Original Article

Effect of Comprehensive Training Package of National Health Programs on Knowledge and Skills of Auxiliary Nurse Midwives in Haryana, India

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Abstract

Introduction: Auxiliary nurse midwives (ANMs), a key cadre within India's National Health Programs (NHPs). However, gaps in training, particularly in practical application, limit their effectiveness. This study evaluates the impact of a comprehensive training package on the knowledge and skills of ANMs in Haryana, India. **Methodology:** A quasi-experimental pre–post design with no control group was conducted among 250 ANMs across 149 subcenters in Ambala and Panchkula districts, Haryana. A universal sampling method was used. Data collection included a self-administered questionnaire (SAQ) and an objective structured clinical examination (OSCE) checklist to assess knowledge and skills. A training intervention consisting of a modular training package and video demonstrations was implemented. Data analysis involved paired *t*-tests and multivariate regression to evaluate changes in knowledge and skill scores. **Results:** Baseline data revealed significant knowledge gaps, particularly in mental health and tobacco control. Following the training, knowledge scores improved by 46% and skill scores by 37% ($P < 0.0001$). Notable skill improvements were observed in areas, such as pregnancy detection, blood pressure measurement, newborn resuscitation, and ORS preparation at home, with most ANMs shifting from the poor/average categories to the good category (>70% score). The greatest overall gains were seen in the National Tuberculosis Elimination Program (NTEP) and Reproductive Maternal and Child Health (RMNCH + A). Factors positively influencing knowledge scores included working alongside a second ANM and receiving the training intervention ($P < 0.05$). However, a decline was noted in certain skills, such as tetanus toxoid (TT) administration, highlighting the need for targeted refresher training. **Conclusion:** A structured, job-oriented training package significantly enhances ANMs' competencies. Integrating practical, hands-on training with existing theoretical models is essential for improving public health outcomes. Policymakers should prioritize periodic refresher training and comprehensive capacity-building strategies to optimize the impact of trainings on ANMs.

Keywords: ANMs, Auxiliary nurse midwives, community health workers, healthcare capacity building, National Health Program, training intervention

Introduction

The establishment of primary health centers (PHCs) in rural areas provides a foundation for health care in underserved regions. Auxiliary nurse midwives (ANMs), introduced at subcenters below PHCs, act as grassroots communicators between the healthcare system and community needs.[1] They play a critical role in delivering maternal and child health care, mainly focused on antenatal and postnatal delivery care. However, there is a need to understand the active role of ANMs concerning the quality of training they are being provided.[2]

Training of HWs is a critical factor contributing to the success or failure of any health program by improving the efficiency of health workers in delivering healthcare services.[2,3] Studies

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in countries, like Senegal, Bolivia, and Papua New Guinea, reveal gaps between theoretical knowledge and clinical competency among CHWs, emphasizing the importance of adequate training and the presence of practical exposure, thereby leading to increased confidence and performance among CHWs. Synchronization among the theory and practical sections of the training program in unison with her roles and responsibilities of the job is essential for effectively utilizing ANM and providing optimal healthcare services.

ANMs in India, who are pivotal in rural healthcare delivery, also exhibit significant knowledge gaps across various healthcare programs.[4,5] Few studies conducted in India have highlighted the impact of training on the performance of CHWs in various National Health Programs (NHPs), such as those targeting malaria and AIDS.[6,7] These studies indicate that targeted training enhances CHWs' including ANMs ability to deliver healthcare services effectively, leading to better program outcomes. However, there are notable gaps in the existing literature. Firstly, the existing studies focus on implementing training in the context of one or two specific programs rather than comprehensively assessing its impact across multiple programs. Secondly, limited attention has been given to evaluating how synchronized training—integrating theoretical knowledge with practical skills tailored to job roles—affects ANMs' overall performance. These gaps are further amplified by the inadequate inclusion of noncommunicable diseases (NCDs) and mental health in their training, which predominantly focuses on maternal and child health[8]; addressing these deficiencies through comprehensive and updated training packages is essential to equip them to meet diverse healthcare challenges and focus on quality improvement while improving the overall quality of healthcare delivery. The current study aims to assess the knowledge of ANMs in relation to crucial NHPs in India, identifying the need for targeted training that could address performance gaps and enhance their competencies at the primary care level.

Methods and Materials

Study Design: The present study was part of a quasi-experimental pre–post design without a control group that measured the occurrence of an outcome before and after intervention in training programs. The study was carried out among all (n = 250) ANMs of all (n = 149) subcenters of two districts (Ambala and Panchkula) in state of Haryana in north India which has a total of 22 districts. These two districts were selected based on logistical feasibility, existing collaborations, and representation of both rural and semi-urban populations, with a combined population of 1.6 million. In both districts, there are six community health centers, 28 primary healthcare centers, and 149 subcenters.

Sample Size and Sampling: A universal sampling technique using a quantitative approach was used in the study. The existing literature shows that the impact of training on an increase in the mean score of knowledge among community health workers ranges from 3% to 40% after various training program interventions. Assuming a minimum difference of 15% in post-intervention knowledge and skill of ANM regardless of their baseline knowledge score, with a confidence interval of 95%, at least 167 individuals were required in this single cohort, which was assessed at two time points (pre- and post-intervention). This estimate reflects the minimum sample size needed to detect a 15% change in knowledge/skill scores within the same group. The sample size gets inflated to 185 individuals in pre- and post-test groups, assuming the nonresponse rate of 10%. The detailed sample size calculation methodology is provided in Supplementary File 1.

The flow of ANMs through different stages of screening, enrolment, intervention delivery, and final analysis is shown in Figure 1.

