



## Magnitude and associated factors of neonatal resuscitation among health care providers in selected public hospitals of Addis Ababa, Ethiopia, 2022. Multi center cross-sectional study

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### Abstract

**Background:** The neonatal stage is one of the most vulnerable in a child's existence due to the high risks of mortality and illness during such a time. One-fourth of newborn mortality worldwide is caused by asphyxia, with Ethiopia bearing a disproportionately large share of this burden among low- and middle-income countries. Poor resuscitation brought on by inexperienced medical staff had a significant impact on this asphyxia-related mortality and morbidity. The aim of the study is to assess magnitude & associated factors toward neonatal resuscitation among nurses working in public hospitals in Addis Ababa, Ethiopia.

**Methods:** An institution-based cross-sectional study was conducted in selected hospitals in Addis Ababa, Ethiopia. A total of 409 health professionals, including nurses, midwives, general practitioners, interns, residents, and obstetric gynecologists, worked in selected hospitals for this study. Data was collected using validated self-administered questionnaires. Bivariate analysis was used to see the association between each independent variable and the outcome variable, and multivariable logistic regression analysis was carried out to determine the effect of various factors on the outcome variable. All variables with a p-value  $\leq 0.25$  were taken into the multivariable model to control for all possible confounders.

**Results:** A total of 409 healthcare professionals with a 100% response rate were included. The majority of 357 (87.3%) of the participants had adequate knowledge, and 365 (89.2%) had good practice in neonatal resuscitation. In this study, the odds of health care providers having work experience greater than 5 years were 3.14 (AOR=3.14, 95% CI: 1.20-8.19), receiving neonatal resuscitation training was 2.68 (AOR=2.68, 95% CI: 1.02-7.03), having adequate knowledge about neonatal resuscitation was 6.18 (AOR=6.18, 95% CI: 2.08-18.37), having appropriate suctioning for neonates was 6.14 (AOR=6.14, 95% CI: 2.39-15.74), and neonates during resuscitation placed under neutral positioning were 3.44 (AOR=3.44, 95% CI: 1.45-8.16) significantly associated with practice of neonatal resuscitation.

**Conclusion and Recommendation:** The overall knowledge and practice score of health professionals was good. Hospital managers and decision makers also need to provide periodic supportive supervision and refreshment training to update knowledge and practice of HCPs.

**Keywords:** neonatal resuscitation, knowledge, practice, Ethiopia, 2022

### Introduction

Resuscitation of the newly born infant presents a different set of challenges than resuscitation of the adult or even the older infant or child. The infant's physiological make-up must significantly change within the first few minutes to hours after birth as it transitions from placental gas exchange in a liquid-filled intrauterine environment to spontaneous breathing of air [1]. About 5% to 10% of newborns need some form of active resuscitation at delivery (including breathing stimulation), while about 1% to 10% of babies delivered in hospitals are known to need assisted ventilation [2].

Neonatal resuscitation is a procedure done on a newborn infant who is having trouble breathing and moving around. In order to avoid long-term damage, a newborn needs appropriate emergency care throughout its most critical early years. Understanding the necessary procedures for appropriate resuscitation before to birth is essential. Low birth weight and early delivery make neonates more likely to require resuscitative procedures, so knowing the

newborn's gestational age beforehand can help in forecasting this need [3].

Neonatal resuscitation aims to restore enough spontaneous respiration and cardiac output while also preventing the morbidity and mortality linked to hypoxic ischemic tissue (brain, heart, and kidney) impairment. Perinatal asphyxia can be avoided by having proper understanding about and training in infant resuscitation. A systematic understanding of the need for resuscitative techniques in newborns is crucial for effective, timely diagnosis, appropriate therapy, and a decrease in problems in babies with life-threatening illnesses [4].

Efforts to reduce under-five mortality across the globe are being hindered by a disproportionately high rate of neonatal deaths. About a quarter of these neonatal deaths are caused by birth asphyxia [5]. According to the facts now available, competent and skilled healthcare personnel can significantly reduce infant mortality by performing effective newborn resuscitation. Numerous factors, including provider characteristics like educational level, experience, and specialization; institutional characteristics like training,

accessibility of guidelines, and equipment; and factors affecting neonatal outcome, affect health professionals' proficiency in neonatal resuscitation [6, 7]. More than 5 million neonatal deaths occur worldwide each year. It has been estimated that birth asphyxia accounts for 19% of these deaths, suggesting that the outcome might be improved for more than 1 million infants per year through implementation of simple resuscitative technique [8].

