

Original Article

Knowledge, practice, and associated factors of obstetric care providers towards neonatal resuscitation in Hawassa city public health institutions: A cross-sectional study

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Abstract

Background: Neonatal mortality reduction remains a significant challenge in Ethiopia. Neonatal resuscitation is one of the proven interventions to manage neonatal asphyxia, a well-known cause of neonatal death. However, there are concerns about obstetric care providers' knowledge and skill in performing neonatal resuscitation. Therefore, this study aimed to assess knowledge, practice, and associated factors of obstetric care providers towards neonatal resuscitation in Hawassa city public health institutions.

Methods: An institution-based cross-sectional study was conducted among 191 obstetrics care providers from May 01-30/2024. The data were collected through face-to-face interviews and observation using a pre-tested, structured, observational checklist. A binary logistic regression analysis model was considered to analyze the data. The adjusted odds ratio (AOR) with a 95% confidence interval (CI) was used to report the measures of association.

Result: In this study, a total of 191 obstetric care providers participated. Among participants, 16.2% (95% CI:10.9: 21.6%) had good neonatal resuscitation knowledge, while 9.9% (95% CI: 5.7%, 14.7%) of obstetric care providers had adequate skills in neonatal resuscitation. Having a diploma level education (AOR = 0.09; 95% CI: 0.01, 0.58), having a Bachelor of science degree level education (AOR = 0.0.21; 95% CI: 0.06, 0.77) and the availability of a neonatal resuscitation algorithm or guideline (AOR = 3.46; 95% CI: 1.1, 10.86) were factors associated with neonatal resuscitation knowledge. Additionally, neonatal resuscitation skill was significantly associated with neonatal resuscitation knowledge (AOR = 4.62; 95% CI: 1.27, 14.30).

Conclusion: The neonatal resuscitation knowledge and skills of obstetric care providers in Hawassa city are notably low. To improve this, obstetric care providers should be encouraged to pursue further education, and neonatal resuscitation guidelines and algorithms should be made readily accessible,

ideally posted on facility walls, to enhance obstetric care providers' knowledge.

Keywords: Neonatal resuscitation, Knowledge, practice, obstetric care provider, Ethiopia

Introduction

Neonatal resuscitation is a set of medical interventions aimed at supporting newborns who are struggling to breathe immediately after birth (1). Resuscitation with a bag and mask is a high-impact intervention that can reduce neonatal deaths in resource-poor countries (2). Reducing neonatal mortality is a crucial component of the third Sustainable Development Goal (SDG), which aims to eliminate preventable child deaths (3).

Currently, the overall rate of childhood mortality is declining; however, nearly half of these deaths still occur during the neonatal period, with birth asphyxia being a significant contributor (4). According to a WHO report from 2013, the number of under-five mortality cases in Ethiopia was 195,504, with 84,437 of those attributed to neonatal deaths. This mortality is closely linked to the immediate obstetric and newborn care provided by obstetric care providers (5). In developing regions, including Africa, birth asphyxia is a leading cause of neonatal mortality, accounting for over one-third of childhood deaths (6). Countries like Nigeria and Ethiopia, which have the largest population estimates, significantly contribute to the regional burden of asphyxia (7).

Obstetric care providers must possess comprehensive knowledge and skills in this lifesaving intervention to effectively respond to neonatal emergencies, where immediate action is critical to saving new-born lives (8). While most newborns transition to extrauterine life without the need for resuscitation or birthing assistance, many do require neonatal resuscitation each year, often unpredictably (9). Therefore, obstetric care providers must be prepared and skilled to support newborns in need of this critical

intervention. In developing countries, including Ethiopia, obstetric care providers frequently lack the essential skills and equipment necessary to provide quality neonatal resuscitation (7). Due to this lack of knowledge and skill, many neonates in developing countries die unnecessarily from birth-related distress (10).