Data Collection Tools and Study Intervention: The study tools included a self-administered questionnaire (SAQ) to assess the knowledge and standard objective structured clinical examination (OSCE) observational checklist skill of ANMs about all major NHPs. The questionnaire included questions with responses either yes/no or multiple-choice questions. It was printed in both Hindi and English languages. SAQ had information on the sociodemographic profile of participants, general, preventive, and curative aspects, causes, roles, and responsibilities of ANMs under different NHPs. The data were collected in two phases for assessing knowledge of

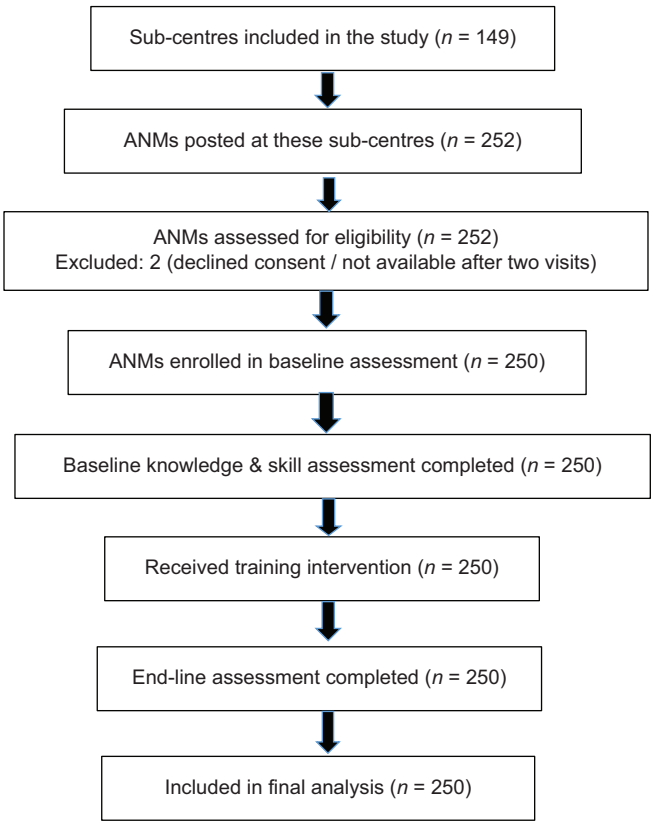

Figure 1: Study profile of ANMs from Panchkula and Ambala districts showing screening, enrolment, intervention, endline assessment, and inclusion in final analysis (n = 250)

ANMs, initially through a baseline survey, followed by an endline survey after the training intervention covering different program aspects.

The SAQ and OSCE checklists underwent content validation by a panel of experts comprising faculty members in Community Medicine, district program managers, and senior nursing trainers. The tools were also pilot-tested among a small group of ANMs ($n = 15$) from a neighboring block not included in the final study to assess clarity, relevance, and feasibility. Based on pilot testing feedback, minor modifications were made to improve wording, sequencing, and alignment with national program guidelines. For both the SAQ and OSCE tools, each item carried a predefined score, and the total score obtained by each ANM was converted into a percentage by dividing it by the maximum possible score and multiplying by 100. These mean percentage scores were subsequently used to describe overall knowledge and skill levels at baseline and endline. Higher percentages indicate better performance. This approach ensured uniform comparison across different domains and tools.

The intervention package consisted of a comprehensive module and video films depicting roles and responsibilities of ANMs on various NHPs. The module outlined the roles and responsibilities of ANMs across these programs, serving as a practical guide for field health staff. A key feature of this module was its compilation of all the programs into a single, concise booklet, designed to be lightweight and easy for ANMs to carry and read during their fieldwork. To enhance accessibility, the module was also translated into the local language, allowing health workers to read and refer to the material at their convenience. In addition to the module, video films were created for various NHPs. The ANMs were made aware of these films and encouraged to take an active role in organizing and participating in the productions at their respective health centers.

To enhance replicability and standardization, the intervention was delivered through a structured blended format that included classroom-based workshops, hands-on practical demonstrations, and self-learning through modules and videos. The training was conducted over three consecutive days (approximately 6–7 hours per day) by faculty from the Department of Community Medicine and SPH, PGIMER, district program managers, medical officers, and SBA-certified nursing trainers. Batch sizes were maintained at 30–35 ANMs to ensure adequate supervision during skill practice. The endline assessment was conducted four to six weeks after the training to allow application of skills in the field. Standardized OSCE checklists and training protocols were used to maintain fidelity across all batches.

Statistical Analysis: The data were coded and entered into Microsoft Excel. Data were then entered into SPSS and cleaned, and in case of any discrepancies, the original completed questionnaire was used for cross-checking. Descriptive statistics, including mean and standard deviation, were used to describe the demographic profile of the study respondents and their characteristics. Mean percentage scores for knowledge and skill assessments were compared using the paired *t*-test to assess pre–post differences. An impact assessment was undertaken after evaluating mean scores in the pre- and post-intervention groups using paired *t*-tests. The scores obtained by the health workers were graded into three categories: good, average, and poor. The scores that were >70% were awarded as good category, scores that lie between 51 and 70% were given average category, and scores obtained <50% were designated as poor category. Multivariate analysis for the dependent variable "knowledge score" and "skill score" was performed using cutoff values as 50%, 60%, and 70%, where the score >70% is considered an effective score having a significant impact on the independent variables (socioeconomic and demographic variables).

Ethical consideration

The necessary permissions and consent were taken from the Chief Medical Officer (CMO) of both the districts and from participating ANMs of the entire block. The participants were informed about the nature and purpose of the study. They were assured that all personal information would be kept confidential and used strictly for the purposes. The study protocol was reviewed and approved by the Institutional Ethics Committee of the Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh (Reference No.: NK/3125/Study, dated: February 23, 2017. At the time of the study, separate approval from the State Ethics Cell was not a requirement. The health workers who denied consent or could not be contacted despite two visits to the respective subcenter were excluded from the study.

Results

A total of 252 ANM were interviewed in the study, wherein 72.6% belong to the 31–50 age group, currently married (90.1%), and (44.0%) were educated up to high school. Most of the ANMs were Hindu (89.3%) and belonged to the general category (55.6%). The work profile of respondents revealed that 64.3% of ANMs were working for more than 10 years and were living in the same village, so they were familiar with the population they serve. In 80.6% of the subcenters, job responsibilities were shared between two ANMs. Among the ANMs, 48.8% were employed on a contractual basis, while 51.2% held regular positions. Most ANMs had received training from several National Health Programs, and 88.0% were trained skilled birth attendants (SBAs), as shown in Table 1.

