12.50	13.46	21.15	21.88	40.38	16.29	22.22		
Partograph	3	Baseline	88.88±29.58	96.29±11.11	86.11±33.2	96.66±10.54	85.41±27.13	84.61±29.23	75±35.48	76.92±25.03	83.33±31.14	87.41±22.80	-4.06	5.92
		Midline	91.66±28.86	96.29±11.11	100±0	90±31.62	93.75±25	97.43±9.24	91.66±19.24	92.3±14.61	94.05±21.18	94.07±17.82		
		Endline	86.11±17.16	88.88±16.66	91.66±15.07	100±0	68.75±30.95	87.17±16.87	89.58±20.06	97.43±9.24	83.33±23.78	93.33±13.48		
		M-B	2.77	0	13.8889	-6.6667	8.33	12.82	16.6667	15.3846	10.71	6.66		
		E-B	-2.77	-7.40	5.5556	3.3333	-16.66	2.57	14.5833	20.5128	0.00	5.92		
Infection prevention	8	Baseline	84.37±15.19	86.11±21.14	70.83±20.87	71.25±24.33	59.37±18.54	69.23±25.31	66.4±35.56	72.11±24.01	69.20±25.56	73.89±23.96	4.15	5.83
		Midline	90.62±12.06	88.88±11.59	72.91±27.6	90±31.62	58.59±17.51	74.03±23.64	76.56±19.83	86.53±16.5	73.66±22.45	82.5±17.56		
		Endline	73.95±8.35	76.38±7.51	91.66±15.07	100±0	46.09±21.75	75±20.41	76.56±12.8	71.15±15.63	69.20±20.78	79.72±17.74		
		M-B	6.25	2.77	2.0834	11.25	-0.78	4.81	10.1562	14.4231	4.46	8.61		
		E-B	-10.41	-9.72	14.5834	28.75	-13.28	5.77	10.1562	-0.9616	0.00	5.83		
Parenteral antibiotics	3	Baseline	80.55±26.43	77.77±28.86	72.22±23.92	70±24.59	64.58±30.95	82.05±22	83.33±27.21	87.17±16.87	75.00±27.89	80.00±22.92	-1.62	6.22
		Midline	94.44±12.97	85.18±24.21	80.55±22.28	76.66±16.1	52.08±40.31	64.1±37.17	77.08±31.54	87.17±21.68	74.40±33.02	77.78±27.52		
		Endline	91.66±15.07	81.48±24.21	86.11±17.16	96.66±10.54	70.83±34.15	87.17±21.68	62.5±29.5	84.61±22	76.19±28.22	87.41±20.46		
		M-B	13.88	7.40	8.33	6.67	-12.50	-17.95	-6.25	0	-0.60	-2.22		
		E-B	11.11	3.70	13.89	26.67	6.25	5.13	-20.8333	-2.5641	1.19	7.41		
Uterotonic drugs	3	Baseline	69.44±26.43	88.88±16.66	94.44±12.97	96.66±10.54	79.16±26.87	89.74±21.01	87.5±20.63	92.3±14.61	82.74±23.78	91.85±16.14	-4.73	0.64
		Midline	94.44±12.97	92.59±14.69	88.88±16.41	86.66±17.21	66.66±27.21	76.92±25.03	81.25±24.24	89.74±16.01	81.55±23.72	85.93±19.45		
		Endline	86.11±17.16	74.07±27.77	77.77±25.94	90±16.1	64.58±22.66	79.48±21.68	68.75±22.66	87.17±16.87	73.21±23.29	82.96±20.87		
		M-B	25.00	3.70	-5.56	-10.00	-12.50	-12.82	-6.25	-2.56	-1.19	-5.92		
		E-B	16.66	-14.81	-16.67	-6.67	-14.58	-10.26	-18.75	-5.13	-9.53	-8.89		
Parenteral anticonvulsants	5	Baseline	88.33±13.37	80±22.36	75±32.05	76±32.38	65±32.24	84.61±23.31	80±30.11	83.07±21.36	76.43±29.07	81.33±24.27	-0.90	6.66
		Midline	88.33±13.37	86.66±17.32	91.66±18	98±6.32	63.75±32.01	70.76±37.07	81.25±21.25	84.61±24.7	80.00±25.01	84.00±26.49		
		Baseline	88.33±18	75.55±24.03	83.33±14.35	100±0	68.75±31.8	93.84±12.6	82.5±21.75	93.84±12.6	80.00±23.82	91.56±16.23		
		M-B	0	6.66	16.67	22.00	-1.25	3.75	1.25	1.54	3.57	2.67		
		E-B	0	-4.44	8.33	24.00	-13.85	9.23	2.50	10.77	3.57	10.23		
Removal of retained products	3	Baseline	86.11±17.16	81.48±29.39	86.11±17.16	86.66±17.21	66.66±21.08	76.92±21.01	75±28.54	71.79±32.9	77.38±23.01	78.52±25.78	6.53	12.89
		Midline	75±25.12	88.88±16.66	91.66±15.07	83.33±23.57	58.33±19.24	69.23±25.31	75±22.77	87.17±21.68	73.81±23.54	81.48±23.09		
		Endline	77.77±21.71	85.18±24.21	94.44±12.97	96.66±10.54	43.75±29.1	84.61±25.87	91.66±14.9	92.3±14.61	75.60±29.47	89.63±19.88		
		M-B	-11.11	7.40	5.5556	-3.3334	-8.33	-7.69	0.00	15.38	-3.57	2.96		

Quality Domains and Signal functions applicable	Maximum obtainable score	Assessment	Mean score obtained (expressed in percentage)											
			Dolakha		Myagdi		Sarlahi		Udayapur		All districts			
			Control (12)	Intervention (9)	Control (12)	Intervention (10)	Control (16)	Intervention (13)	Control (16)	Intervention (13)	Control (n= 56)	Intervention (n=45)	DiD[2] midline	DiD[2] End line
		E-B	-8.33	3.70	8.3333	10	-22.92	7.69	16.67	20.51	-1.79	11.11		
Newborn resuscitation	3	Baseline	97.22±9.62	92.59±14.69	97.22±9.62	100±0	93.75±13.43	87.17±25.59	83.33±24.34	89.74±21.01	92.26±16.80	91.85±19.01	1.62	7.58
		Midline	80.55±22.28	85.18±17.56	97.22±9.62	83.33±23.57	93.75±13.43	97.43±9.24	97.91±8.33	94.87±12.51	92.86±15.19	94.07±12.89		
		Endline	94.44±12.97	88.88±16.66	94.44±12.97	100±0	66.66±32.2	92.3±14.61	97.91±8.33	94.87±12.51	86.90±23.51	94.07±12.89		
		M-B	-16.66	-7.40	0	-3.3333	0.00	10.26	14.58	5.13	0.60	2.22		
		E-B	-2.77	-3.70	-5.5555	0	-27.08	5.13	14.58	5.13	-5.36	2.22		
Overall practice score	20	Baseline	82.91±13.39	84.44±13.09	73.33±21.14	79±18.07	59.68±17.65	68.84±16.97	63.43±31.87	60.38±22.12	68.66±23.83	71.78±19.89	1.09	7.56
		Midline	86.66±9.61	85±10.6	77.91±15.44	80±10.27	66.56±17.67	77.69±12.18	80.31±13.59	83.84±17.69	77.23±16.04	81.44±13.30		
		Endline	77.08±5.82	79.44±6.34	82.91±6.89	96.5±2.41	57.18±22.2	81.15±8.93	75.93±12.67	76.92±8.78	72.32±17.16	83.00±10.36		
		M-B	3.75	0.55	4.58	1.00	6.88	8.85	16.88	23.46	8.57	9.66		
		E-B	-5.83	-5.00	9.58	17.50	-2.50	12.31	12.50	16.54	3.66	11.22		
Overall signal function score	17	Baseline	84.8±12.65	83.66±17.59	83.82±16.08	84.7±16.91	72.79±18.33	84.16±17.21	81.61±19.78	84.61±16.9	80.25±17.50	84.31±16.54	0.06	6.78
		Midline	86.76±9.08	87.58±8.54	90.19±13.35	89.41±8.68	66.54±20.79	75.11±22.54	82.35±17.58	88.23±13.37	80.46±18.47	84.58±15.93		
		Endline	87.74±11.88	80.39±19.5	86.27±9.15	97.05±4.15	63.6±22.75	88.23±9.9	80.88±12.97	90.95±7.82	78.57±18.17	89.41±12.13		
		M-B	1.96	3.92	6.37	4.71	-6.25	-9.05	0.74	3.62	0.21	0.27		
		E-B	2.94	-3.27	2.45	12.35	-9.19	4.07	-0.74	6.33	-1.68	5.10		

**p<0.05; **p<0.01*

Overall signal function score (Parenteral antibiotics+ uterotonic drugs+ anticonvulsants+ removal of retained products+ newborn resuscitation)

Overall practice score (Delivery services+ Partograph+ infection prevention+ Family planning)

Table 35: Health facilities having good practices (scoring 1 in practice domain)

Practice domains	Assessment	Number of health facilities having good practices (%)									
		Dolakha		Myagdi		Sarlahi		Udayapur		All districts	
		Control (n=12)	Intervention (n=9)	Control (n=12)	Intervention (n=10)	Control (n=16)	Intervention (n=13)	Control (n=16)	Intervention (n=13)	Control (n=56)	Intervention (n=45)
Delivery Services (Observation of delivery charts of 3 recently delivered mothers)											
Provision of newborn assessment within 1 hour of delivery	Baseline	12	9	10	10	11	12	12	9	45 (80.36%)	40 (88.89%)
	Midline	12	9	12	9	15	13	15	12	54 (96.43%)	43 (95.56%)
	Endline	12	9	12	10	14	13	15	13	53 (94.64%)	45 (100%)
Women and babies kept in facility at least 12 hours after delivery	Baseline	11	8	12	9	6	8	8	6	37 (66.07%)	31 (68.89%)
	Midline	11	9	8	7	7	7	13	11	39 (69.64%)	34 (75.56%)
	Endline	12	9	12	10	12	13	8	9	44 (78.57%)	41 (91.11%)
Physical check-up of postnatal mothers done during discharge time by the use of PNC job aids	Baseline	10	8	9	8	11	11	9	3	39 (69.64%)	30 (66.67%)
	Midline	12	8	12	9	15	13	16	12	55 (98.21%)	42 (93.33%)
	Endline	12	9	12	10	11	13	16	13	51 (91.07%)	45 (100.00%)
Newborn checked-up by using PNC job aids	Baseline	10	8	10	9	11	10	9	3	40 (71.43%)	30 (66.67%)
	Midline	12	8	12	9	15	13	15	12	54 (96.43%)	42 (93.33%)
	Endline	12	9	12	10	12	13	15	13	51 (91.07%)	45 (100.00%)
PNC job aids used for health teaching to newborn and mother before discharge from health facilities	Baseline	10	9	10	9	11	8	8	2	39 (69.64%)	28 (62.22%)
	Midline	12	9	12	10	15	13	16	12	55 (98.21%)	44 (97.78%)
	Endline	12	9	12	10	12	13	15	13	51 (91.07%)	45 (100.00%)
Provision of health teaching to new mothers about essential care before her discharge	Baseline	11	8	11	10	10	13	12	10	44 (78.57%)	41 (91.11%)
	Midline	11	9	12	10	15	13	16	12	54 (96.43%)	44 (97.78%)
	Endline	12	9	12	10	14	13	16	13	54 (96.43%)	45 (100.00%)
Availability of all 8 emergency obstetric complication management flow charts within delivery/ maternity room	Baseline	8	6	4	6	1	1	8	6	21 (37.50%)	19 (42.22%)
	Midline	11	6	9	7	4	6	11	10	35 (62.50%)	29 (64.44%)
	Endline	10	8	10	10	4	8	11	9	35 (62.50%)	35 (77.78%)
Availability of all 8 standard protocols and guidelines within duty room	Baseline	2	9	0	2	0	1	3	2	5 (8.93%)	5 (11.11%)
	Midline	0	9	1	2	0	0	4	2	5 (8.93%)	4 (8.89%)
	Endline	0	9	1	3	2	0	1	0	4 (7.14%)	3 (6.67%)
Partograph (observation of last 3 deliveries)											
Complete fill-up of partograph for last 3 deliveries	Baseline	10	8	10	9	11	10	9	7	40 (71.43%)	34 (75.56%)
	Midline	11	8	12	9	15	12	14	10	52 (92.86%)	39 (86.67%)
	Endline	7	6	9	10	8	13	12	12	36 (64.29%)	41 (91.11%)
Use of Oxytocin drugs for AMTSL in last 3 deliveries	Baseline	11	9	10	10	15	12	13	12	49 (87.50%)	43 (95.56%)
	Midline	11	9	12	9	15	13	15	13	53 (94.64%)	44 (97.78%)
	Endline	12	9	12	10	14	13	15	13	53 (94.64%)	45 (100.00%)
Labor augmentation not done/ oxytocin not used for labor augmentation on last 3 deliveries	Baseline	11	9	11	10	15	11	14	11	51 (91.07%)	41 (91.11%)
	Midline	11	9	12	9	15	13	15	13	53 (94.64%)	44 (97.78%)
	Endline	12	9	12	10	11	8	16	13	51 (91.07%)	40 (88.89%)
Infection Prevention Pratices											