A systematic review and meta-analysis found that health care providers' knowledge of neonatal resuscitation in East Africa averages 59% (11). In Ethiopia, however, knowledge levels among obstetric care providers vary widely by region and study areas: 37.8% in Northern Ethiopia (12), 76.2% in Southern Ethiopia (13), 83.2% at Assela Teaching Hospital (14), 58.2% in Hadiya Zone (15), 46.2% at Gondar University specialized hospital (16), and 87.3% in Addis Ababa (17), 19.9% in northwest Ethiopia (18) and 9.8% Eastern Ethiopia (19) with an overall range of 9.8% (19) to 87.3% (17). The neonatal resuscitation skill level among obstetric care providers in East Africa averages 46.2% (20). In Ethiopia, skills also vary significantly by region and study area 67.2% in Southern Ethiopia (21), 55.9% in Hadiya Zone (15), 11.2% Eastern Ethiopia (22), 6.8% Northwest Ethiopia (19) and 89.2% in Addis Ababa (17), spanning 6.8% (19) to 89.2% (17).

Previous studies identified several factors associated with neonatal resuscitation knowledge and skills. Factors linked to knowledge include on-the-job training (12, 16), supportive supervision (12,14), more than five years of work experience, education level, equipment availability (11), age (13), training (14, 20), recent involvement in basic newborn resuscitation (13), well-equipped facilities (13, 20), profession (14, 16), sex and attitude (14).

Factors associated with neonatal resuscitation skill include the absence of guidelines, lack of supportive supervision, specialization in neonatology, age (21), work experience (17, 21), neonatal resuscitation training (21), guideline availability (21), and knowledge status (17,20, 21).

The findings above highlight substantial variability in the levels of neonatal resuscitation knowledge and skills among obstetric care providers, as well as in the associated factors, with inconsistencies in the types of providers considered across studies. In our study area, concerns have arisen regarding the competency and knowledge of obstetric care providers during neonatal resuscitation, particularly given the high neonatal mortality rate.

Therefore, this study aimed to assess the knowledge, practices, and associated factors influencing neonatal resuscitation among obstetric care providers in public health institutions in Hawassa City. It included a range of obstetric care providers and employed on-the-job observational techniques to capture a comprehensive view of current competencies and practices.

Methods and materials

Study Area

This study was conducted in public health facilities in Hawassa city. Hawassa City, the administrative city of Sidama Region, is located 273 km south of Addis Ababa, the capital of Ethiopia, and serves a total population of 343,175, of which 166,576 (48.54%) are female. The city's public health infrastructure includes one comprehensive specialized hospital, three primary hospitals, one general hospital, and five public health centers. Across all public healthcare facilities, there are a total of 418 obstetric care providers.

Study Design and Period

A facility-based cross-sectional study was conducted from May 1 to 30, 2024.

Source and Study population

The source population for this study included health care providers working in Hawassa City. The study population comprised obstetric care providers who had been employed in public health facilities for at least six months, excluding those who were seriously ill during the data collection period.

Sample Size Determination

The required sample size for the prevalence of obstetric care providers knowledge and skill was determined by using Epi Info version 7 software with the assumptions of a 95% confidence interval with 76.2% knowledge in Southern Ethiopia (13) and 55.9% for practice in Hadiya Zone (15), a level of significance (α) of 0.05, a 5% margin of error ($d = 0.05$). The sample size for factors associated with obstetric care providers neonatal resuscitation knowledge and skill were also computed using Epi-Info version 7 with the assumptions of a two-sided confidence level of 95%, a power of 80, a ratio of (unexposed: exposed), and a percent outcome in the unexposed group versus a percent outcome in the exposed group. Accordingly, the maximum (216) sample size was determined by training on neonatal resuscitation (21).

The sample size of 379 from the prevalence of obstetric care providers' skill was the largest. After adjusting for an anticipated 10% nonresponse rate, the final sample size was 417. To ensure accurate representation, we considered the correction formula since the population size is small ($n/N > 0.05$).