Even though the need for resuscitation of a newborn baby is frequently predictable, such situations can nonetheless happen quickly and in places that don't frequently offer neonatal critical care. Thus, it is essential that the knowledge and skills required for resuscitation should be possessed by all providers of neonatal care. To achieve a better initial newborn outcome, health practitioners' expertise in neonatal resuscitation is vital. Therefore, in order to decrease neonatal mortality, health care personnel' knowledge of neonatal resuscitation treatments must be improved. The first step in putting training and policy-related initiatives in place is understanding the knowledge and competence levels of health care providers with reference to neonatal resuscitation [11]. However, little is currently known about the awareness and application of newborn resuscitation among medical personnel in Ethiopia. Even though there are studies that concentrate on newborn resuscitation, certain health professionals who are involved in neonatal care and attend deliveries were left out. Therefore, this study is aimed at all health personnel who provide care for newborns. Therefore, the aim of this study is to assess the magnitude and associated factors of neonatal resuscitation among health care providers in selected public health facilities in Addis Ababa, Ethiopia, in 2022.

## Method and Materials

### Study design, Area and the Study Period

An institutional based cross-sectional study was conducted in selected hospitals of Addis Ababa, Ethiopia. Addis Ababa is the capital city of Ethiopia and seat of African Union and the United Nations World Economic Commission for Africa. It covers an area of 527 square kilometers and has 11 sub cities. According to population projection value for 2020 the city has an estimated population of 4.592 million [12]. The city has twelve public Hospitals. Except for Amanuel Hospital, the majority of these hospitals have their own labor and delivery room. As a result, four public hospitals in Addis Ababa were chosen at random to participate in the study. These chosen hospitals are Gandhi Memorial Hospital, Ras-Desta Damtew Memorial Hospital, Menillik II Referral Hospital, and Zewditu Memorial Hospital. The study was conducted from May- June, 2022

### Inclusion and Exclusion Criteria

Participants from each sampled health facility were enrolled in the study after getting their confirmation to work in neonatal intensive care units and delivery units either on a regular basis, by rotation, or on night duty, regardless of the time duration for which the provider stayed in the delivery unit. Nurses, midwives, general practitioners, interns, residents, pediatricians, and obstetric gynecologists who fulfilled the following criteria (all health care providers working in neonatal intensive care units and delivery rooms of selected hospitals) were included in the study. Those health care providers (HCPs) who were not accessible

during the data collection period or on annual or sick leave were excluded from this study.

## Operational definitions

**Knowledge:** Appropriate response from nurses about neonatal resuscitation was assessed through the structured knowledge questionnaires, and those who scored above 80% were considered to have good knowledge, while those below 80% were considered to have poor knowledge (according to the 2018 AHA PALS accreditation criteria).

**Practice:** Appropriate response from nurses about neonatal resuscitation was assessed through interview questionnaires and those who scored above 80% were considered to have good practice and those below 80% were considered to have poor practice (according to the 2018 AHA PALS accreditation criteria).

## Sampling Size and Sampling Procedure

### Sample Size Determination

Single population proportion formula is used to estimate the sample size and with the following assumptions:

Based on the study conducted in North West Ethiopia on practice of health care providers on neonatal resuscitation, a proportion of 59.2% (0.592)(13) is used.

Level of significance 5% ( $\alpha = 0.05$ ), 95% confidence level ( $Z \alpha/2 = 1.96$ ) and absolute precision or margin of error 5% ( $d = 0.05$ ).

The following two formulas are used to calculate sample sizes.

$$no = \frac{(Z\alpha/2)^2 \times p(1-p)}{d^2} = 371$$

The sample size (no) is 371. By adding 10% non-response rate a total of 409 Sample was used for this study.