Practice domains	Assessment	Number of health facilities having good practices (%)									
		Dolakha		Myagdi		Sarlahi		Udayapur		All districts	
		Control (n=12)	Intervention (n=9)	Control (n=12)	Intervention (n=10)	Control (n=16)	Intervention (n=13)	Control (n=16)	Intervention (n=13)	Control (n=56)	Intervention (n=45)
Separate room/ corner available for sterilization	Baseline	11	9	11	9	9	11	13	11	44 (78.57%)	40 (88.89%)
	Midline	12	9	8	9	13	12	10	11	43 (76.79%)	41 (91.11%)
	Endline	12	9	12	10	5	8	14	12	43 (76.79%)	39 (86.67%)
Functional autoclave machine	Baseline	6	6	6	5	6	5	10	8	28 (50.00%)	24 (53.33%)
	Midline	9	8	9	9	4	11	15	10	37 (66.07%)	38 (84.44%)
	Endline	10	9	11	10	2	6	16	8	39 (69.64%)	33 (73.33%)
Availability of materials for disinfection	Baseline	12	8	10	9	13	10	10	9	45 (80.36%)	36 (80.00%)
	Midline	12	9	11	10	13	12	16	13	52 (92.86%)	44 (97.78%)
	Endline	12	9	12	10	8	11	15	9	47 (83.93%)	39 (86.67%)
Availability of sharp bins in delivery room, postnatal room and uncapped needles are not witnessed	Baseline	12	9	12	10	11	13	15	13	50 (89.29%)	45 (100.00%)
	Midline	12	9	10	8	8	12	14	13	44 (78.57%)	42 (93.33%)
	Endline	2	1	9	10	11	13	13	11	35 (62.50%)	35 (77.78%)
Availability of all protective barriers within maternity ward	Baseline	11	9	9	7	13	9	9	10	42 (75.00%)	35 (77.78%)
	Midline	11	9	8	10	13	11	12	11	44 (78.57%)	41 (91.11%)
	Endline	11	9	12	10	14	13	14	13	51 (91.07%)	45 (100.00%)
Availability of protective barriers for waste disposal person	Baseline	9	8	7	6	11	10	9	9	36 (64.29%)	33 (73.33%)
	Midline	12	9	11	9	13	9	14	13	50 (89.29%)	40 (88.89%)
	Endline	11	9	12	10	11	12	15	12	49 (87.50%)	43 (95.56%)
Availability of 3 colored buckets in maternity ward	Baseline	10	6	7	7	10	8	8	8	35 (62.50%)	29 (64.44%)
	Midline	11	6	10	10	11	7	9	10	41 (73.21%)	33 (73.33%)
	Endline	12	8	12	10	7	9	8	7	39 (69.64%)	34 (75.56%)
Availability of all waste disposal places	Baseline	10	7	6	4	3	6	11	7	30 (53.57%)	24 (53.33%)
	Midline	8	5	3	1	0	3	8	9	19 (33.93%)	18 (40.00%)
	Endline	1	1	2	10	1	6	3	2	7 (12.50%)	19 (42.22%)

5.2.7. Perceived reasons for increased effectiveness of SBMP

During the in-depth interviews, both mentors and mentees shared the positive effects of SBMP intervention on themselves and in their health facilities. Both the mentors and mentees shared that the SBMP was helpful in increasing their confidence while handling cases in their health facilities; they have improved their counseling skills and behavior towards the patients; they have been able to timely identify complicated cases like PPH and pre/eclampsia and refer to higher facilities after doing initial management; they learned to work in a team; health facility readiness to manage cases has increased; and they have been able to diagnose complications and make decisions more quickly than before (Figure 3). They mentioned that these improvements eventually helped them improve overall service delivery and case management.

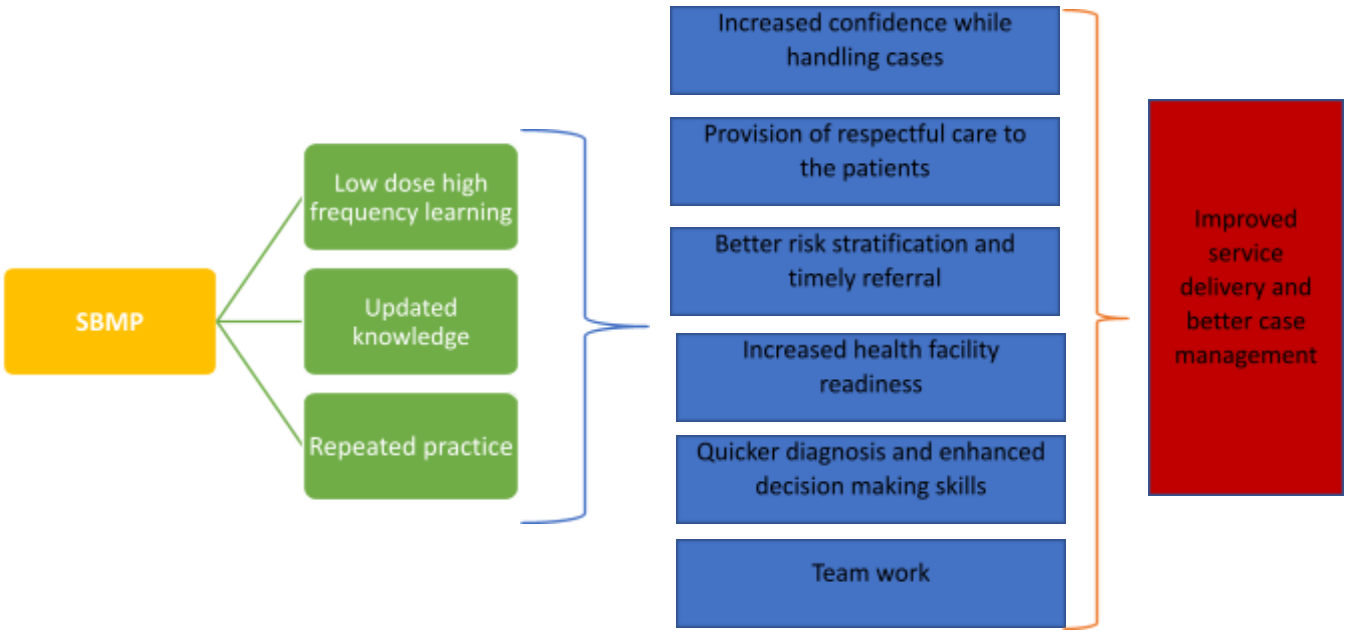


Figure 3: Reasons for increased effectiveness of SBMP (mentioned by mentors and mentees)

The relevant quotes regarding effectiveness of SBMP are depicted in Table 36.

Table 36: Quotes depicting perceived reasons for effectiveness of SBMP

Reasons	Specifics	Relevant quotes
Knowledge and skills updated and enhanced	Active management of third stage of labor, applying condom tamponade, Cervical tear repair, shock management, conduction of normal delivery, PPH management, neonatal	*"I know how to adjust the ambu bag. we even teach the intern doctors how to adjust the ambu bag." (Mentor 5)* *"In Bleeding after birth, if there is retained placenta, I learned to wait for 30 minutes after delivery and give IM oxytocin. This was new for me, didn't learn in SBA training." (Mentee 22)* *"I also learned about cervical tear repair in this training. Previously, the cervical tear cases were directly transferred to the OT and I had not even got a*

	resuscitation, Pre-eclampsia and eclampsia management, public speaking	*chance to see how cervical repair is done. But here, I got to do the cervical repair myself." (Mentee 23)*
Increased confidence		*"After taking BAB session, I have effectively managed (bleeding) cases, even before the doctor's arrival. We just inform the doctor now. Doctors don't have to do anything. They just instruct us to send (patient's) blood for hemoglobin test next day. I managed the cases as per the (SBMP) guideline. I am very confident in handling cases alone now" Mentor 5)* *"Previously, we used to call the doctors if there were any patient with high blood pressure. My heart used to beat faster before. That does not happen now. I am calm now and I know I can handle such cases. …… and now I handle even if I'm alone." (Mentee 12)*
Better risk stratification and timely referral	PPH, hypertension, pre/eclampsia, identification and referral; Accompanied by staff, initial management and stabilization in referral	*"We didn't ask the previous history during ANC, but we do that now. We now do proper history taking and have referred one mother due to previous history of ectopic pregnancy and antihypertensive medicine consumption. We would not have asked such details if we had not received this training… We referred that mother and later we got to know that she underwent abortion." (Mentee 22)* *"Previously, we used to provide referral slip and asked the patient to go to higher center. But now, we inform the CEONC site about the cases we are referring before-hand. We also send one staff along with the patient when referring." (Mentor 13)* *"We should do some sort of intervention from our side before referring. The woman can die on the way if we directly tell her to go to other facility. In such cases, we have to make sure that the uterus is contracted first… for that, we have to give 10 units oxytocin or perform condom tamponade procedure or look of tears and repair them. We have to stabilize the patient first and then refer." (Mentee 20)*
Quicker diagnosis and enhanced decision making skills	Filling partograph, identification of pre-eclampsia	*"pre-eclampsia case can come here (MCH clinic), we check their blood pressure, and if it's high we have to send that case to up to IPD (Inpatient Department. We have transferred cases to inpatient department… (Mentee 9)* *"I think that my decision making skill has also improved. We learned about properly filling the partograph." (Mentor 1)*
Team work	Mobilization of staff when managing cases	*"We learned how to execute the team when a PPH case arrives in the health facility. If a PPH case arrives in a health facility, we have to shout for help at first. Then, assign roles to different staff after knowing the cause of bleeding……some will arrange the necessary equipment, some will repair the tear, etc." (Mentee 4)*
Provision of respectful care	Improved counselling, allowing mothers to deliver in position they like	*"….and (also learnt about) behavior towards patient/client in a step by step manner during ANC visit. We must start from personal history, then menstruation history, then their medical history then, present ANC (history)... These processes were forgotten, even the system was this and the practice should be changed and step wise system was taught and learnt more." (Mentee 9)* *"Mothers should be allowed to deliver in position they wish, but we used to force them into lithotomy position previously." (Mentee 25)*
Increased health facility readiness	For complications management	*"Readiness has also improved. We have equipment, but had not prepared them for handling cases. Now, we have made sets for handling cases. Handwashing steps is also changed." (Mentee 25)*

		"Talking about PPH cases, we used to refer those cases without doing much management. But now, we know about complications readiness and we have kept a PPH set ready for management." (Mentor 13)
Improved service delivery	ANC and PNC counseling, use of double gloves during service delivery, infection prevention, quick check	*"Previously, during delivery we used to wear loose gloves (examination gloves) to do PV (Per Vaginal) examination. Now, we use surgical gloves during PV examination. Next, we used to wear single gloves while conducting delivery, but now we are using double gloves. Before, IP practices were poor, but now, it has also been maintained properly. Before, we didn't have 'bata' (bucket) and slippers in labor room. But now, we have ordered separate slippers for labor room, the office helpers clean the labor room. For decontamination, we have kept 3 'bata' (bucket), one with virex (chlorine solution), one with soap water and another one with normal water as per the color code. Before, for sterilization we were not using autoclave tape. But now, we are using sterile/autoclave tape with expiry date, and we have also ordered cupboard to store sterile instruments". (Mentor 11)* *"My ANC counseling skills have improved after the training. I learned about the step-by-step method. I used to haphazardly do the steps before. I also learned how to fill the ANC card properly. The first page is filled after taking history, EDD calculation is done later. We used to fill all the information in the ANC card at the same time. But that is not correct." (Mentee 13)*
Better case management	Birth Asphyxia, PPH, Shock, Severe pre-eclampsia	*"We recently received an Eclampsia case referred from a municipality. The nurses had already received the training (Eclampsia management). So, they provided loading dose of MgSo4 and referred." (Mentor 5)* *"I used to clean the uterus by inserting my hand soon after the delivery of placenta. I now know that it should not be done." (Mentee 6)* *"Before this program (SBMP), 1 or 2 babies expired. But recently, in our center two babies were born with improper breathing. Then I provided a bag and mask (ventilation) and the baby was stable/normal." (Mentee 16)*

However, the staff revealed that the changes is not uniform in all the sites:

"In many sites, I was not so satisfied during the observation. Therefore, there are mixed type of outcome. The results are good in many sites but in some sites, the results are not as expected even after the hard work of mentors. We have to look on this again." (Staff 6)

They did not find much changes in Infection prevention practices of the health facilities even after the training:

"there is practical along with the theory but even after the practical, there was no change in term of infection prevention as expected in some sites…. I had gone myself to observe everything in that PHC." (Staff 6)

5.3. ADOPTION (A)

This dimension presents the number of BCs adopting the program (i.e. completing all 6 monthly sessions), number of mentees adopting the intervention (i.e. participation in monthly sessions on scheduled date, doing 4 weekly practices per monthly session), and number of mentors adopting the mentorship role (i.e. involved in monthly sessions).