Correction formula: $n_{adj} = \frac{no}{1 + ((no - 1)/N)}$.

Where n_{adj} =adjusted sample size, n_0 =initial sample size calculated, and N =Total population size.

Therefore, $n_{adj} = n_0 / 1 + n_0 - 1 / N = 417 / 1 + ((417 - 1) / 418) = 417 / 1 + ((416 / 418) = 417 / 1 + 0.9952 = 209$
The final sample size (209) was proportionally allocated to the 10 public health facilities (five hospitals and five health centers) based on the number of obstetric care providers. Obstetric care providers were selected by using a simple random sampling technique.

Variables

Dependent variables: Neonatal resuscitation knowledge and skill

Independent variables: For knowledge and skill, on-job training, supportive supervision, work experience, education level, equipment availability, age, training, well-equipped facility, profession, sex, attitude, and knowledge status.

Operational Definitions

Obstetric care providers who scored 80% or higher on the 27 objective knowledge questions were classified as having good knowledge in neonatal resuscitation, with each correct answer assigned one point and each incorrect answer assigned zero points. Providers scoring below 80% were categorized as having poor knowledge. A similar classification was applied to the 33-item objective skill observational checklist for neonatal resuscitation, where each fully completed step was awarded one point, and incompletely or unperformed steps received zero points (22).

Data collection tools and procedures

The data collection tools were developed from different literature (10, 13, 16, 22), which consists of personal and socio-demographic characteristics of obstetric care providers, facility characteristics, knowledge questions, and a neonatal resuscitation observational checklist.

After developing and pretesting the tool, five data collectors and one supervisor were recruited and employed. All data collectors were midwives with MSc degrees and certified skills and knowledge in neonatal resuscitation. The data were collected through face-to-face interviewing and observational techniques using a structured questionnaire. The interview and observation were conducted in a place where confidentiality and privacy are assured.

Data Quality Control

To ensure the quality of the data collection, a two-day data collector training was given, and a pre-test was done. The principal investigator (PI) monitored and controlled the overall process and checked the completeness of the questionnaires daily.

Data entry and Analysis

Version 2021.3.4 Kobo Collect application was used to collect the data. Following the collection, the data were imported into SPSS version 23 for analysis. In this software, data cleaning and organization were done. The distribution of discrete variables was checked by running the frequency and mean + SD (standard deviation) for continuous variables. To analyze the data, a binary logistic regression analysis model was used. A bivariable binary logistic regression was conducted to identify eligible variables with a P-value of less than 0.20, which were then considered eligible for inclusion in the multivariable binary logistic regression analysis. The multivariable binary logistic regression was performed to check the presence of an association between independent variables and outcome variables (obstetric care providers' knowledge and skill). Adjusted odds ratio (AOR) with a 95% confidence interval and P-value less than 0.05 was used to assess the significance and strength of the association between independent and dependent variables.

Results

Socio-Demographic Characteristics of Study Participants

A total of 191 obstetric care providers participated in this study, with a 91.4% response rate. The mean (SD) age of the study participants was 29.3 (4.12) years. Among the study participants, 86.4% were females, and 74.9% were married. The majority (74.9%) were midwifery professionals, and 69.6% were BSc degree holders (Table 1).

Table 1: Socio-demographic characteristics of obstetric care providers in Hawassa city administration, Sidama Regional State, Ethiopia, 2024

Variable		Frequency	(%)
Age in years mean (SD)	29.3 (4.12)		
Sex	Male	26	13.6
	Female	165	86.4
Marital status	Married	143	74.9
	Not married	48	25.1
Religion	Protestant	107	56
	Orthodox	78	40.8
	Others *	6	3.1
Level of education	Diploma	46	24.1
	BSc degree	133	69.6
	MSc and above	12	6.3
Profession	Midwifery	143	74.9
	Nurse	33	17.3
	Physician and health officer	15	7.9
Current working unit	Delivery room	111	58.1
	Other MCH units	80	41.9
Work experience	1-5 years	106	55.5
	6-10 years	69	36.1
	≥11 years	16	8.4

Others *Muslim, Catholic Apostolic church

Knowledge and skill of obstetric care providers

Among the study participants, 16.2% (95% CI: 10.9; 21.6%) had good knowledge about neonatal resuscitation. Regarding skill, 9.9% (95% CI: 5.7%, 14.7%) of obstetric care providers had a skill towards neonatal resuscitation.