As shown in Figure 2, a highly significant ($P < 0.0001$) increase in knowledge scores was observed in the National Tuberculosis Elimination Program (NTEP), National Tobacco Control Program (NTCP), and Reproductive Maternal Newborn Child Health + Adolescent Program (RMNCH + A), with most respondents shifting to the "good" category by endline. In the National Program for Control of Blindness (NPCB), a

Table 1: Sociodemographic and work profile of respondents

Sociodemographic variables		Frequency (n=252)	Percentage
Age (in completed years)	21–30	27	10.7
	31–40	83	32.9
	41–50	100	39.7
	51–60	37	14.7
Marital status	Currently married	227	90.1
	Unmarried	11	4.4
	Divorced	14	5.6
Education	Secondary	111	44.0
	Senior secondary	83	32.9
	Graduate	46	18.3
	Postgraduate	12	4.8
Category	General	140	55.6
	SC/ST	60	23.8
	OBC	34	13.5
	Others	18	7.1
Religion	Hindu	225	89.3
	Sikh	27	10.7
Duration of working as ANM (in years)	1–5	39	15.5
	6–10	51	20.2
	>10	162	64.3
Duration of living in the same village (in years)	1–5	78	31.0
	6–10	66	26.2
	>10	94	42.9
Second ANM working in the center	Yes	203	80.6
	No	49	19.4
Type of employment	Regular	129	51.2
	Contractual	123	48.8
Training status	SBA*	222	88.0
	IMNCI*	201	79.7
	NSSK*	199	80
	IUCD*	199	80
	NTEP*	224	89
	Routine Immunization	199	80
	Malaria	202	80.1

Source: Field Survey October 2015 till September 2016. (*SBA=Skilled birth attendant; IMNCI=Integrated Management of Neonatal Childhood Illness; NSSK=Navjaat Shishu Suraksha Karyakram.; IUCD=Intrauterine contraceptive device; NTEP=National Tuberculosis Elimination Program)

significant improvement was noted, with the "poor" category decreasing from 51.6% at baseline to 13.9% at the end line.

A highly significant shift in skill scores from the average category (51–70%) to the good category (>70%) was observed in all skills at the endline assessment, as shown in Table 2. Notably, there was a substantial increase (88.9%, $P < 0.0001$) in the number of health workers in the good category for calculating EDD and (93.7%, $P < 0.0001$) performing the pregnancy detection test. In addition, the percentage of respondents in the poor category for newborn resuscitation decreased dramatically from 44.4% at baseline to just 0.8% at the endline. Moreover, there was a significant shift in the skill of ANMs in the good category for performing the steps for ORS preparation at home, increasing from 8.3% at baseline to 88.1% at endline.

The results suggest that while targeted training interventions improved knowledge across all programs, the degree of improvement varied, as shown in Table 3. Programs, like the National Vector Borne Disease Control Program (NVBDCP), demonstrated the most substantial improvement, with mean scores rising from 14.2 to 19.9 (difference: 5.6, $P = 0.046$), which indicates a highly effective training intervention addressing knowledge gaps for vector-borne diseases. In contrast, the National Mental Health Program (NMHP) and National Tobacco Control Program (NTCP) exhibited the lowest improvements; the NMHP's mean score increased from 0.02 to 0.55 (difference: 0.5, $P < 0.001$), while NTCP scores rose from 0.5 to 1.0 (difference: 0.5, $P < 0.001$), as shown in Table 3.

The analysis revealed a statistically significant improvement in knowledge scores among ANMs in specific determinants, including having a second ANM in the subcenter (OR = 3.418, 95% CI: 2.12–2.58), belonging to the Hindu religion (OR = 0.36, 95% CI: 2.42–2.94), and due to the implementation of the intervention package OR = (23.16, 95% CI: 1.70–2.14). In

contrast, factors, such as education level, years of experience, marital status, employment type, caste category, and prior training status, showed no significant impact on knowledge scores.

On applying multivariate analysis using > 70% score as a cutoff value, there was no statistically significant improvement in the skill scores of health workers between different categories after the intervention. Various determinants, such as age, education, marital status, and training status, have no impact on the skill scores of the respondents [Table 4].

The results demonstrate a significant improvement in skill scores across various OSCE skills following the intervention, as shown in Figure 3. For example, skills, such as ORS preparation at home, counseling the woman before distributing the OCP, steps for sputum test, skills to be observed during immunization sessions, and measuring blood pressure (BP), showed substantial increases, with mean differences 41.2, 34, 33.3, 28, and 25, respectively. These results highlight the effectiveness of targeted training in enhancing critical skills required for improving maternal and child health outcomes and the management of communicable diseases at the community level.[9] Additional disaggregated baseline and endline mean skill scores for each OSCE component are presented in Supplementary Table S2.

Table 2: Program-wise comparison of skill scores of health workers for OSCE skills