5.3.1. Number and percentage of intervention BCs completing all 6 monthly sessions

Out of the total 56 BCs, selected for the study, the intervention was completed in 51 BCs (Table 37). Among the five BCs dropped, two monthly sessions were conducted in two BCs, one BC had completed three monthly sessions, one had completed one session, and one was dropped before starting the sessions. The drop-out of mentors and mentees were the reason for dropping the intervention BCs.

Table 37:District-wise Birthing Centers dropped and BCs with all 6 sessions conducted

District	Number of BCs selected for intervention	Number of BCs dropped	Number of BCs with all 6 monthly sessions conducted
Dolakha	12	1	11
Myagdi	12	1	11
Sarlahi	16	2	14
Udayapur	16	1	15
Total	**56**	**5**	**51**

5.3.2. Number and percentage of mentees participating in monthly sessions

The number of mentees participating in all 6 monthly sessions on the day they were scheduled is shown in Table 38. Overall, only 110 mentees (53.40%) attended all six monthly sessions on the day of conduction/ on scheduled date. The mentees missing the monthly sessions later learned from their respective mentors and peers.

Table 38: Mentees attending all 6 monthly sessions

District	Total mentees	Mentees attending all 6 monthly sessions	
		Number	Percentage
Dolakha	49	25	51.02%
Myagdi	35	15	42.86%
Sarlahi	63	31	49.21%
Udayapur	59	39	66.10%
Total	**206**	**110**	**53.40%**

Table 39 shows the attendance of mentees in monthly sessions by session name and district. Overall, the attendance was less in Bleeding After Birth (BAB) session (77.18% attendance), followed by Essential Care of Labor and Birth (ECLB) (77.68% attendance). The mentees missed the sessions on the scheduled dates mainly due to work conflict/ other priorities.

Table 39: Module wise attendance of mentees in monthly session on the scheduled day

District	Site and number of mentees enrolled	Number of mentees attending the session (%)					
		IP	ANC& PNC	ECLB	HBB	BAB	PE/E
Dolakha	Hub sites (n=29)	22 (75.86)	20 (68.97)	23 (79.31)	28 (96.55)	22 (75.86)	25 (86.21)
	Sub-hub sites (n=20)	14 (70.00)	16 (80.00)	16 (80.00)	17 (85.00)	14 (70.00)	18 (90.00)
	All sites (n=49)	36 (73.47)	36 (74.47)	39 (79.59)	45 (91.84)	36 (73.47)	43 (87.76)
Myagdi	Hub sites (n=17)	15 (88.27)	13 (76.47)	12 (70.59)	13 (76.47)	12 (70.59)	16 (94.12)
	Sub-hub sites (n=18)	12 (66.67)	17 (94.44)	15 (83.33)	15 (83.33)	16 (88.89)	17 (94.44)
	All sites (n=35)	27 (77.14)	30 (85.71)	27 (77.14)	28 (80.00)	28 (80.00)	33 (94.29)
Sarlahi	Hub sites (n=29)	21 (72.41)	17 58.62)	16 (55.17)	27 (93.10)	19 (65.52)	20 (68.97)
	Sub-hub sites (n=34)	28 (82.35)	27 (79.41)	22 (64.71)	25 (73.53)	25 (73.53)	30 (88.24)
	All sites (n=63)	49 (77.78)	44 (69.84)	38 (60.32)	52 (82.54)	44 (69.84)	50 (79.37)
Udayapur	Hub sites (n=27)	26 (96.30)	27 (100.00)	25 (92.59)	23 (85.19)	20 (74.07)	22 (81.48)
	Sub-hub sites (n=32)	28 (87.50)	29 (90.63)	31 (96.88)	31 (96.88)	31 (96.88)	30 (93.75)
	All sites (n=59)	54 (91.53)	56 (94.92)	56 (94.92)	54 (91.53)	51 (86.44)	52 (88.14)
All districts	**Hub sites (n=102)**	**84 (82.35)**	**77 (75.49)**	**76 (74.51)**	**91 (89.22)**	**73 (71.57)**	**83 (81.37)**
	Sub-hub sites (n=104)	**82 (78.85)**	**89 (85.58)**	**84 (80.77)**	**88 (84.62)**	**86 (82.69)**	**95 (91.35)**
	All sites (n=206)	**166 (80.58)**	**166 (80.58)**	**160 (77.67)**	**179 (86.89)**	**159 (77.18)**	**178 (86.41)**

5.3.3. Number and percentage of mentees doing weekly practice

After each monthly session, the mentees were supposed to practice the taught skills at least 4 times, one small topic per week. However, all the mentees did not practice during the weekly sessions. The percentage of mentees doing weekly practice is comparatively more in sub-hub sites than the hub sites (Table 40). Table 41 shows the attendance of mentees each week.

Table 40: Number of mentees doing all 4 weekly practice

Sessions	Hub sites (n=102)	Sub-hub sites (n=104)	Total (n=206)
Infection Prevention	65 (63.73%)	73 (70.19%)	138 (66.99%)
ANC/PNC	56 (54.90%)	77 (74.04%)	133 (64.56%)
ECLB	66 (64.71%)	76 (73.08%)	142 (68.93%)
HBB	77 (75.49%)	77 (74.04%)	154 (74.76%)
BAB	56 (54.90%)	77 (74.04%)	133 (64.56%)
PE/E	65 (63.73%)	86 (82.69%)	151 (73.30%)

Table 41: Number of participants in each weekly practice session (n=206)

Week	1	2	3	4
IP	159 (77.18%)	151 (73.30%)	150 (72.82%)	150 (72.82%)
ANC/ PNC	143 (69.42%)	142 (68.93%)	141 (68.45%)	138 (66.99%)
ECLB	152 (73.79%)	150 (72.82%)	147 (71.36%)	144 (69.90%)
HBB	169 (82.04%)	164 (79.61%)	165 (80.10%)	166 (80.58%)
BAB	143 (69.42%)	141 (68.45%)	141 (68.45%)	142 (68.93%)
PE	172 (83.50%)	171 (83.01%)	166 (80.58%)	161 (78.16%)

5.4. IMPLEMENTATION (I)

The implementation domain includes the planned vs actual implementation of the program, perception of interview participants on different aspects of the program intervention like- course contents, teaching methodology, mentors and mentees selection, and conduction of monthly and weekly session. The detail description is given below:

5.4.1. Perception regarding the course content

5.4.1.1. Positive aspects

i. Comprehensive course structure:

The participants acknowledged that the course content covered all the skills required for a BC nurse. The balance between theoretical and practical sessions was appreciated, as it provided a holistic learning experience:

"Content is very good. Content has a broad and more detail than SBA. (Mentor 10)

"Those topics (7 modules) which were done on simulation training are all needed ..... After we conducted the delivery, some had bleeding, the baby asphyxiated, and we were also lacking skills. One heart provided SBMP training, and we got skills." (Mentee 16)

ii. Inclusion of new/ recent updates and skills:

The course content was commended for incorporating recent updates and introducing new skills. Participants mentioned specific techniques such as the one-hand delivery technique, Kangaroo Mother Care (KMC), newborn assessment, double gloving, medication administration, and condom tamponade. The inclusion of these updates reflected the commitment to keeping the training current and relevant.

"I personally feel that using double gloves is good. The infection from mother not to be transmitted to child…….to prevent child from that dirt and infection, to change the gloves is very good system." (Mentee 9)

"I attended SBA training long ago. At that time, in bleeding after birth there was not condom tamponade session……I learned as plus point that how to make condom tamponade ready, how to use, how much effective it is for patient as we are using it these things are started by mentor training by One heart. I did not know that before..."(Mentor 7)

iii. Knowledge and skills refreshed, confusions clarified:

The participants also highlighted that the course content allowed them to refresh their existing knowledge and skills. The training provided an opportunity for nurses and ANMs to enhance their proficiency and ensure their skills were aligned with current standards. They further reported that the course effectively addressed participants' confusions, improving their understanding and confidence in managing pre-eclampsia and eclampsia cases.

"My knowledge and skills were also not very good before the simulation training. This simulation training has refreshed my knowledge and skills." (Mentee 3)

"I was confused about MgSo4 dose……In Bleeding after birth, if there is retained placenta, I learned to wait for 30 minutes after delivery and give IM oxytocin. This was new for me, didn't learn in SBA training." (Mentee 22)

iv. **Got to practice the management of cases that are not received very often**, like- PPH, birth asphyxia, and cervical tear repair:

I had only gone theoretically on condom tamponade and shock management procedure, and did not get a chance to handle them. I learned those skills through this simulation training. we became patient, helpers and health workers during the training. that method has helped in remembering the steps easily. i feel like i can remember these steps exactly when i have to perform them in real patients. (Mentee 25)

I also learned about cervical tear repair in this training. Previously, the cervical tear cases were directly transferred to the OT and I had not even got a chance to see how cervical repair is done. But here, I got to do the cervical repair myself. (Mentee 23)

v. **Most effective modules**:

The participants also highlighted on certain modules of the training program being highly informative and practical, equipping them with valuable skills for managing critical situations, like Managing pre/eclampsia, Bleeding after birth, condom tamponade insertion, helping babies breathe, and EMOTIVE approach:

"Best session was... Eclampsia session, there was a case of eclampsia, mother was unconscious with the incontinence of urine. We managed that case by giving loading dose." (Mentor 10)

"I really like the bundle approach method of PPH (management) because of condom tamponade (procedure)……Till now we did not get a chance to apply condone tamponade to real patient, but we were practicing at mamabirthe." (Mentor 12)

"…the EMOTVIE step in Bleeding after Birth is also very effective. Most of the cases are managed after doing those steps. I found that very effective as well. It's easier to remember too." (mentee3, Udayapur)

5.4.1.2. Difficulties/Challenges in Course Content

i. Different course content in similar trainings:

The participants reported the lack of uniformity in teaching of the government protocols and the SBMP training for the same content led to inconsistent knowledge among them. Some also noted differences in content in onsite coaching mentoring training and MNH update training, and differences in content when different mentors taught same content- especially in donning and doffing procedure:

"Although the government's protocol says to provide iron tablets for 45 days, I am teaching my mentees to provide iron and calcium even after 45 days…." (Mentor 6)

"In this program, we were told to provide iron tablets for 6 weeks, but it's given for 3 months at my PHC. There was huge issue during supervision from municipality…. It made difficult for both work learner and tutor. It would be better if similar protocol is brought." (Mentee 9)

"In donning and doffing, at first, we were taught to remove gloves and PPE at the same time. Another time, we were taught to remove the gloves first. I got a little confused in this" (Mentee 12)

ii. Lengthy sessions/ tight course schedule

The length and tight schedule of the training sessions in some modules (Bleeding after birth, ECLB, pre-eclampsia and eclampsia management) were identified as challenges. The participants felt that the lengthy sessions affected their ability to fully absorb the content which hindered their engagement and retention of information.