Factors associated with neonatal resuscitation knowledge

In the bivariate logistic regression analysis, age, level of education, and the availability of a neonatal resuscitation algorithm were considered for inclusion in the multivariate analysis. After adjusting for potential confounders in the multivariate logistic regression analysis, only the level of education and the availability of a neonatal resuscitation algorithm remained significantly associated with neonatal resuscitation knowledge.

Obstetric care providers with a diploma were 91% less likely to know neonatal resuscitation (AOR=0.09; 95% CI: 0.01, 0.58) compared to those with an MSc degree or higher. Similarly, those with a BSc degree were 79% less likely to have this knowledge (AOR=0.21; 95% CI: 0.06, 0.77). Additionally, obstetric care providers working in institutions with a neonatal resuscitation algorithm had three times higher odds of having neonatal resuscitation knowledge (AOR=3.46; 95% CI: 1.1, 10.9) compared to those in facilities without such an algorithm (Table 2).

Factors associated with neonatal resuscitation skill

In the bivariate logistic regression analysis, level of education, average number of monthly deliveries, neonatal resuscitation knowledge, neonatal resuscitation related training, and work-

Table 2: Factors associated with neonatal resuscitation knowledge among obstetric care providers in Hawassa city administration, Sidama National Regional State, 2024

Variables		NR-Knowledge		COR with 95% CI	AOR with 95% CI
		Yes	No		
Sex	Female	26	139	0.79 (0.27, 2.27)	
	Male	5	21		
Age	22 to 26	1	44	0.05 (0.01, 0.59)	0.08 (0.01, 1.04)
	27 to 31	20	82	0.57 (0.14, 2.39)	0.49 (0.11, 2.28)
	32 to 36	7	27	0.61 (0.12, 2.96)	0.47 (0.09, 2.49)
	37 and above	3	7	1	
Marital status	Married	26	117	1.91 (0.69, 5.29)	0.29 (0.04, 2.25)
	Not married	5	43	1	1
Profession	Midwifery	23	120	0.77 (0.20, 2.93)	
	Nurse	5	28	0.71 (0.15, 3.48)	
	Physician & health officer	3	12	1	
Level of education	Diploma	2	44	0.05 (0.01, 0.08)	0.09 (0.01, 0.58) **
	BSc degree	23	110	0.21 (0.06, 0.71)	0.21 (0.06, 0.77) **
	MSc and above	6	6	1	1
Working unit	Delivery room	18	93	0.99 (0.46, 2.18)	
	Other MCH units	13	67	1	1
NR-related training	Yes	7	51	1.60 (0.65, 3.97)	
	No	24	109	1	1
Work experience	1-5 years	16	90	0.53 (0.15, 1.86)	
	6-10 years	11	58	0.57 (0.16, 2.09)	
	≥11 years	4	12	1	1.00
NR-algorithm availability	Yes	27	102	3.84 (1.28, 11.5)	3.46 (1.1, 10.86) **
	No	4	58	1	

NR: Neonatal resuscitation; *: P-value < 0.2; **: P-value < 0.05; AOR: Adjusted odds ratio

experience were eligible for multivariable analysis. However, after adjusting for potential confounders in the multivariate logistic regression analysis, only neonatal resuscitation knowledge remained significantly associated with neonatal resuscitation skill. Obstetric care providers having neonatal resuscitation knowledge had four times higher odds of neonatal resuscitation skill (AOR=4.26; 95% CI: 1.27, 14.30) compared to their counterparts (Table 3).