Name of skill	Baseline			Endline			*P*
	Good (>70%)	Average (51–70%)	Poor (<50%)	Good (>70%)	Average (51–70%)	Poor (<50%)	
EDD	123 (48.8)	16 (6.3)	113 (44.8)	224 (88.9)	0 (0)	28 (11.1)	<0.0001
Pregnancy detection test	115 (45.6)	100 (39.7)	37 (14.7)	236 (93.7)	16 (6.3)	0 (0)	<0.0001
Measuring BP	58 (23.0)	105 (41.7)	89 (35.3)	231 (91.7)	21 (8.3)	0 (0)	<0.0001
Measuring pulse	76 (30.2)	73 (29.0)	103 (40.9)	249 (98.8)	3 (1.2)	0 (0)	<0.0001
Abdominal examination during pregnancy	112 (44.4)	82 (32.5)	58 (23.0)	242 (96.0)	8 (3.2)	2 (0.8)	<0.0001
HB testing	87 (34.5)	91 (36.1)	74 (29.4)	226 (89.7)	26 (10.3)	0 (0)	<0.0001
Testing urine for glucose	82 (32.5)	46 (18.3)	124 (49.2)	239 (94.8)	13 (5.2)	0 (0)	<0.0001
Testing urine for protein	123 (48.8)	16 (6.3)	113 (44.8)	226 (89.7)	24 (9.5)	2 (0.8)	<0.0001
Measuring weight	80 (31.7)	70 (27.8)	102 (40.5)	172 (68.3)	74 (29.4)	6 (2.4)	<0.0001
Newborn resuscitation	67 (26.6)	73 (29.0)	112 (44.4)	219 (86.9)	31 (12.3)	2 (0.8)	<0.0001
Kangaroo mother care	81 (32.1)	69 (27.4)	102 (40.5)	243 (96.4)	9 (3.6)	0 (0)	<0.0001
Administration of injection TT	67 (26.6)	73 (29.0)	112 (44.4)	238 (94.4)	11 (4.4)	3 (1.2)	<0.0001
Insertion of IUCD	83 (32.9)	92 (36.5)	77 (30.6)	210 (83.3)	39 (15.5)	3 (1.2)	<0.0001
Counseling the woman before the distribution of OCP	17 (6.7)	69 (27.4)	166 (65.9)	224 (88.9)	28 (11.1)	0 (0)	<0.0001
Skills to be observed during immunization session	52 (20.6)	110 (43.7)	90 (35.7)	238 (94.4)	14 (5.6)	0 (0)	<0.0001
Infection control	79 (31.3)	70 (27.8)	103 (40.9)	176 (69.8)	68 (27.0)	8 (3.2)	<0.0001
Steps for the sputum test	41 (16.3)	82 (32.5)	129 (51.2)	232 (92.1)	20 (7.9)	0 (0)	<0.0001
Handwashing steps	80 (31.7)	70 (27.8)	102 (40.5)	201 (79.8)	51 (20.2)	0 (0)	<0.0001
Steps for slide preparation of the malaria test	37 (14.7)	68 (27.0)	147 (58.3)	226 (89.7)	24 (9.5)	2 (0.8)	<0.0001
Steps for ORS preparation at home	21 (8.3)	60 (23.8)	171 (67.9)	222 (88.1)	29 (11.5)	1 (0.4)	<0.0001

Source: Field Survey October 2015 till September 2016. Chi-square test was used to compare pre- and post-training categorical skill scores.
(*EDD=Estimated Date of Delivery; BP=Blood pressure; HB=Hemoglobin; TT=Tetanus toxoid; OCP=Oral contraceptive pills; IUCD=Intrauterine contraceptive device; ORS=Oral rehydration solution)

Table 3: Mean difference in knowledge assessment of NHPs

Program	Baseline mean (SD)	Endline mean (SD)	Difference (SE)	Confidence interval	*P*
NVBDCP*	14.2 (112.7)	19.9 (157.8)	5.6 (2.8)	(0.1–11.2)	0.046
NTEP*	9.1 (72.4)	10.2 (81.2)	1.1 (0.5)	(0.0–2.2)	0.047
NMHP*	0.02 (0.15)	0.55 (0.5)	0.5 (0.03)	(0.4–0.5)	0.000
NTCP*	0.5 (0.50)	1.0 (.000)	0.5 (0.03)	(0.4–0.5)	0.000
NACP*	9.6 (76.7)	11.3 (89.5)	1.6 (0.8)	(0.0–3.2)	0.048
NPCB*	2.8 (22.8)	4.1 (32.9)	1.2 (0.6)	(0.0–2.5)	0.047
NPCDCS*	3.0 (23.9)	3.6 (29.1)	0.6 (0.3)	(0.0–1.5)	0.048
RMNCH + A*	51.6 (4.9)	55.3 (5.3)	3.6 (0.3)	(2.9–4.2)	0.000

Source: Field Survey October 2015 till September 2016. A paired *t*-test was used to compare the mean pre- and post-training knowledge scores.
(*NVBDCP=National Vector Borne Disease Control Program; NTEP=National Tuberculosis Elimination Program; NPCB=National Program for Control of Blindness; NACP=National AIDS Control Program; NTCP=National Tobacco Control Program; NMHP=National Mental Health Program; RMNCH+A=Reproductive Maternal Newborn Child Health+Adolescent Program; NPCDCS=National Program for prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and stroke)