"They complain that the session is long and one heart always brings long session and never leave us on time. This might also be the reason." (Staff 8)

"It was hard, Content was tight, we needed to be fully prepared. Because of life saving procedures we need to convey right skill, information to mentees." (Mentor 10)

5.4.1.3. Suggestions for improvement of course content

i. Update course content:

The partakers suggested that the uniformity of course contents with timely updates could help in avoiding confusion and inconsistencies in knowledge and skills, which would help in enhancing the training's relevance.

"…should be needed to provide accurate information or procedures as well as content should be changed as updated." (Mentor 10)

"In infection prevention, it is being said that we don't need to make chlorine solution and it would be better if the contents are updated during our next session." (Staff 8)

"There is not anything ma'am (to suggest). It will be easier for us to work if the government protocol is also matched with the simulation program's guideline". (Mentee 10)

ii. Inclusion of additional topics:

They further recommended incorporating additional topics like family planning, breech delivery, shoulder dystocia management, PPIUCD, nutrition, kangaroo mother care, handling RH negative cases, manual vacuum aspiration, which were seen as valuable for comprehensive training.

"I think family planning part should be added because after delivery it is necessary to provide effective FP counseling……If we get FP charts, we will do better counselling to mother regarding postnatal care." (Mentee 20)

"We have to manage breech delivery, Shoulder dystocia, feeding problems…. In SBMP those cases/content are in miscellaneous parts so, those content we skip to teach mentees. In my opinion, if miscellaneous content should be the part of modules, it might be effective." (Mentor 10)

iii. Remove topics:

In addition, a few mentors and mentees suggested removing topics which were deemed less relevant and time-consuming, which would allow for a more focused and efficient use of training time.

"Donning and doffing was very important at that time because of the covid pandemic. But. I don't think this is necessary anymore because there are no more covid cases and we don't use PPEs now. I think it would be better if this topic was removed." (Mentor 2)

"Donning, doffing is a bit boring topic too…. Others topics (of infection prevention) module was good. Wrapping and decontamination were very useful…. Donning doffing procedure is not used here. It might be effective for corona hospital, but it's of no use here. That topic can be removed. The topic is useful, but we don't follow them." (Mentee 23)

iv. Change time duration of some sessions:

Furthermore, the mentors and mentees proposed extending the duration of practice sessions, as the current timeframe was not sufficient for effective skill development. Allowing an extra day for monthly sessions would facilitate more hands-on practice.

"They (mentees) complain about the tight schedule, sessions were conducted from morning to late evening" (Mentor 10)

"It was hard to finish even in two days. Then we requested the sister (OHW TFS) to manage the topic according to their length. For instance, if the topic is short, it should be done in 2 days and if the topic is vague of having an actual session duration is 2 days should be changed to 3 days…." (Mentee 16)

5.4.2. Perception regarding the teaching and learning methodology

5.4.2.1. Positive aspects

i. Helpful action cards

The participants found the action cards helpful in guiding their actions and preventing them from missing any crucial steps in patient care. They mentioned that action cards facilitated decision-making, especially in critical situations and were seen as practical tools that improved memory retention, facilitated learning, and ensured comprehensive care provision.

"……we can remember by observing these (action cards)… It has developed the habit of learning through these cards and easy to memorize rather than reading books." (Staff 6)

"Action cards make us easy… Action cards help to make a decision in which condition we can manage in our site or refer to CONC sites for advance care." (Mentor 12)
"Action cards show us the way… they prevent us from going out of track. The flow charts shown in action cards have made our job really easy." (Mentor 5)

One of the mentees highlighted the use of action cards not only for clinical procedures but also for counselling patients and visitors: using actions cards improved the effectiveness of their counselling and ensured the essential information was conveyed accurately.

"....we see the action cards and inform about birth preparedness, complications… We even show the action cards to women during counseling. I counsel the visitors showing the steps written in the action cards… visitors listen actively when we provide counseling in such a way." (Mentee 20)

ii. Realistic and durable manikins:

They emphasized the value of practicing with realistic manikins and found that practicing procedures on manikins closely mimicked real-life scenarios and enhanced their skills and confidence.

"They (dummies) were very good. It felt like doing in the real case… Like that, it is prepared on that way… using dummies was better." (Mentor 11)

"Practicing in the dummies made it easier to memorize the steps… Dummies were similar to real patients." (Mentee 5)

iii. Experiential learning using simulation based approach:

The training program was described as comprehensive, incorporating various teaching methods such briefing, scenario-based learning, role-playing, and debriefing. The participants expressed appreciations for this approach, as it allowed them to apply theoretical knowledge in realistic scenarios and receive constructive feedback to enhance their skills.

"... During the simulation, we assigned different roles… They had to act and provide care just like the real situation..." (Mentor 2)

"We practiced in demo and then did discussion... and used action cards as well." (Mentee 12)

"During debriefing, we discussed what went well, what could be done, what steps were missing, etc… they evaluate each other's performance and give feedback after completion…" (Mentor 12)

iv. Low dose high frequency methodology:

The training program followed a low dose high frequency learning approach, focusing on one topic at a time and practicing it repeatedly over a period of weeks or months. The participants noted that practicing the same topic multiple times improved their confidence and ability to handle similar cases in real-life situations.

"...We learned through breaking down the sessions in parts on a weekly basis which helps to grasp easily...." (Mentor 10)

"We went once a month, if we taught one topic, let's say IP (infection Prevention), they had to practice every week… That activity made their practice compulsory and also pushed them to do better...." (Mentor 8)

5.4.2.2. Difficulties/Challenges

The language barrier was a significant challenge identified by the participants. The action cards and the training materials being in English posed difficulties for understanding and implementation. There was a preference for action cards and manuals to be readily available in Nepali language, enabling better comprehension for a wider range of healthcare provider.

> *"Action cards are not given in Nepali... It would be easy for them to understand if action cards were in Nepali language..." (Staff 8)*
>
> *"....There is a language barrier in Sarlahi district... We are translating and making them write in Nepali." (Staff 7)*
>
> *"..At first, while providing in English, it was difficult for them to learn and understand... Later, I converted it into Nepali and slowly they did." (Mentor 7)*

The size of the flex and the font size were other difficulties recognized by the participants. It was suggested that the font size of the action card to be increased to enhance the visibility and readability.

> *"In my opinion, the size of the flex and font size should be slightly increased based on the size of the skill lab. It should be properly visible by the people." (Staff 6)*

The participants highlighted the issue of lack of resources or limited availability which might hinder the complete execution of all recommended steps. They focused on addressing the gaps in resource availability of ensure comprehensive implementation.

> *"Also for action cards, nothing. Let say for shock management, things like pneumatic stocking we don't implement..... Most of the things/cases are not implemented here so, if we have the resources for the implementation and manage, the case would be better." (Staff 9)*

5.4.2.3. Suggestions

i. Develop standard videos of procedure to ensure uniformity of teaching by mentors:

The participants expressed the importance of videos, to enhance understanding and ensure uniformity in teaching.

> *"I wish there was a video as well. I think video wasn't there. I felt that if video was there then it would be nice. I mean there will be uniformity if there were videos. We just discussed, but there was no video... if there was video, it would have been easier." (Mentee 12)*
> *"It would have been better if we were provided video after the session. We could refer to the videos and continue practice. We should have recorded video of us doing practice at that time." (mentee 23)*

ii. Revision of previous module before starting a new module:

The participants suggested the inclusion of regular revision sessions to reinforce previously taught concepts and address knowledge retention issues. The idea of reviewing the previous month's session before starting a new one was suggested. Participants also expressed a desire for reference manuals or modules to support their learning, which would also serve as a resource for future reference.

"I mentioned earlier that if dummies were available, then we could also practice. And, there are many things that are updated. We did not know that thing. Before six months, I mean in between two-three months if mentors could come once here…. looking after our work done through dummy and finding our weakness and if feedback given then it will be better." (Mentee 14)

"I want to give one suggestion. It would have been better if revision of last month's session was done before starting new session. Even post-test previous session can be done next month. It's difficult when the post-test off all the sessions are conducted at last, all at once. Review of previous session was not done in new session. We practice sincerely due to fear of post-test." (Mentee 22)

5.4.3. Perception regarding the mentors and mentees

5.4.3.1. Mentees perception about mentors

Several mentees appreciated mentors who had a friendly behavior and were actively involved in their mentoring process. They felt supported and could approach their mentors at any time for guidance and teaching.

"Our mentor was very friendly." (Mentee 16)

"Both our mentors are good…… they have given us time and been practicing us for our best…..(Mentee 19)

Some mentees felt that having a mentor who was their friend was not effective because the mentor did not believe them or provide adequate time for mentoring suggesting that personal relationships between mentors and mentees might hinder effective mentorship.

"I am talking about the fact that our recent mentor is not a good option because she is our friend. She won't believe us and will not provide adequate time….."(Mentee 16)

The mentees expressed some difficulties and confusion resulting from changes in mentors throughout the training program. They also highlighted those differences in teaching approaches, varying instructions, and conflicting information provided by different mentors created inconsistencies in teaching content.

"What happened is, the first mentor taught in one way, then another mentor taught in a different way….no, there is little difference. I don't know, maybe I was confused….." (Mentee 12)
"There was a different mentor for each session……. The previous mentor taught one thing, and the next mentor taught another thing. I got confused…." (Mentee 21)

5.4.3.2. Mentors perception about mentees

The mentors observed positive changes in mentees' skills and abilities, indicating that the program had a beneficial impact on mentees' professional growth and competence.

"…. They were not able to handle the case of baby resuscitation (neonatal resuscitation), but they can do it easily now. Again, same on PPH (management), finally, they can manage the PPH case too. They now handle the cases very confidently…." (Mentor 11)

However, some mentors expressed concerns about the mentees' adherence to weekly practice and the submission of practice logs and photos, which indicated a need for improved monitoring and accountability for ensuring mentees' active engagement in regular practice sessions.

"I have told the mentees to maintain logbook and send photos of weekly practice. But they sometimes do not do that. When I ask about that, they say that they are doing weekly practice." (Mentor 13)

It was also found quite challenging to teach some mentees for various reasons with diverse backgrounds and experience levels.

"It was quite challenging in the beginning because the mentees had forgotten a lot of steps. So, it was like starting from zero level at the beginning….." (Mentor 11)

"It was a little bit uneasy teaching senior staffs….. Some senior mentees initially did not like being taught by junior mentor." (Mentor 13)

"The staff there lack a bit in skills performance compared to the staff here (hub-site). It maybe because they have less practice…." (Mentor 14)

5.4.3.3. Staff's Perception about mentors and mentees

There were differing perceptions among staff members regarding the level of commitment and interests shown by mentors and mentees. While some staff members expressed concerns about the mentors' level of activity and their value for the program, and the lack of genuine interest and commitment from mentees, others had positive observations about the enthusiasm and eagerness of the participants.

"Among 10 mentors, most of them actively participate in the program and do themselves and in our perception, they are doing good." (Staff 8)

"One mentor is not very active. There had been instances when the mentees deny participating in monthly session due to other works…Some of the participants ask us to finish the training as quickly as possible." (Staff 3)

"…I think that they are not doing this….They have not shown that much interest in this program. They even take this as a burden, especially the mentors….I also want to inform you that the participants don't do weekly practice. I can give 100% guarantee; they have not done weekly practice." (Staff 4)

".....the participants of the implementation sites that I visit show eagerness in learning and they do participate well in the trainings." (Staff 5)

"Secondly, luckily it was good because in the context of mentor selection, we got potential mentor for the program." (Staff 6)

Some staff members emphasized the importance of selecting mentors, particularly based on the higher educational degree, to support the staff nurses and ANMs in peripheral areas.

"…… if possible, one B. Sc. nursing should be developed as a mentor so that they can support staff nurse and ANM in the periphery. If we select ANM, it will seem only temporary. Therefore, we need to work out on this and need to enhance this in the context of quality." (Staff 6)

The issue of mentor turnover was identified as a significant challenge in the program according to the staffs. Mentors being unavailable or leaving the program prematurely resulted in difficulties in mentor mobilization and disrupted the continuity of training sessions.

"There is a problem in mentor mobilization as well…. Our one entire day is spent just searching for available mentors." (Staff 4)

"We also had a lot of turnovers in mentors…Our mentors from Charikot were transferred to another health facilities. One mentor took postnatal leave after conducting two sessions. (Staff 5)"

5.4.4. Duration between monthly sessions

During the planning phase, monthly sessions were expected to conduct every month, with the average duration of 28 to 32 days in between the sessions. However, the average duration between two monthly sessions was 54.94 days (Table 43), which is almost two months' difference. Overall, 28 health facilities had more than 3 months' difference between two monthly sessions (Table 44).