Discussion

Among obstetric care providers, 16.2 % had good neonatal resuscitation knowledge, while 9.9 % had adequate neonatal resuscitation skills. Level of education and availability of neonatal resuscitation algorithm or guideline were factors associated with neonatal resuscitation knowledge. Additionally, neonatal resuscitation skill was significantly associated with neonatal resuscitation knowledge.

Table 3: Binary and multivariable logistic regression analysis for factors associated with neonatal resuscitation skill among obstetric care providers in Hawassa city administration, Sidama National Regional State, 2024

Variables		NR-Skill		COR with 95% CI	AOR with 95% CI
		Yes	No		
Sex	Female	15	150	0.56 (0.17, 1.81)	
	Male	4	22	1	
Age	22 to 26	3	42	0.64 (0.06, 6.91)	
	27 to 31	11	91	1.09 (0.13, 9.42)	
	32 to 36	4	30	1.20 (0.12, 12.14)	
	37 and above	1	9	1	
Marital status	Married	14	129	0.93 (0.32, 2.74)	
	Not married	5	43	1	
Profession	Midwifery	16	127	1.76 (0.22, 14.32)	
	Nurse	2	31	0.90 (0.08, 10.81)	
	Physician & health officer	1	14	1	
Level of education	Diploma	1	45	0.11 (0.01, 1.35)	0.20 (0.01, 3.36)
	BSc degree	16	117	0.68 (0.34, 3.41)	1.43 (0.22, 9.17)
	MSc and above	2	10	1	1
Monthly delivery	Less than 150	8	112	2.57 (0.98, 6.73)	0.65 (0.19, 2.23)
	150 and above	11	60	1	1
NR-related training	Yes	2	56	0.24 (0.05, 1.09)	0.21 (0.04, 1.16)
	No	17	116	1	1
Work experience	1-5 years	5	101	0.35 (0.15, 1.86)	0.27 (0.04, 1.69)
	6-10 years	12	57	1.47 (0.30, 7.35)	
	≥11 years	2	14	1	1
NR-algorithm availability	Yes	13	116	1.05 (0.38, 2.90)	
	No	6	56	1	
NR-knowledge	Yes	8	23	4.71 (1.71, 12.95)	4.26 (1.27, 14.30) **
	No	11	149	1	

NR: Neonatal resuscitation; *: P-value < 0.2; **: P-value < 0.05; AOR: Adjusted odds ratio

In this study, the neonatal resuscitation knowledge of obstetric care providers (16.2%) is almost in line with the findings in northwest Ethiopia, 19.9% (19), and Eastern Ethiopia, 9.8% (18). But this result is notably lower than findings from other studies in east Africa 59% (11), and varies parts of Ethiopia: 37.8% in Northern Ethiopia (12), 46.2% at Gondar University specialized hospital (16), 58.2% in Hadiya Zone (15), 76.2% in Southern Ethiopia (13), 83.2% at Assela Teaching Hospital Oromia (14), and 87.3% in Addis Ababa (17). The

possible justification for these discrepancies might be that most of the cited studies were conducted in a hospital setting, where more experienced and senior obstetric care providers are often assigned. Additionally, these studies (12, 14, 16, 17) used self-administered questionnaires for data collection, which may introduce various biases, potentially inflating knowledge assessment scores as participants might consult others, use online resources, or consider other means to answer the questions.

Neonatal resuscitation knowledge among obstetric care providers is associated with level of education. Compared to those with a Master's degree or higher, obstetric care providers with a diploma or a Bachelor's degree tend to have a lower level of knowledge in neonatal resuscitation. This evidence is supported by a systematic review and meta-analysis study conducted in East Africa (11). This difference might be explained by the likelihood that, as educational level increases, the depth and breadth of knowledge related to neonatal resuscitation among obstetric care providers also increase.