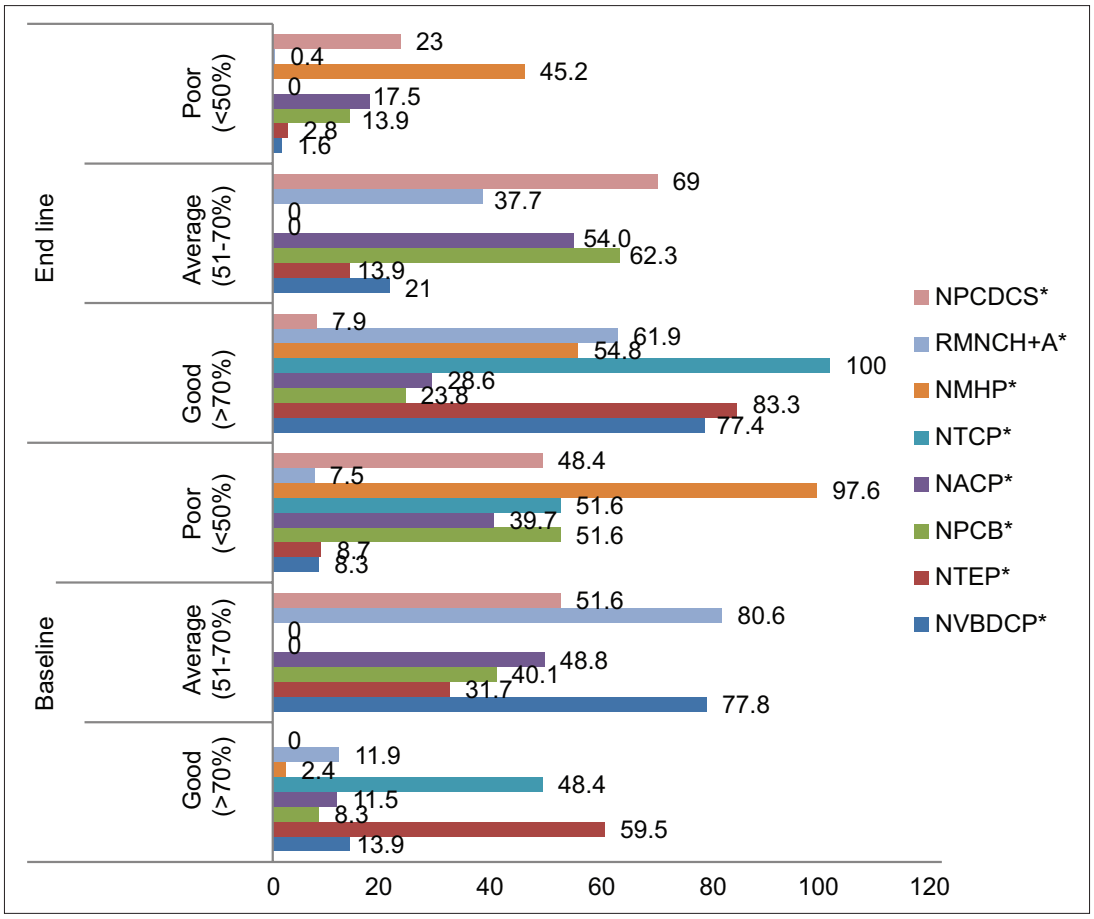

Figure 2: Program-wise comparison of knowledge scores of health workers in various NHPs. Source: Field Survey October 2015 till September 2016. *NVBDCP = National Vector Borne Disease Control Program; NTEP = National Tuberculosis Elimination Program; NPCB = National Program for Control of Blindness; NACP = National AIDS Control Program; NTCP = National Tobacco Control Program; NMHP = National Mental Health Program; RMNCH + A = Reproductive Maternal Newborn Child Health + Adolescent Program; NPCDCS = National Program for prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and stroke

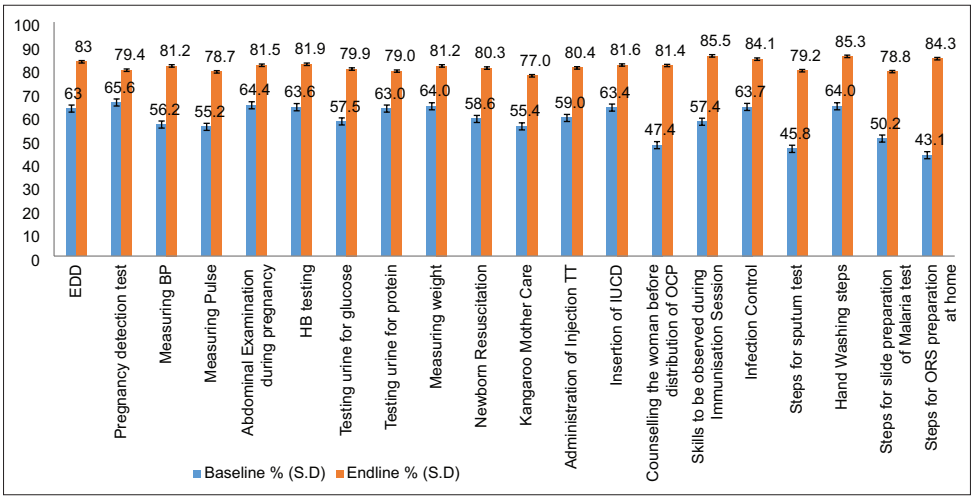

Figure 3: Mean differences in skill scores of various OSCE skills. Source: Field Survey October 2015 till September 2016. *EDD = Estimated Date of Delivery; ORS = Oral rehydration solution

Interestingly, the skill of administration of tetanus toxoid (TT) injection showed a decline, with a negative difference of 21.54%. This anomaly points to potential challenges in either training delivery or retention of this specific skill, indicating a need for further investigation and focused interventions to address this gap.

Table 4: Factors affecting knowledge scores of health workers under various NHPs Dependent variable: Knowledge score (>70%=good)

Variable	*B*	S.E.	Wald	df	Sig.	Exp(*B*)	CI
Age (in years)							
21–30*			4.148	3	0.246		
31–40	-0.776	0.466	2.771	1	0.096	0.460	(.18–1.14)
41–50	-0.247	0.495	0.249	1	0.618	0.781	(.29–2.0)
51–60	-0.561	0.594	0.890	1	0.345	0.571	(.17–1.8)
Education status							
Secondary*			4.554	3	0.208		
Senior secondary	-0.236	0.307	0.592	1	0.442	0.790	(.43–1.4)
Graduate	0.276	0.403	0.469	1	0.493	1.318	(.59–2.9)
Postgraduate	0.998	0.661	2.281	1	0.131	2.712	(.74–9.9)
Duration of working as ANM (in years)							
1–5*			0.482	2	0.786		
6–10	0.332	0.515	0.416	1	0.519	1.394	(.50–3.8)
>10	0.215	0.423	0.257	1	0.612	1.239	(.54–2.8)
Duration of ANM living in the same village (in years)							
1–5*			4.638	2	0.098		
6–10	0.273	0.411	0.440	1	0.507	1.314	(.58–2.9)
>10	-0.562	0.370	2.306	1	0.129	0.570	(.27–1.7)
Marital status							
Married*			0.114	2	0.945		
Unmarried	0.145	0.617	0.055	1	0.815	1.156	(.34–3.8)
Divorced	-0.136	0.576	0.056	1	0.814	0.873	(.28–2.7)
Presence of another ANM							
No*							
Yes	1.229	0.344	12.782	1	0.000	3.418	(1.7–6.7)
Employment status							
Contractual*							
Regular	-0.055	0.283	0.038	1	0.846	0.946	(.5–1.6)
Caste							
GENERAL*			0.909	3	0.823		
SC/ST	0.263	0.314	0.699	1	0.403	1.300	(.7–2.4)
OBC	0.191	0.393	0.236	1	0.627	1.210	(.5–2.6)
OTHERS	0.299	0.617	0.234	1	0.628	1.348	(.4–4.5)
Religion							
Others*							
Hindu	-1.014	0.448	5.124	1	0.024	0.363	(.15–.87)
Training status							
SBA*			4.235	2	0.120		
RNTCP	-0.907	0.444	4.168	1	0.041	0.404	(.16–.96)
>2 trainings	-0.262	0.461	0.324	1	0.569	0.769	(.31–1.89)
Intervention	3.142	0.275	130.948	1	0.000	23.161	(13.5–39.6)
Constant	-1.789	0.565	10.037	1	0.002	0.167	