Table 42: Average difference between two monthly sessions by districts

District	N	Average days
Dolakha	11	54.16
Myagdi	11	56.09
Sarlahi	14	46.86
Udayapur	15	62.21
Total	**51**	**54.94**

Table 43: Duration between two sessions

Difference between 2 monthly sessions	No. of health facilities				
	Difference between 1st and 2nd	Difference between 2nd and 3rd	Difference between 3rd and 4th	Difference between 4th and 5th	Difference between 5th and 6th
Within one month	6	7	8	4	9
1-2month	24	33	28	30	27
2-3 month	13	11	11	11	10
3-4 months	7	1	5	5	4
More than 4 months	4	0	0	1	1

5.4.5. Challenges conducting/attending monthly and weekly sessions

5.4.5.1. Drop-out/ attrition of mentors and mentees

The nurses and ANMs working in the intervention birthing centers/ sites were the target population of the Simulation Based Mentorship Program (SBMP). Before the program implementation, a total of 34 mentors were trained and they provided simulation-based mentorship on seven modules to 206 mentees of the intervention sites of four study districts. However, 5 mentors (14.71%) and 54 mentees (26.21%) dropped out during the program implementation, before the midline assessment. Further drop-out of mentors and mentees were experienced during the end-line assessment. Out of 34 mentors trained, only 20 mentors (i.e. 58.82%) were remaining during the end-line assessment. Similarly, among the mentees, out of total 206 mentees enrolled during the baseline assessment, only 133 (i.e. 64.56%) of them were present during the end-line assessment (Table 45 and 46).

Table 44: Number of mentors in the study

Mentors	Baseline	Midline	Endline	Attrition from Baseline to endline (%)
Dolakha	7	6	5	2 (28.57%)
Myagdi	8	6	6	2 (25%)
Sarlahi	10	10	5	5 (50%)
Udayapur	9	7	4	5 (55.56%)
Total	**34**	**29**	**20**	**14 (41.18%)**

Table 45: Number of mentees/ intervention group participants enrolled

Mentees	Baseline	Midline	Endline	Attrition from Baseline to endline (%)
Dolakha	49	33	27	22 (44.90%)
Myagdi	35	25	23	12 (34.29%)
Sarlahi	63	42	36	27 (42.86%)
Udayapur	59	52	47	12 (20.34%)
Total	**206**	**152**	**133**	**73 (35.44%)**

Reasons for drop-out/ attrition of mentors and mentees

One of the major barrier in reaching the target population was drop out of the participants in between the program. Due to this, 5 study sites from the implementation group were dropped during the program implementation as there were no mentees remaining. The reasons for drop-out/ attrition of mentors and mentees is shown in Tables 47 and 48. Termination of contract (voluntary resignation or end of temporary contract period) was one of the major reason for drop-out among both mentors and mentees (14.71% mentors and 19.42% mentees) (Table 6 and 7).

"…. there were many nursing staffs working in contract and after the election, the local representative changed, due to which there was turnover of health workers after 3-4 session of simulation program." (Staff 6)

"We have canceled one program site because the mentee left the health facility." (Staff 9)

Table 46: Reasons for attrition among mentors

Reasons	n (%)
Transferred to another health facility	2 (5.88%)
Resigned from job or termination of contract	5 (14.71%)
Maternity leave	1 (2.94%)
Study leave	6 (17.65%)
Total	**14 (41.18%)**

Table 47: Reasons for attrition among mentees

Reasons	n (%)
Transferred to another health facility	19 (9.22%)
Resigned from job or termination of contract	40 (19.42%)
Maternity leave	4 (1.94%)
Refused to participate	6 (2.91%)
Study leave	4 (1.94%)
Total	**73 (35.44%)**

Six mentees refused to participate/ enroll in the program, and assessments. One of them refused thinking that the program was a part of research:

"…One of the mentee rejected to participate because this was a part of research and she told us that we conducted this program for our benefit only…..(we) could not change her opinion, then we removed her." (Staff 5)

Difficulties in program implementation after drop-out of mentors and mentees

The turnover of nursing staff led to challenges like difficulties in mobilizing the mentors, scheduling time for monthly sessions, and eventually caused delays in monthly sessions:

"Some mentors left … we had a shortage of mentors for some time and we faced challenges in mobilizing them." (Staff 10)

"We had turnovers of mentors at 3 sites. One was transferred to another health facility and another one took postnatal leave after conducting two sessions. I then planned to mobilize mentor of other sites, but she refused saying that she had motion sickness. My one entire day was spent just searching for available mentors…" (Staff 4)

Although one mentor should be present during the monthly sessions, total 21 sessions were conducted by OHW staff due to absence of mentors (Table 49). Difficulty in mentors' mobilization was faced in Dolakha and Myagdi.

Table 48: District-wise health facilities with no mentors

Sessions	Number of BCs with no mentors during monthly session				
	Dolakha	Myagdi	Sarlahi	Udayapur	Total
1st Monthly session	0	0	0	0	0
2nd Monthly session	1	1	0	0	2
3rd Monthly session	2	5	0	0	7
4th Monthly session	2	1	0	0	3
5th Monthly session	2	4	0	0	6
6th Monthly session	1	2	0	0	3
Total	**8**	**13**	**0**	**0**	**21**

After the mentors left, new mentors were mobilized. Some of the mentees didn't face any challenges due to this, while some shared difficulties in learning due to differences in mentoring techniques:

"We had different mentors in each session…. It would have been easier for us to communicate and learn if only one mentor taught us. There was also confusion at one time. The previous mentor taught one thing, and the next mentor taught another thing. I got confused. I think it was in HBB module. There was a confusion in administering oxytocin…. "(Mentee 21)

5.4.5.2. Program schedule conflicts and staff scarcity

The participants mentioned about the difficulties they had to face while managing time due to program schedule conflicts and overlapping training programs. They added that the delays in conducting session were due to unavailability of the participants; the problems being different duty shifts and conflicting schedules. In some, there were not simply enough participants to conduct the sessions (lack of manpower stationed in the health facility).

> *"Time management is also quite hard... If they (mentees) were doing night shifts and having training at the same time, that brings physical tiredness and exhaustion for them..." (Mentor 10)*
>
> *"Sometimes….we are participating in the training during duty time and we get a call saying a case has come. Then, we had to leave the training and handle the case. After handling the case, we again go back to the training, but we get confused." (Mentee 11)*

5.4.5.3. High Patient Load and Delivery Cases:

The heavy flow of delivery cases and high patient load in health facilities caused interruptions during training sessions. The mentees reported instances where they had to leave training sessions to attend to delivery cases and then resumed the training afterward, resulting in session extensions.

> *"It was hard for us to manage time for weekly sessions because of heavy flow of delivery cases... We continuously watch the mother during the training…..We have less staff, we are just three of us and hard to manage time for regular duty as well." (Mentee 20)*
>
> *"We have high patient flow here (health post), but we don't have adequate number of staff... I have to look at ANC and delivery cases at the same time." (Mentor 12)*

5.4.5.6.Session Duration and Time Management Challenges

The participants expressed difficulties with long working hours, transportation issues, and mental stress due to lengthy sessions. Suggestions were made to increase course duration and improve time arrangement for sessions.

> *"We had to come early in the morning and stayed until late 7pm-8pm. That was hard because of bus problem, winter short days, due to which I felt mental stress and exhaustion. If course time should increase from 5 to 7-8 days, we can't feel pressure." (Mentor 10)*

5.4.5.7.External factors

The participants mentioned the challenges they had to face because of the external factors like extreme weather conditions, poor road conditions with transportation management issues, the lockdown due to COVID pandemic, lack of support/coordination from the Palika etc. They also mentioned about the delays in the training schedule due to festivals.

The condition of roads is very dangerous during the rainy season. It used to be difficult to carry dummies and other materials for training." (Mentor 3)

"Because of the lockdown, the mentor of Pawati was unable to run the program…." (Mentor 6)

"There were some delays due to covid vaccination and other programs." (Mentee 25)

"Health coordinators are the same…communicated with them verbally. But, they ask to bring the documented information…. they tell us that they don't know about the program at all and ask us about the program. " (Staff 3)

"As far as I know, there was a problem in coordination even before I joined this office. The palika stakeholders do a lot politics, so we could not finish program activities on time…" (Staff 3)

5.5. Measures applied to mitigate the challenges encountered

5.5.1. Flexible Scheduling and Duty Management:

The participants adjusted their schedules, exchanged duties, and made use of spare time, evenings, weekends, and shifts to accommodate practice sessions. Some sessions were conducted inside the labor/delivery room, allowing the participants to observe and attend to real-time delivery cases while incorporating simulation training.

"We even stayed late in the birthing center because we wanted to practice. Some of us come earlier than our duty time as well." (Mentee 20)

". I managed my time by exchanging shifts. If I have to attend some other training, then only I skip that session, otherwise I never skip." (Mentor 12)

"To run sessions, we arrange our time in the evening because the patient flow is high in the morning." (Mentor 12)

"The woman will be on bed, and we continuously watch the mother during the training. We conducted the delivery first…. then continued with the simulation session." (Mentee 20)

5.5.2. Accountability through photo and video sharing

The mentors implemented a practice accountability system by requesting mentees to send photos and videos of their weekly practice sessions.

". I've asked the mentees to send either photos or videos of the practice sessions, and that activity made their practice compulsory and also pushed them to do better." (Mentor 8)

"...The mentees also send photos of weekly practice in that group. I clarify any issues in that group." (Mentor 13)

5.5.3. Rotational Practice and supportive environment

The participants took turns practicing in groups, allocating specific days and times for practice sessions. Health facility in-charges and coworkers were supportive and played a role in managing time due to their understanding of the workload and services provided.

"Initially, there were two groups, and we took turns practicing. We used to allocate a day and time for meeting (practicing)." (Mentee 12)

"We work in mutual understanding. Even us in-charge sir helps in managing the time because we provide a lot of services." (Mentee 25)

5.6. MAINTENANCE (M)

There was a strong consensus among the stakeholders, mentors, and mentees that the program should continue. They acknowledged the positive impact it had on improving skills and knowledge in managing the maternal and neonatal cases.

"We learn more by doing. This program should not be stopped here, we would like to see program more and would like to learn more." (Mentee 9)

"One Heart should not completely leave this program after this 6 months training, I suggest One Heart to run the program continuously It it's not possible to conduct every month or every month, you can conduct one-day review programs once every 2 to 3 months" (Mentor 5).

"This program is supporting the Nepal government's goal of reducing maternal and newborn mortality rates. That is why this program must continue. One Heart should continue this program in order to continue the progress it has been making in this palika. We can discuss for further modification of this program." (Stakeholder 4)

The participants stressed on the need to scale up and continue the program due to its effectiveness. The program was considered superior to other existing programs. They expressed their desire to continue learning and improving through the program.

"This program is doing good and will do good. So, we must give continuation to the program as it is far better than other programs. It directly helps to reduce maternal and neonatal mortality and morbidity if it is scaled up and we are able to continue this program" (Staff 8).

5.6.1. Cost of continuing SBMP by the local government

The program will be sustainable if it is adopted by the government. OHW established a simulation skills lab at 14 hub sites, provided six action cards to all intervention sites, and also trained district-level mentors. The cost of skills lab materials at one hub site was NRs. 340,208.00, and the cost of six action cards per health facility was NRs. 1,440 (Table 50). Similarly, the cost of developing one mentor was NRs. 62,781.50. For the continuation of SBMP, the local governments should invest in the monthly session costs, as shown in Table 51. The cost of SBMP training per mentee per session in the study was NRs. 2,974.84. The detailed breakdown of the costs incurred is presented in the Annex.

Table 49: Capital cost per health facility

Cost of skills lab materials at one hub site	NRs. 340,208.00
Cost of 6 action cards per health facility	NRs. 1,440

Table 50: Cost of monthly sessions and cost per mentor development

Cost of conducting one monthly session per health facility	NRs. 9,951.76
Cost of conducting six monthly sessions per health facility	NRs. 59,710.55
Cost of conducting one monthly session per hub site	NRs. 13,309.60
Cost of conducting six monthly sessions per hub site	NRs. 79,857.61
Cost of conducting one monthly session per sub-hub site	NRs. 8,552.66
Cost of conducting six monthly sessions sub-per hub site	NRs. 51,315.95

Cost of SBMP training per mentee per session	NRs. 2,974.84
Cost per mentor development at district level	NRs. 62,781.50

5.6.2. Retention of knowledge, skills and confidence during end-line assessment

At the individual level, the retention of knowledge, skills, and confidence assessment scores were also assessed. After the completion of midline assessments, OHW did not conduct any intervention. The health facilities, mentors, and mentees were told that the program has ended and they should continue practicing on their own. To assess retention, the knowledge, skills, and confidence of the participants were re-assessed after 4 to 6 months of completion of the SBMP intervention. A paired t-test was done to analyze the difference in the scores obtained during midline and end line assessments.