The availability of a neonatal resuscitation algorithm or guideline is another factor associated with neonatal resuscitation knowledge. Obstetric care providers in health facilities without a neonatal resuscitation algorithm or guideline had lower neonatal resuscitation knowledge compared to those in health facilities where a neonatal resuscitation algorithm or guideline was available. This finding aligns with studies conducted in Southern Ethiopia (13) and a systematic review and meta-analysis study conducted in East Africa (20). A possible justification might be that the presence of a neonatal resuscitation algorithm or guideline in a health facility increases the likelihood that obstetric care providers will review and internalize the steps and principles of neonatal resuscitation.

This study found that only 9.9% of obstetric care providers had neonatal resuscitation skills. This result is almost similar to the results of studies done in Eastern Ethiopia, 11.2% (22), and Northwest Ethiopia, 6.8% (19). Nevertheless, this prevalence is lower than findings from studies conducted in East Africa, where the prevalence was 46.2% (20), as well as studies from different parts of Ethiopia: 67.2% in Southern Ethiopia (21), 55.9% in Hadiya Zone (15), and 89.2% in Addis Ababa (17). This discrepancy might be due to differences in data

collection methods. The previous studies (15, 17) relied on self-administered questionnaires, which could introduce various biases. In contrast, this study used a structured observation checklist to directly assess the skill of obstetric care providers.

Knowledge of neonatal resuscitation was the only factor associated with obstetric care providers' neonatal resuscitation skills. Obstetric care providers with better neonatal resuscitation knowledge demonstrated better neonatal resuscitation skills compared to those with lower neonatal resuscitation knowledge. This finding aligns with results from a study conducted in Addis Ababa (17). As expected, knowledge is fundamental to effectively perform any skill-based activity, explaining why obstetric care providers with neonatal resuscitation knowledge exhibited better neonatal resuscitation skills.

These findings may be essential for stakeholders invested in improving the knowledge, skill, and related factors influencing obstetric care providers. This study uniquely includes a diverse group of obstetric care providers: midwives, nurses, physicians, and public health officers working across public health facilities (hospitals and health centers). Unlike previous studies, which often exclude health centers and focus primarily on midwives and nurses, this study provides a broad perspective. Another strength lies in the use of a structured neonatal resuscitation observation checklist, which offers a more objective skill assessment. Consequently, these results can be generalized to all obstetric care providers in public health facilities.

LIMITATIONS

A limitation of this study was the use of anatomical model simulations and observations to assess neonatal resuscitation skills. Many providers may not fully engage with or give the same attention to the anatomical model as they would to a real patient. This could have led to an underestimation of the obstetric care providers'

knowledge and skill in neonatal resuscitation. And also, the relatively small sample size may affect the precision of estimates and the generalizability of the findings. Additionally, in practice assessments, not all steps carry equal importance, and missing a critical step may undermine overall performance despite a high total score.

Conclusion

The neonatal resuscitation knowledge and skill of obstetric care providers in Hawassa city are notably low. Educational level and availability of neonatal resuscitation algorithm or guideline were factors associated with neonatal resuscitation knowledge, while knowledge in neonatal resuscitation was the sole factor associated with neonatal resuscitation skill. To enhance neonatal resuscitation knowledge, obstetric care providers should be encouraged to pursue further education, and health facilities should ensure that neonatal resuscitation guidelines and algorithms are readily accessible, ideally posted on facility walls. Strengthening obstetric care providers' knowledge is vital to improving neonatal resuscitation skills. For future studies, we recommend considering a weighted scoring system or a checklist that distinguishes between critical and non-critical steps to more accurately assess practical competence.

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Ethical considerations

The study fulfilled the declaration of Helsinki and was approved by the IRB at the College of Medicine and Health Sciences of Hawassa University with an approval reference number of (Ref. No.): IRB/073/16. There is no risk in participating in this survey; we followed the Helsinki Declaration guidelines.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author.

Conflicts of interest

The authors declared that no conflicts of interest exist.

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