Source: Field Survey October 2015 till September 2016. (*are the reference category of the particular variable, SBA=Skilled birth attendant; NTEP=National Tuberculosis Elimination Program)

There is a statistically significant increase of 23% in both knowledge and skill scores post-intervention ($P < 0.0001$), as shown in Table 5.

Discussion

Community health workers form the backbone of India's healthcare delivery system and are pivotal in delivering essential healthcare services under the National Health Mission—a key priority for the Government of India. Their contributions in areas, such as maternal and child health and the prevention and management of diseases like malaria, tuberculosis, and HIV/AIDS,[10] are well documented. As trusted community members, they regularly interact with individuals and families, gaining first-hand insights into health experiences and challenges.

The current study findings reveal critical gaps in prior knowledge among ANMs, particularly in addressing mental

Table 5: Overall comparison of knowledge and skill scores between pre-training and post-training

Domain	Baseline percentage (Bp)	Endline percentage (Ep)	Difference increase in percentage (Ep-Bp)	Percentage increase wrt baseline (Ep-Bp/Bp*100)	*P*
Knowledge assessment	51	74	23	46	<0.0001
Skill assessment	58	81	23	37	<0.0001

Source: Field Survey October 2015 till September 2016. Percentages represent mean percentage scores derived from total SAQ (knowledge) and OSCE (skill) scores. Test of significance: A paired t-test was used to compare pre- and post-training mean scores

health and tobacco control, emphasizing the need for a stronger focus on these areas within training curricula. These gaps hinder ANMs' ability to effectively meet clients' needs, underscoring the importance of a more comprehensive and practical capacity-building approach. Studies have identified significant training needs among ANMs in tobacco cessation. For instance, a mixed-methods needs assessment highlighted that CHWs often lack the necessary training to effectively assist patients with smoking cessation, suggesting the development of tailored curricula to bridge this gap.[11] Similarly, research indicates that CHWs face challenges in integrating into psychiatric rehabilitation and mental health services due to insufficient training and supervision. Enhancing CHWs' skills through targeted training programs has been associated with improved patient engagement and outcomes in mental health contexts.[12] While most training programs prioritize theoretical knowledge, they often neglect the practical, hands-on components for addressing real-world challenges. This area requires significant improvement, as such deficiencies can limit ANMs' ability to deliver impactful health interventions.

Our results further demonstrate the effectiveness of targeted training interventions, as evidenced by a significant improvement in the knowledge and skill scores of ANMs following a modular, hands-on training program. The tailored modules and video films used during the intervention likely contributed to these positive outcomes.[13] This aligns with findings from prior studies by Rana HB *et al*.[14] and Pattinson RC and Hall M,[15] which reported similar improvements in health workers' knowledge after short-term, targeted training sessions focused on maternal and child health. Together, these findings underscore the value of modular, practical training approaches in equipping ANMs with the skills necessary to address community health challenges effectively.

The studies revealed that programs, such as NMHP and NPCDCS, showed smaller but statistically significant gains. These modest improvements could be due to the programs' more complex and less familiar content, along with a lack of practical components in the training curricula. Similar results have been shown in previous studies by Rowe AK *et al*. (2005)[16] and Adeyemo MO (2017),[17] which noted that complex program content and insufficient practical exposure often result in lower knowledge retention among community health workers. These studies also concluded that simple dissemination of written guidelines is usually ineffective, and supervision and multifaceted interventions might be more effective than single interventions.[18] Addressing these gaps through targeted and frequent refresher training could enhance knowledge retention and application in these areas.

Additionally, the findings highlighted workplace factors that influence knowledge scores. ANMs working collaboratively with a second ANM at their subcenter achieved higher post-training knowledge scores, indicating the value of supportive and interactive work environments in fostering learning and knowledge sharing.[19] This observation aligns with findings by Ojakaa D (2009),[20] highlighting the positive impact of collaborative and well-supported environments on improving health workers' performance.[21]

In our study, participants' skill scores showed a significant increase of 23% post-intervention. However, the multivariate analysis conducted to assess the skill scores did not indicate a statistically significant improvement. Similar findings have been reported by Paudel *et al*. (2017),[22] where logistic regression did not demonstrate significant improvements in combined outcomes, including birth preparedness and antenatal care seeking (aOR = 1.0, 95% CI: 0.6 to 1.5), antenatal care quality (aOR = 1.4, 95% CI: 0.9 to 2.1), delivery by skilled birth attendants (aOR = 1.5, 95% CI: 1.0 to 2.3), immediate newborn care (aOR = 1.1, 95% CI: 0.7 to 1.9), and postnatal care (aOR = 1.3, 95% CI: 0.9 to 1.9). This improvement in skills aligns with findings from a study conducted in Uganda by Rosskam *et al*. (2013),[23] where an eight-day training package led to a 20% enhancement in health workers' skills, including correct assessment, classification, treatment, and counseling of children. The consistency of these findings highlights the potential for structured training programs to improve specific competencies, even if broader multivariate analyses do not always reflect statistically significant changes.