Table 56 presents the knowledge assessment scores; Table 57 shows the skills assessment scores; and Table 58 shows the confidence assessment scores obtained by the mentees during midline and end line assessments. There is no statistically significant difference in the knowledge assessment scores, except for module 6- pre-eclampsia and eclampsia ($p>0.05$). The knowledge assessment score of the mentees significantly increased in module 6 during end line assessment compared to the midline (Table 56).

Table 51: Retention of knowledge assessment scores among mentees (expressed in percentage)

Module	Midline (n=133)	Endline (n=133)	Difference (E-M)	P-value
Module 1: Infection Prevention	90.98	91.84	0.86	0.334
Module 2 : Antenatal care and counselling	91.31	90.79	-0.52	0.65
Module 3: Essential care of labor and birth	90.27	91.25	0.98	0.268
Module 4: Helping Babies Breathe	95.15	95.32	0.17	0.83
Module 5: Bleeding after birth complete	91.84	91.37	-0.47	0.59
Module 6: Preeclampsia and eclampsia	79.46	82.79	3.33	0.019
Module 7: Postnatal Care and Counselling	83.96	85.91	1.95	0.149
Overall knowledge assessment score	88.96	89.87	0.91	0.141

Similarly, no statistically significant difference was found in all the skills assessment modules (Table 57).

Table 52: Retention of skills assessment scores among mentees (expressed in percentage)

Module	Midline (n=133)	Endline (n=133)	Difference (E-M)	P-value
Module 1: Infection Prevention	80.63	81.25	0.62	0.549
Module 2 : Antenatal care and counselling	81.86	82.59	0.73	0.518
Module 3: Essential care of labor and birth	80.09	80.00	-0.09	0.936
Module 4: Helping Babies Breathe	78.68	80.11	1.43	0.213
Module 5: Bleeding after birth complete	76.03	77.67	1.64	0.108
Module 6: Preeclampsia and eclampsia	77.93	79.91	1.98	0.082
Module 7: Postnatal Care and Counselling	79.47	81.62	2.15	0.065
Overall confidence assessment score	79.00	80.19	1.19	0.206

The confidence of mentees increased significantly in four modules (module 2, 3, 4, and 7) during the endline assessment compared to the midline assessment ($P<0.01$) (Table 58). There were no statistically significant changes in confidence assessment in other three modules as well.

Table 53: Retention of confidence assessment scores among mentees (expressed in percentage)

Module	Midline (n=133)	Endline (n=133)	Difference (E-M)	P-value
Module 1: Infection Prevention	96.23	96.22	-0.01	0.976
Module 2 : Antenatal care and counselling	87.77	91.08	3.31	<0.001
Module 3: Essential care of labor and birth	89.7	91.27	1.57	0.037
Module 4: Helping Babies Breathe	89.62	91.58	1.96	0.033
Module 5: Bleeding after birth complete	90.21	91.39	1.18	0.094
Module 6: Preeclampsia and eclampsia	88	89.31	1.31	0.143
Module 7: Postnatal Care and Counselling	87.7	90.46	2.76	0.002
Overall skills assessment score	91.14	92.5	1.36	0.001

The above findings suggest that SBMP was effective in retaining the knowledge, skills, and confidence of the participants, even after four to six months of completion of intervention.

5.6.3. Application of learnings in real cases after completion of SBMP intervention

Maintenance of program is ensured when both individuals (mentors and mentees) and the settings (local levels and health facilities) continue the program/ apply the learned skills after the completion of the program. The participants (mentors and mentees) were expected to apply the learned skills at their respective work stations, in real patients. In addition to the assessments, the mentees were asked to rate their thoughts on application of learned skills in real patients at their respective health facilities. A five point Likert scale was used for rating. The number of mentees agreeing or disagreeing to the statements are shown in Table 54. During the end line assessment, all 130 mentees either agreed or strongly agreed on using the learned skills on real patients. However, 14 out of 130 mentees (i.e. 10.77%) either agreed or strongly agreed that application of learnings is difficult in real patients. However, only 55.38% mentees strongly agreed on practicing skills in the skills lab every week.

Table 54: Perception of mentees regarding application of learned skills (n=130)

Statements	n (% of participants)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
It was difficult for me to apply learned skills (using manikins) in real patients.	62 (47.69)	50 (38.46)	4 (3.08)	6 (4.62)	8 (6.15)
I can apply the acquired knowledge and skills in my professional life.	0 (0.00)	0 (0.00)	0 (0.00)	27 (20.77)	103 (79.23)
I have used the skills learned in the skills lab in my patient.	0 (0.00)	0 (0.00)	0 (0.00)	27 (20.77)	103 (79.23)
I have practiced different skills in the skills lab every week.	2 (1.54)	4 (3.08)	6 (4.62)	46 (35.38)	72 (55.38)

5.6.3.2. Challenges in application of learnings

The difficulties faced by mentors and mentees while applying the learned skills in real patients are described below:

i. Unavailability of equipment and supplies

One of the major challenges identified in the application of learnt skills was the unavailability of necessary equipment and supplies in the healthcare facilities. For instance, participants mentioned the scarcity of gloves, which prevented them from practicing double gloving as recommended, as evident by the following quote from one of the staff members:

> *"In case double gloving, it has come to practice in many sites but in some sites, in charge does not give extra gloves so, it is not in practice even after knowing due to scarcity of gloves." (staff 9)*

In another case, the absence of penguin suction and unreliable electricity supply hindered the implementation of proper neonatal resuscitation techniques, as highlighted in the following quote:

> *"During the helping babies breathe session, we were taught using penguin suction. But we don't have penguin suction in our health facility. We have an electric suction. But we don't have electricity every day. I feel like the equipment used while training should be available in reality as well. We have requested the palika for the materials, but they're not provided yet" (Mentee 4).*

ii. Exact application difficulties

The exact application of learnt procedures faced challenges due to factors such as inadequate staffing and high patient loads. The staff to patient ratio did not match the ideal conditions presented in the training modules, making it difficult to follow the exact procedures. Time constraints were also highlighted, as healthcare providers had to handle a large number of patients within a limited time frame.

> *"Sometimes we face difficulties due to inadequate staff. Some may have to go for vaccination, some will be in training, and other places. Sometimes, there won't be the required number of staff in the health facility. Sometimes, we have to manage the cases alone, I feel anxious when I have to work alone. At that time, I cannot work as I was taught during the training." (mentee 4)*
>
> "*In modules of simulation, it has all procedures which have to be done but on applying in real it is hard too. Because in every center, staff and patient's ratio doesn't match. Considering the modules of ANC and PNC in simulation, it took more than 1 hour. We have to look at approximately 45 to 50 patients per staff. Following the exact procedure is quite hard." (mentor 8)*

The participants gave the impression of the challenges and unpredictability of real-life situations compared to controlled practice scenarios. It highlighted the need for adaptability and teamwork in the healthcare settings, as highlighted in the statement below:

> *"There is a little difference practicing in dummies and in real patients. We can take time while practicing. But unthinkable situation can occur in real case. For example, see yesterday's case, when we were about to conduct delivery….we had just opened the sterile delivery set, laid down the sterile wrapper and wearing sterile gloves but the patient suddenly sat on the floor (laughs). In that condition, if only one staff member was conducting the delivery, it would be hard whether we could hold the patient or to maintain IP, but yesterday we were three staff, so we managed somehow. It becomes difficult sometimes" (Mentee 16).*

"We do follow each step for each and every patient. We do individual ANC checkup, but counselling is done in group (taking 3-4 person at a time) due to lack of time. Here, we have 15 - 20 visits in a day." (mentor 11)

The staff also felt that some mentees lacked motivation and interest in applying the learnt skills, considering the training as a burden. This attitude hindered the effective utilization of the acquired knowledge and skills in their work.

"I believe that participants should implement the learned skills in their real life, in their working areas. This is also one of the objectives of this program. But I think that they are not doing this. Even when you take the interview, they will tell that they like the program a lot and are utilizing the skills. But that's not true. We (the participants and OHW field staff) are like friends, they tell us everything. They have not shown that much interest in this program. They even take this as a burden, especially the mentors. They have to participate every month, and for that, they have to talk to their in-charges, call the mentees and they themselves have to manage as they have their own schedule, they have their routine immunization program and different other programs. If you ask me, I feel that the participants are not taking this program seriously, some of them even feel burdensome. They don't tell us directly, but I can understand by their gesture." (staff 4)

iii. Un-updated government protocols

Conflicting protocols and techniques taught in different programs created confusion among the healthcare providers. Divergence from the official government protocols made it challenging to determine which procedures to follow leading to inconsistencies in practice and hindering the application of learnt skills.

"*During the simulation training, we were taught to provide iron tablets for 3 months during post-partum period. But the government protocol mentions about 45 days. Maybe, the government protocol is not revised yet and the new information will be circulated to us soon. But we are confused which protocol to follow. I was the one who raised this question first. PNC program was being conducted in Palika at that time (by the Palika). They were teaching about providing iron tablets for 45 days. Then, I raised question that we were taught about prescribing iron tablets for 3 months by one heart. Then, the Palika created a big issue. As you know, Palika generally do not listen to project's suggestions." (mentee 13)*

"After the training provided by one heart, we've been doing both. But after ma'am from SBA told, then the working staff are confused, and mentor trainers are feeling tension. They are providing training and the things from government and one heart are not similar or not matched then participants will say it then mentors might feel uneasy. We discussed that….Because of that system being unmatched with government's protocol, we feel confused which one to do. This, very nice protocol from one heart has been developed here. so, this protocol should be discussed with Nepal government by the high-level authorities of One heart about the how to regulate it in order to avoid discussion." (mentee 9)

iv. Inadequate cases for application

Some participants declared that there was lack of delivery cases in the health facility because of which they could not practice the learning as revealed in the following quotes:

"Neonatal resuscitation (in the health facility), not much for now. Here we haven't done delivery much now that's why, no." (Mentee 12).

"We receive very little delivery cases nowadays. Deliveries are not much compared to when we had MDGP in our health facility. Women do not come (here) for delivery as there is no MDGP, they go to Charikot instead" (Mentee 12).

"Sometimes, it will be referred. That happened. There were five deliveries in ours since Shrawan. And after that, we did not get to practice as much. There will not be dummy either. I feel like that it might be forgotten" (Mentee 14)

They also complained of not receiving any complicated cases as highlighted in the following quotes:

"We have not received any complicated cases till now. It should be managed, after they came, no? After managing, it should be done till refer. Till now, eclampsia, pre-eclampsia, PPH, birth asphyxia cases have not come in our health facility." (mentee 14)

"No, ma'am…. not in real patient, haven't got that opportunity yet (to apply learned skill in real patient). Well, we do not receive such type of cases at our (health facility) level. We have a CEONC site nearby our birthing center. We also have Dolakha Hospital, Dhulikhel Hospital's branch nearby. That is why, we don't have any cases these days. It's been almost 7 to 8 months now, it's (normal delivery cases) nil" (Mentee 10).

5.6.4. Perception of mentees regarding the involvement of mentors after completion of intervention

As shown in Table 60, majority of mentees strongly agreed that the mentors helped them to clarify the difficulties (88.46%), and were able to successfully transfer the knowledge and skills of the subject matter (82.31%). However, 10% mentees agreed or strongly agreed that the follow-up process was less than they expected after the program ended.