Limitations: There are a few limitations in this study. First, the use of self-reported data could lead to response bias. Moreover, the study's focus on two districts in Haryana may restrict the applicability of the results to regions with different sociocultural and healthcare contexts. Lastly, the short time frame between the intervention and the endline survey may not adequately reflect participants' long-term knowledge retention. However, the study also underscored challenges, such as frequent changes in program guidelines and limited availability of refresher training. These barriers often lead to knowledge gaps and decreased efficiency in fieldwork, as echoed in studies from similar contexts.

Conclusion

The current study highlights the importance of targeted, practical training interventions in strengthening the knowledge of ANMs

and improving the overall impact of NHPs. We propose that the interventions should use modular approaches that focus on the routine tasks of healthcare workers. Incorporating audiovisual aids and on-the-job training methods can enhance learning and improve the skills required for various programs. To sustain these knowledge and skill gains and ensure high-quality healthcare delivery at the grassroots level, it is crucial to incorporate periodic refresher training, align program content with updated guidelines, and emphasize hands-on components, particularly for complex programs. Policymakers, program managers, and educators should develop and implement comprehensive and practical training packages to improve the effectiveness of health workers at the grassroots level.

Recommendations

To further strengthen capacity-building efforts and sustain improvements in knowledge and skills, the following measures are recommended:

1. Establish State/District Resource Centres anchored in medical colleges, AIIMS, and other tertiary institutions to serve as training and knowledge hubs.
2. Conduct regular and structured refresher training for all cadres of healthcare providers at defined intervals.
3. Develop integrated training calendars to synchronize sessions across various NHPs.
4. Set up practical skill stations/OSCE labs within resource centers for hands-on practice in essential procedures.
5. Leverage digital platforms (e-learning modules, mobile apps, video demonstrations) to supplement face-to-face training.[24]
6. Implement peer-mentoring programs pairing experienced staff with newly trained workers.
7. Include emerging health priorities, such as NCDs, mental health, and tobacco cessation, in training curricula.
8. Strengthen monitoring and feedback mechanisms to track skill retention and address gaps promptly.

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Ethical approval

Ethical approval for the research proposal and data collection tools was obtained from the Institutional Ethical Review Board of PGIMER, Chandigarh.

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Conflicts of interest

There are no conflicts of interest.

References

1. Mavalankar D, Vora K, Sharma B. The midwifery role of the auxiliary nurse midwife. In: Sheikh K, George A, editors. Health Providers in India: On the Frontlines of Change. 2010. p. 38-56.
2. Lopes SC, Cabral AJ, de Sousa B. Community health workers: To train or to restrain? A longitudinal survey to assess the impact of training community health workers in the Bolama Region, Guinea-Bissau. Hum Resour Health 2014;12:8.
3. Keni BH. Training competent and effective primary health care workers to fill a void in the outer islands health service delivery of the Marshall Islands of Micronesia. Hum Resour Health 2006;4:1-8.
4. Katajavuori N, Lindblom-Ylänne S, Hirvonen J. The significance of practical training in linking theoretical studies with practice. High Educ 2006;51:439-64.
5. Pandve H, Pandve T. Primary healthcare system in India: Evolution and challenges. Int JHealth Syst Disaster Manage 2013;1:125.
6. Rajvanshi H, Nisar S, Bharti PK, Jayswar H, Mishra AK, Sharma RK, *et al*. Significance of training, monitoring and assessment of malaria workers in achieving malaria elimination goal of Malaria Elimination Demonstration Project. Malaria J 2021;20:1-2.
7. Nyamathi A, Vatsa M, Khakha DC, McNeese-Smith D, Leake B, Fahey JL. HIV knowledge improvement among nurses in India: Using a train-the-trainer program. J Assoc Nurses AIDS Care 2008;19:443-9.
8. Narain JP. Integrating services for noncommunicable diseases prevention and control: Use of primary health care approach. Indian J Community Med 2011;36(Suppl 1):S67-71.
9. Kassabry MF. Evaluation of simulation using objective structured clinical examination (OSCE) among undergraduate nursing students: A systematic review. Int J Afr Nurs Sci 2023;18:100553.
10. Moh DR, Bangali M, Coffie P, Badjé A, Paul AA, Msellati P. Community health workers. Reinforcement of an outreach strategy in rural areas aimed at improving the integration of HIV, tuberculosis and malaria prevention, screening and care into the health systems "Proxy-Santé" study. Front Public Health 2022;10:801762.
11. Tan MM, Oke S, Ellison D, Huard C, Veluz-Wilkins A. Addressing tobacco use in underserved communities outside of primary care: the need to tailor tobacco cessation training for community health workers. Int J Environ Res Public Health 2023;20:5574.
12. Foo CY, Potter K, Nielsen L, Rohila A, Maravic MC, Schnitzer K, *et al*. Implementation of community health worker support for tobacco cessation: A mixed-methods study. Psychiatr Serv 2025;76:30-40.
13. Arora H, Goel S, Sharma V. Impact of comprehensive training package of National Health Programs on knowledge and skills of primary health care workers in a District of North India. Int J Basic Appl Res 2020;9:1094-108.
14. Rana HB, Banjara MR, Joshi MP, Kurth AE, Castillo TP. Assessing maternal and neonatal near-miss reviews in rural Nepal: An implementation research study to inform scale-up. Acta Paediatr 2018;107:17-23.
15. Pattinson RC, Hall M. Near misses: A useful adjunct to maternal death enquiries. Br Med Bull 2003;67:231-43.
16. Rowe AK, De Savigny D, Lanata CF, Victora CG. How can we achieve and maintain high-quality performance of health workers in low-resource settings? Lancet 2005;366:1026-35.
17. Adeyemo MO. The role of supportive supervision in enhancing and sustaining health education in home management and prevention of malaria among mothers of under-five children. Int J Nurs Midwifery 2017;9:53-7.
18. Hicks J. Health workforce interventions in low-and-middle-income-countries (LMICs). K4D Helpdesk Report. Institute of Development Studies; 2022. [doi: 10.19088/K4D.2023.003].
19. Jaskiewicz W, Tulenko K. Increasing community health worker productivity and effectiveness: A review of the influence of the work environment. Hum Resour Health 2012;10:1-9.
20. Ojakaa D, Olango S, Jarvis J. Factors affecting motivation and retention of primary health care workers in three disparate regions in Kenya. Hum Resour Health 2014;12:1-3.
21. Pyone T, Karvande S, Gopalakrishnan S, Purohit V, Nelson S, Balakrishnan SS, *et al*. Factors governing the performance of auxiliary nurse midwives in India: A study in Pune district. PLoS One 2019;14:e0226831.
22. Paudel D, Shrestha IB, Siebeck M, Rehfuess E. Impact of the community-based newborn care package in Nepal: A quasi-experimental evaluation. BMJ Open 2017;7:e015285.
23. Rosskam E, Pariyo G, Hounton S, Aiga H. Increasing skilled birth attendance through midwifery workforce management. Int J Health Plann Manag 2013;28:e62-71.
24. World Health Organization (WHO). Health worker education and training: Strengthening the health workforce through digital education. 2016. Available from: https://www.who.int/activities/health-workforce-education-and-training. [Last accessed on 2026 Feb 17].