Table 55: Perception of mentees regarding the involvement of mentors (n=130)

Statements	n (% of participants)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The mentors helped me to understand the content that I found difficult before.	0 (0.00)	2 (1.54)	0 (0.00)	13 (10.00)	115 (88.46)
Mentors were able to successfully transfer the knowledge and skills of the subject matter	1 (0.77)	5 (3.85)	1 (0.77)	16 (12.31)	107 (82.31)
The follow-up process from mentors were less than expected.	35 (26.92)	72 (55.38)	10 (7.69)	9 (6.92)	4 (3.08)

5.6.5. Commitments made by the health coordinators for continuation of SBMP during district level dissemination of findings

The district level findings were shared to district and local level stakeholders in all 4 study districts. The details of the dissemination meeting are as follows:

Table 56: Details of SBMP annual learning and sharing meeting at district level

District	Date of dissemination	Participants
Dolakha	December 28, 2023	Total participants- 28 ● District level stakeholder- 5 ● Health coordinator-5

		● Health facility in charge- 10 ● Doctor- 1 ● SBA- 7
Myagdi	January 17, 2024	Total participants- 31 ● District level stakeholder- 9 ● Health coordinator- 6 ● Health facility in charge- 10 ● SBA- 6
Sarlahi	December 22, 2023	Total participants- 40 ● Provincial level stakeholder- 2 ● District level stakeholder- 2 ● Health coordinator-14 ● Health facility in charge- 15 ● Doctor- 2 ● SBA-5
Udayapur	December 25, 2023	Total participants- 37 ● District level stakeholder- 8 ● Health coordinator- 7 ● Health facility in charge- 14 ● Doctor- 2 ● SBA- 6

The findings of SBMP IR were appreciated by all the participants and acknowledged that SBMP is beneficial in building the capacity of nurses working in the Birthing Centers. They admitted that SBMP is not just OHW's program, but it's the palikas' program as well. During the discussion, participants, especially the health coordinators were asked what they would do to continue the program in their own palikas. Some of the plans shared by the health coordinators are listed below:

a. Mobilize the district level mentors in health facilities in their palika that were not selected for the intervention.
b. Coordinate with the district health office for additional mentor development.
c. The health coordinators requested the district level mentors to bring a plan for simulation based sessions conduction, and they will inform the local level executive members about the effectiveness of SBMP. In addition to this, they mentioned lobbying to allocate a budget for simulation based trainings in next fiscal year's plan.
d. Assess the training needs of the nurses and plan for simulation based trainings in specific modules.
e. Integrate SBMP with other similar activities like MNH refresher training to avoid duplication.

The district level stakeholders also agreed to work together with local level stakeholders to develop district level mentor mobilization guideline. They further mentioned lobbying with provincial level stakeholders.

5.6.6. Recommendations for continuation of program/ sustainability

i. Continued monitoring and supervision

The participants proposed an idea of continuous monitoring and supervision for the effectiveness of the program.

"There should be regular follow up, monitoring and refresher training in the future. It would be helpful if we were reminded every 2 to 4 months, provided refresher training in problematic areas." (mentor 3)

"I feel that SBA training should be removed and provide simulation training instead. After the simulation training, they must be continuously monitored. We cannot ensure that all the mentees will practice as trained without effective monitoring." (mentor 2)

ii. Promote regular refresher trainings for skill maintenance

The participants emphasized the need for regular practice to retain the knowledge and skills acquired through the program. They expressed the concerns about skill deterioration if practice opportunities were limited. The importance of repeated practice and continuous skill development was recognized as an effective tool for the management of maternal and neonatal cases.

"We should have refresher training at least in the 1 to 2 months' gap otherwise we may forget (even topic) what we have learned." (Mentee 16)

"Palika can plan for the training and practice session for us if possible in 3~3 month which would be better otherwise at least they should have given in 6 month including PHC, palika." (Mentee 5)

iii. Involvement and support from local-level stakeholders

The stakeholders were involved in selection of study sites, mentors, managing space and furniture for skills lab, room for conducting monthly sessions, observation of monthly sessions, and monitoring visits:

"I was invited in some of the sessions…I got a chance to observe the practical and discussions taking place there. I realized that this program is very important. The nurses were learning condom tamponade procedure through simulation. I also saw that the nursing staff practice the taught skills in group whenever they were free. They practiced PPH management, condom tamponade, shock management, referral procedure, etc. in the practical room. When I asked them, they told me that they practice every week and whenever they have spare time." (Stakeholder 8)

"I was involved from the start. I was involved in selecting the mentors, the criteria was to select at least Staff nurse… .I got a chance to observe three sessions. I went in the beginning, and at the closing. They (mentees) did practice at the end, they used to do role play while practicing. I used to teach there during the role play stage. They used mamabirthie while role playing." (Stakeholder 9)

"I was involved from the beginning, from the planning phase. We had to choose one center for monitoring 3 municipalities… we had to select mentor who is accessible to all those municipalities and must have studied staff nurse and we had nursing staff with the qualification of BN working as S. ANM and she had already worked as SBA trainer and she was accessible to all. Therefore, she was selected as a mentor… we provided the furniture needed for the office and other equipment needed by the health workers while providing service. We provided the equipment apart from the equipment provided by one heart." (Stakeholder 6)

However, as mentioned above, most of them were not very aware or knew very less about the program. The staff's shared that the stakeholders were not engaged much during the program:

"I have never seen the active involvement of the stake holders. In the beginning, during the planning phase, we engaged stake holders, HFOMC members for the introduction regarding our program and how we will conduct it and they praised that it is good program and we must do it. But, they didn't even offer tea when we were doing sessions."(Staff 8)

Palikas were seen as key stakeholders in program continuation. They needed to understand the importance of the program, allocate the budgets, provide necessary equipment, and involve themselves in policy-level discussion to ensure the sustainability of the program, as highlighted in the following quotes:

"The municipality should understand this program is good and they must show interest." (Staff 8)

"They wanted to strengthen this program and it is observed that overall delivery services have been strengthen after the implementation of this program but if we talk about some stakeholders, the administration officer might be unknown about this. Therefore, they should be provided with at least one day orientation because if we involve the stakeholders as much we can, it will be easy to work in the policy level. The stakeholders such as health coordinator, PHN are quite positive for this program, and they are providing support but there was no expectation from the administrative officer or the in charge. We could involve municipality in charge during the program in municipality, but others could not get involved. So we could find a gap there. Secondly, we could not involve every administrative officer so, gap was seen. But potential stakeholders or those involved in policy making level are not seen to be involved in this program. In my opinion, we also need to consider this while conducting this program in other districts. Overall, they also have supported the simulation program and giving time and support." (Staff 6)

iv. Manikins mobilization from local levels

Suggestions were made to hand over the manikins and equipment to the local levels for proper storage and usage, which could help in continued practice and skill retention, as evident in the following quotes:

"If there was a system of providing the manikins and returning the manikins after practice, it would have been better. We have not left manikins at the sub-hubs after the completion of training" (Mentor 6).

"It will be possible to manage manikins by local level but at this time we are not asked about it . Have to conduct this program to make staff more skilled or for the quality services. It will be low costly if they circulate staff with in the municipality and it will be easy for them, and they can conduct the program with in the time period" (Mentor 6).

v. Need of incentives

Mentors expressed their willingness to continue but emphasized the need for incentives and a reason to visit the health facilities. Stakeholders also agreed that providing additional support and incentives to mentors could help sustain their engagement and motivation.

"I have not visited my sub-hubs now because the program has already ended… I won't go…There must be a reason for my visit. Either the palika should call me or there must be any programs from the NGOs just like the simulation program…. Additional incentives must be provided to the mentors." (mentor 2)

"The mentors are getting some incentives now from your organization. But, if we could not provide motivational factors to them, or if we cannot mobilize them properly, the program can discontinue. One heart must have also provided refreshment and sustenance incentives to the nurse. We haven't provided this to them." (Stakeholder 8)

6. Conclusion and Recommendations

Overall, Simulation Based Mentorship Program (SBMP) was effective in improving and retaining the essential obstetric and newborn care related knowledge, skills, and confidence of nurses working in different birthing centers of four district of Nepal. The SBMP could be a valid alternative for training Maternal and Newborn Health service providers of the country to provide quality perinatal care. A few programmatic level recommendations are given below:

- Careful selection of participants- both mentors and mentees to reduce drop-outs. Permanent staff, and interested ones can be selected.
- Include new staff, doctors, paramedics, office helpers during the monthly sessions. Office helpers are involved in Infection Prevention activities of the health facilities, so they must be involved in the Infection Prevention session.
- Include additional topics like Post-Partum Intra-Uterine Contraceptive Device (PPIUCD) insertion, integrated Kangaroo Mother Care (iKMC), Manual Vacuum Aspiration (MVA), breech delivery as health facilities provide these services as well.
- Change time duration of lengthy sessions (ECLB, BAB, PE/E). Increase time for simulated practice.
- Increase time duration between two sessions (maybe 2 months) to ensure attendance of all the mentees.
- Use videos in monthly sessions to enhance teaching and learning.
- Revision of previous monthly session before starting a new one. This will help in clarifying any confusions that the mentees may have.
- Provide learning materials/ resources to mentees as well.
- Develop teaching and learning materials (action cards, reference guides) in Nepali language.
- Tracking of weekly practice sessions (maintain real time database).
- Teach alternatives when exact application is difficult in real cases- e.g. group ANC and PNC sessions- especially in Madhesh/ crowded health facilities.
- Pre-inform about the changes/ updated in training protocol to the local stakeholders beforehand to avoid hindrances.
- Follow up of commitments for continuation of program made by the stakeholders (especially the health coordinators) during the district level dissemination workshops.

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8. Annex

Annex I: Details of study sites

District	Study sites				
	Intervention group			Control group	
	Municipality	Hub/ Sub-hub	Health facilities	Municipality	Health facilities
Dolakha	Bhimeshor UM	Hub	Charikot Hospital	Kalinchok RM	Lapilang HP
	Bhimeshor UM	Sub-Hub	Boach BC	Tamakoshi RM	Jhule HP
	Bhimeshor UM	Sub-Hub	Dolakha BC	Gaurisankhar RM	Jugu HP
	Sailung RM	Sub-Hub	Magadeurali BHSC	Bigu RM	Khopachagu HP
	Melung RM	Hub	Pawati HP	Bigu RM	Alampu HP
	Melung RM	Sub-Hub	Melung HP	Saiung RM	Fasku HP
	Melung RM	Sub-Hub	Dadakharak HP	Tamakoshi RM	Bhirkot HP
	Sailung RM	Sub-Hub	Sailungeshwor HP	Tamakoshi RM	Chyama HP
	Jiri UM	Hub	Jiri Hospital	Bigu RM	Laduk HP
	Jiri UM	Sub-Hub	Shyama HP	Gaurisankhar RM	Jhyaku HP
	Baiteshor RM	Sub-Hub	Kavre HP	Baiteshor RM	Chhetrapa HP
	Baiteshor RM	Sub-Hub	Namdu HP	Kalinchok RM	Singati PHC
Myagdi	Beni Municipality	Hub	District Hospital	Beni Municipality	Bhakimli HP
	Beni RM	Sub-Hub	Pulachaur HP	Raghuganga RM	Rakhu Bhagwati HP
	Annapurna RM	Sub-Hub	Bhu. Tatopani HP	Beni Municipality	Singha HP
	Raghuganga RM	Sub-Hub	Rakhu Piple HP	Beni Municipality	Jyamrukot HP
	Malika RM	Hub	Durbang PHCC	Annapurna RM	Ghara HP
	Dhawalagiri RM	Sub-Hub	Marang HP	Raghuganga RM	Pakhapani HP
	Malika RM	Sub-Hub	Ruma HP	Dhawalagiri RM	Malkawang HP
	Mangala RM	Sub-Hub	Arman HP	Mangala RM	Baranja HP
	Dhawalagiri RM	Hub	Takam HP	Mangala RM	Kuhu HP
	Malika RM	Sub-Hub	Devisthan HP	Raghuganga RM	Sikha HP
	Dhawalagiri RM	Sub-Hub	Lulang HP	Malika RM	Bima HP