Supplementary File 1: Sample Size Calculation

This is a quasi-experimental pre–post design without a control group, where the same participants are assessed before and after the intervention. Therefore, the correct sample size formula is for paired mean difference.

Assumptions Used

- Expected minimum change (effect size, Δ): 15% increase in mean scores
- Standard deviation of change (SD): 35–40% (based on prior CHW studies)
- Significance level (α): 0.05
- Power (1−β): 80%
- Test: Two-sided paired *t*-test

Formula Used

$n = ((Z\alpha/2 + Z\beta) \times SD/\Delta)^2$

Where: $Z\alpha/2 = 1.96$, $Z\beta = 0.84$, $SD = 0.35$, $\Delta = 0.15$

Stepwise Calculation

$n = ((1.96 + 0.84) \times 0.35/0.15)^2$

$n = (2.80 \times 0.35/0.15)^2$

$n = (0.98/0.15)^2$

$n = (6.53)^2 = 42.6$

Given the variability in training outcomes (3–40%), a conservative inflation factor resulted in a required minimum sample size of 167 ANMs.

Final Sample Size with Adjustments

Base sample size required: 167

Adjustment for 10% nonresponse:

$n\_final = 167/(1 - 0.10) = 185.5 \approx 185$

Final required sample size: 185 ANMs.

Final Achieved Sample

The study achieved 252 ANMs, exceeding the required minimum, thereby improving the study's power.

Sampling Technique

Universal sampling method: All 149 subcenters across Ambala and Panchkula districts were included, and all ANMs posted there were invited.

Supplementary Table S2: Baseline and Endline Mean Skill Scores of ANMs Across OSCE Skills

OSCE Skill	Baseline % (SD)	Endline % (SD)	Difference (SE)	95% CI	*P*
EDD	63.0 (24.5)	83.0 (56.0)	20.0 (4.0)	(12.1–27.9)	<0.0001
Pregnancy detection test	65.6 (15.6)	79.4 (7.4)	13.8 (1.0)	(11.6–15.9)	<0.0001
Measuring BP	56.2 (17.8)	81.2 (7.2)	25.0 (1.2)	(22.6–27.4)	<0.0001
Measuring pulse	55.2 (21.8)	78.7 (8.7)	23.4 (1.4)	(20.5–26.3)	<0.0001
Abdominal examination	64.4 (16.1)	81.5 (7.1)	17.1 (1.1)	(14.9–19.4)	<0.0001
HB testing	63.6 (17.5)	81.9 (6.9)	18.2 (1.1)	(15.9–20.6)	<0.0001
Testing urine for glucose	57.5 (22.0)	79.9 (9.0)	22.3 (1.4)	(19.5–25.1)	<0.0001
Testing urine for protein	63.0 (24.5)	79.0 (10.0)	15.9 (1.6)	(12.6–19.3)	<0.0001
Measuring weight	64.0 (25.2)	81.2 (13.1)	17.1 (1.7)	(13.7–20.6)	<0.0001
Newborn resuscitation	58.6 (17.8)	80.3 (8.9)	21.7 (1.2)	(19.1–24.2)	<0.0001
Kangaroo mother care	55.4 (22.5)	77.0 (9.0)	21.6 (1.4)*	(18.5–24.4)*	<0.0001
Administration of injection TT	59.0 (18.6)	80.0 (9.1)	21.0 (1.4)*	(18.2–23.8)*	<0.0001
Insertion of IUCD	63.0 (19.6)	82.0 (7.9)	18.0 (1.3)*	(15.4–20.6)*	<0.0001
Counseling before OCP	47.0 (21.0)*	81.0 (8.0)*	34.0 (1.8)*	(30.5–37.5)*	<0.0001
Skills during Immunization session	57.0 (20.6)	86.0 (10.0)	28.0 (1.6)*	(24.8–31.2)*	<0.0001
Infection control	64.0 (18.0)*	84.0 (9.0)*	20.0 (1.5)*	(17.0–23.0)*	<0.0001
Steps for the sputum test	46.0 (16.3)	79.0 (9.0)	33.0 (1.7)*	(29.6–36.4)*	<0.0001
Handwashing	64.0 (18.0)*	85.0 (10.0)*	21.0 (1.5)*	(17.8–24.2)*	<0.0001
Slide prep (malaria)	50.0 (14.7)	79.0 (9.0)	29.0 (1.6)*	(25.8–32.2)*	<0.0001
ORS preparation at home	43.0 (23.0)*	84.0 (9.0)*	41.0 (2.0)*	(37.0–45.0)*	<0.0001

Percentages represent mean percentage scores derived from OSCE tool scoring. Test of significance: Paired *t*-test used for pre–post comparison.
SE=Standard error; CI=Confidence interval; OSCE=Objective structured clinical examination; EDD=Estimated Date of Delivery; BP=Blood pressure; HB=Hemoglobin; TT=Tetanus toxoid; IUCD=Intrauterine contraceptive device; OCP=Oral contraceptive pills; ORS=Oral rehydration solution