District	Study sites				
	Intervention group			Control group	
	Municipality	Hub/ Sub-hub	Health facilities	Municipality	Health facilities
	Dhawalagiri RM	Sub-Hub	Mudi HP	Dhawalagiri RM	Muna HP
Sarlahi	Malangwa UM	Hub	Malangwa Hospital	Baira UM	Achalgadh PHC
	Kabilasi UM	Sub-Hub	Jamuniya PHCC	Ishwarpur UM	Ishwarpur HP
	Bishnu RM	Sub-Hub	Simara HP	Bagmati UM	Karmaiya HP
	Haripurwa UM	Sub-Hub	Dhankaul Purwa HP	Chakkarghatta RM	Aurahi HP
	Goadaita UM	Hub	Sisautiya HP/ BC	Godaita UM	Rohuwa HP
	Godaita UM	Sub-Hub	Bagdah HP	Ramnagar	Ramnagar Bahurwa HP
	Dhankaula RM	Sub-Hub	Harkathwa HP	Balra UM	Sekhauna HP
	Balra UM	Sub-Hub	Dumariya HP	Kabilashi UM	Pipariya HP/BC
	Haripur UM	Hub	Haripur PHCC	Chandranagar RM	Babarganj HP
	Basbariya RM	Sub-Hub	Sadodwa HP	Haripur UM	Parwanipur HP
	Barahathawa UM	Sub-Hub	Barahathwa PHCC	Ishwarpur UM	Bhaktipur HP
	Chakraghatta RM	Sub-Hub	Sundarpur HP	Ishwarpur UM	Kalinjor HP
	Haripur UM	Hub	Lalbandi PHC/ BC	Bagmati UM	Gaurisankhar HP
	Haripur UM	Sub-Hub	Laxmipur Kodraha HP	Haripur UM	Haripurwa HP
	Chandranagar RM	Sub-Hub	Chandranagar HO	Parsa RM	Parsa HP
	Hariwan UM	Sub-Hub	Sasapue H	Kaudena RM	Kaudena HP
Udayapur	Triyuga UM	Hub	District Hospital	Chaudandigadhi UM	Sundarpur HP
	Triyuga UM	Sub-Hub	Deuri HP	Chaudandigadhi UM	Hadeya HP
	Triyuga UM	Sub-Hub	Jogidha HP	Katari UM	Hardeni HP
	Udayapur Gadhi RM	Sub-Hub	Bhalayadada HP	Sunkoshi RM	Baraha HP
	Belaka UM	Hub	Rampur HP	Triyuga UM	Khanbu HP
	Belaka UM	Sub-Hub	Tapeswori HP	Rautamai RM	Murkuchi HP
	Chaudandigadhi UM	Sub-Hub	Beltar PHC	Udayapurgadi RM	Udayapurgadi HP
	Chaudandigadhi UM	Sub-Hub	Basaha BC	Tapli RM	Ename HP
	Katari UM	Hub	Katari HP	Chaudandigadhi UM	Siddhipur HP

District	Study sites				
	Intervention group			Control group	
	Municipality	Hub/ Sub-hub	Health facilities	Municipality	Health facilities
	Katari UM	Sub-Hub	Tribeni HP	Triyuga UM	Saune HP
	Katari UM	Sub-Hub	Risku HP	Katari UM	Lekhani HP
	Udayapurgadhi RM	Sub-Hub	Tawashree HP	Katari UM	Mayankhu HP
	Sunkoshi RM	Hub	Jatay BC	Udayapurgadhi RM	Baray HP
	Sunkoshi RM	Sub-Hub	Basbotay HP	Tapli RM	Tamlichha HP
	Rautamai RM	Sub-Hub	Bhutar HP	Rautamai RM	Lafagaun HP
	Rautamai RM	Sub-Hub	Pokhari HP	Rautamai RM	Aaptar HP

Annex II: Names of quantitative tools used in the study, maximum obtainable score, and source

S.N.	Tools	Number of questions/ steps	Maximum Obtainable score	Source/ Referred from
I	Socio-demographic information questionnaire		-	Self-developed
II	**Knowledge assessment questionnaire**			
1	Module 1: Infection Prevention Practices	14	14	SBA reference manual 2006, 2014; and Infection prevention training guideline 2014
2	Module 2: Antenatal Care & Counseling and Referral Procedure	16	16	SBA reference manual 2006 and 2014
3	Module 3.1 : Essential Care for Labor and Birth	19	19	Helping Mothers Survive: Essential Care for Labor and Birth Training Package (version 9/2019)
4	Module 3.2: Use of Partograph	5	5	SBA reference manual 2006 and 2014
5	Module 3.3: Vacuum Delivery	5	5	SBA reference manual 2006 and 2014
6	Module 4: Helping Babies Breathe	18	18	Helping Babies Breathe manual, 2nd edition
7	Module 5: Bleeding After Birth	21	21	Helping Mothers Survive: Bleeding After Birth Complete (version 10/2017)
8	Module 6: Pre-eclampsia and Eclampsia	19	19	Helping Mothers Survive: Pre-Eclampsia and Eclampsia (version 01/2017)
9	Module 7: Post-partum Care and Counseling	15	15	SBA reference manual 2006 and 2014
III	**Confidence assessment tool**			
1	Module 1: Infection Prevention Practices	6	30	SBA reference manual 2006, 2014; and Infection prevention training guideline 2014
2	Module 2: Antenatal Care & Counseling and Referral Procedure	5	25	SBA reference manual 2006 and 2014
3	Module 3.1 : Essential Care for Labor and Birth	7	35	Helping Mothers Survive: Essential Care for Labor and Birth Training Package (version 9/2019)
4	Module 3.3: Vacuum Delivery	4	20	SBA reference manual 2006 and 2014
5	Module 4: Helping Babies Breathe	4	20	Helping Babies Breathe manual, 2nd edition
6	Module 5: Bleeding After Birth	8	40	Helping Mothers Survive: Bleeding After Birth Complete (version 10/2017)
7	Module 6: Pre-eclampsia and Eclampsia	8	40	Helping Mothers Survive: Pre-Eclampsia and Eclampsia (version 01/2017)
8	Module 7: Post-partum Care and Counseling	4	20	SBA reference manual 2006 and 2014
IV	**Skills assessment checklist**			
1	Module 1: Infection Prevention Practices			SBA reference manual 2006, 2014; and Infection prevention training guideline 2014
i.	Checklist 1: Hand Hygiene	9	9	
ii.	Checklist 2: Putting and removing gloves	12	12	

S.N.	Tools	Number of questions/ steps	Maximum Obtainable score	Source/ Referred from
iii.	Checklist 3: Donning of Personal Protective Equipment (PPE)	13	13	
iv.	Checklist 4: Doffing of Personal Protective Equipment (PPE)	18	18	
v.	Checklist 5: Making of 0.5% chlorine solution	15	15	
vi.	Checklist 6: Decontamination	8	8	
vii.	Checklist 7: Cleaning and Drying of instrument	9	9	
viii.	Checklist 8: Wrapping, sterilizing, and storing for IP	13	13	
2	Module 2: Antenatal Care & Counseling and Referral Procedure			SBA reference manual 2006 and 2014
i.	Checklist 1: Antenatal Care and Counseling	31	31	
ii.	Checklist 2: Referral Procedure	11	11	
3	Module 3 : Essential Care for Labor and Birth			Helping Mothers Survive: Essential Care for Labor and Birth Training Package (version 9/2019)
i.	Checklist 1: Abdominal examination	12	12	
ii.	Checklist 2: Vaginal examination	12	12	
iii.	Checklist 3: Support during birth	17	17	
iv.	Checklist 4: Clinical decision making skills	13	13	
v.	Checklist 5: Vacuum delivery	25	25	
4	Module 4: Helping Babies Breathe			Helping Babies Breathe manual, 2nd edition
i.	Checklist 1: General evaluation of helping babies breathe	12	12	
ii.	Checklist 2: Neonatal Resuscitation within Golden 1 minute	23	23	
5	Module 5: Bleeding After Birth			Helping Mothers Survive: Bleeding After Birth Complete (version 10/2017)
i.	Checklist 1: Active Management of Third Stage of Labor (AMTSL)	12	12	
ii.	Checklist 2: Retained placenta	18	18	
iii.	Checklist 3: Management of atony	15	15	
iv.	Checklist 4: Uterine balloon tamponade	13	13	
v.	Checklist 5: Repair of cervical tear	9	9	
vi.	Checklist 6: Shock Management	13	13	
6	Module 6: Pre-eclampsia and Eclampsia			Helping Mothers Survive: Pre-Eclampsia and Eclampsia (version 01/2017)
i.	Checklist 1: Administering loading dose	9	9	
ii.	Checklist 2: Care during convulsion	11	11	
iii.	Checklist 3: Monitoring of MgSO4 toxicity	8	8	
7	Module 7: Post-partum Care and Counseling	22	22	SBA reference manual 2006 and 2014
V	**Quality Improvement Process (QIP) tool**			Nepal Government's MNH readiness and QI tool for Birthing Center
1	**Quality domain**			
i.	Management demand	3	3	
ii.	Referral	3	3	
iii.	Electricity	2	2	
iv.	Water and sanitation	4	4	

S.N.	Tools	Number of questions/ steps	Maximum Obtainable score	Source/ Referred from
v.	Patient's respect and dignity	9	9	
vi.	Management	10	10	
vii.	Staff	3	3	
viii.	Supplies and equipment	22	22	
ix.	Emergency drugs and supplies	7	7	
x.	Delivery service	8	8	
xi.	Partograph	3	3	
xii.	Family planning service	1	1	
xiii.	Infection prevention	8	8	
2	**BEONC signal function readiness**			
i.	Parenteral antibiotics	3	3	
ii.	Uterotonic drugs	3	3	
iii.	Parenteral anticonvulsants	5	5	
iv.	Removal of retained products	3	3	
v.	Newborn resuscitation	3	3	

Annex III: Details of cost incurred during mentor development and monthly sessions conduction

Total Cost of district level mentors development training (DTOT)

Headings	Total amount (in NRs.)
Resource person fee	14352.00
Consultants (trainers)' fee	500000.00
Facilitation fee (for mentors)	8400.00
Daily allowance for local participants	20300.00
DSA of non-local participants	364200.00
DSA of consultants	297525.00
Travel cost of local participants	700.00
Travel cost of non-local participants	97550.00
Travel cost of consultants	204424.96
Refreshment (snack, lunch, tea, snack)	430717.90
Hall rent	54681.00
Support staff cost	1050.00
Reference manual printing and binding	47307.00
Training materials	66930.66
Other miscellaneous cost	26432.50
Grand total	**2134571.02**
cost per mentor development (34 mentors)	**62781.50**

Total cost of monthly sessions by headings

Cost heading	Dolakha	Myagdi	Sarlahi	Udayapur	Total
Facilitation fee (for mentors)	109200	116400	175200	161000	561800
Resource person fee (event management)	39000	33400	42400	43600	158400
Daily allowance (mentees)	220500	156800	244300	301700	923300
DSA: Non -local mentors	27600	109750	143398.05	93600	374348.05
Refreshment/ lunch cost	160558	133693	223615.36	262373.86	780240.22
Travel cost: mentees	0	0	0	0	0
Travel cost: facilitator	21100	38190	47560	68000	174850
Support staff allowance/ office helper	9150	12150	20400	30600	72300
Hall Rent	0	0	0	0	0
Vehicle rental (for mentors and mentees)	0	0	0	0	0
Total	**587108**	**600383**	**896873.41**	**960873.86**	**3045238.27**

Cost of monthly session per health facility

District	Health facility types	Number of health facilities	Total Cost (in NRs.)	Average cost for conducting all 6 sessions (in Nrs.)	Average cost for conducting 1 session (in NRs.)
	All health facility	11	587108	53373.45	8895.58
	CEONC site	2	247458	123729.00	20621.50
	BEONC site	9	339650	37738.89	6289.81
	Hub-site	4	308618	77154.50	12859.08
Dolakha	Sub-hub site	7	278490	39784.29	6630.71
	All health facility	11	600383	54580.27	9096.71
	CEONC site	1	132518	132518.00	22086.33
	BEONC site	10	467865	46786.50	7797.75
	Hub-site	3	227063	75687.67	12614.61
Myagdi	Sub-hub site	8	373320	46665.00	7777.50
	All health facility	14	896873.41	64062.39	10677.06
	CEONC site	1	132518	132518.00	22086.33
	BEONC site	13	727150.15	55934.63	9322.44
	Hub-site	4	308138.31	77034.58	12839.10
Sarlahi	Sub-hub site	10	588735.1	58873.51	9812.25
	All health facility	15	960873.86	64058.26	10676.38
	CEONC site	2	275834.86	137917.43	22986.24
	BEONC site	13	685039	52695.31	8782.55
	Hub-site	4	354044.86	88511.22	14751.87
Udayapur	Sub-hub site	11	606829	55166.27	9194.38
	All health facility	51	3045238.3	59710.55	9951.76
	CEONC site	6	788328.86	131388.14	21898.02
	BEONC site	45	2219704.1	49326.76	8221.13
	Hub-site	15	1197864.2	79857.61	13309.60
Overall	Sub-hub site	36	1847374.1	51315.95	8552.66