### Sampling methods/procedure

The study was conducted in Addis Ababa public hospitals with NICUs and labor and delivery units. Out of 12 public hospitals, all but Amanuel Hospital have their own labor and delivery units. From the remaining eleven [11] hospitals, four hospitals (Gandhi Memorial Hospital (GMH), Menillik II referral hospital, Ras-Desta Damtew memorial hospital, and Zewditu memorial hospital) are selected using a simple random lottery method. By using the simple random sampling method, samples of obstetrician and gynecologists, pediatricians, residents, interns, general practitioners, nurses, and midwives were taken from the labor and delivery units of each respective hospital. A list of obstetric care providers was obtained from the delivery units of each hospital. The sample size is proportionally allocated to each hospital based on the number of delivery units at each hospital.

According to data from the four hospitals in the two months prior to the study period from February 2022 to March 2022, a total of 466 health care providers worked in the neonatal intensive care unit and labor and delivery units (Gandhi Memorial Hospital 132, Dagmawi Menillik II referral hospital 116, Ras-Desta Damtew Memorial Hospital 124, and Zewditu Memorial Hospital 94). Then, allocation of the sample size to each hospital was completed proportionally based on the average number of health care providers working at the neonatal intensive care unit and labor and delivery ward in each hospital. For overall

samples of health professionals, data collectors distributed self-administered questionnaires by selecting them with a simple random sampling method and collected sheets within a given time period.

**Data collection tools and techniques**

The data collection tool for this study was organized by the researcher using previous studies of similar kinds, including WHO guidelines, 2015 American Heart Association guidelines, Help Babies Breathe (HBB) 2nd edition knowledge assessments, and Ethiopian Pediatric Association Guidelines. The tool consists of structured, self-administered questionnaire that addresses socio-demographic, knowledge, and practice questions about basic life support (BLS) and advanced cardiac life support (ACLS), provider, and institutional characteristics.

Eight health professionals-six data collectors and two supervisors-took part in the data collection process. These data collectors and supervisors received a two-day training on the data collection process, including information on the study's purpose, how to conduct interviews, how to administer self-administered questionnaires, how to obtain consent, maintain confidentiality, and respect participant rights.

**Data quality control and management**

Expert doctors and researchers evaluated the tool's quality and decided on its content before the actual data collection time. Additionally, 5% of the total sample amount was pretested in another hospital in Addis Ababa. To avoid social bias, data collectors were chosen from different hospitals. Supervisors should monitor daily the process of data collection, delivery of the instrument, review the recorded data for readability and reliability, and look for any odd indicators written clearly or not.

**Method of Data Analysis**

The study results (data) were verified, coded, and entered into the Epi Data software, which was then exported into SPSS version 26 for analysis. The analysis result was described using descriptive analysis frequency, percentage, and mean) using tables, graphs, and texts. Bivariate analysis was used to see the association between each independent variable and the outcome variable, and multiple logistic regression analysis was carried out to determine the effect of various factors on the outcome variable. All variables with a p-value≤0.25 were taken into the multivariable model to control for all possible confounders. The degree of association between dependent and independent variables was assessed using an odds ratio with a 95% confidence interval and a p-value≤0.05.

**Results**

**Table 2:** Responses given by health professionals for selected knowledge questions towards neonatal resuscitation at selected public hospitals of Addis Ababa, Ethiopia, 2022 (n=409).

Variables	Frequency	Percentage (%)
Immediate problem of new born		
Hypothermia	42	10.3
Asphyxia	101	24.7
Infection	22	5.4
Respiratory distress	216	52.8
Hypoglycemia	13	3.2
Others	15	3.7

**Provider’s socio-demographic characteristics**

A total of 409 health care providers were included, with a response rate of 100% from and delivery units of three public hospitals in Addis Ababa. Males accounted for 172 (42.1%) and females 237 (57.9%) of the participants. The maximum and minimum age of the participants were 50 and 23 years, respectively, with a mean of 29.21 (SD=5.24). About 265 (64.8%) were between the ages of 25 and 29 years. Regarding educational status, 338 (82.6%) were degree holders, and 65 (15.9%) were doctors. From the total study participants, 240 (58.7%) had less than five years of experience (Table 1).

**Table 1:** Socio-demographic characteristics of neonatal resuscitation among health care providers in selected public hospitals in Addis Ababa, Ethiopia, 2022 (n=409).

Variables	Frequency	Percentage (%)
Sex		
Male	172	42.1
Female	237	57.9
Age group (year)		
<24	29	7.1
25-29	265	64.8
30-34	83	20.3
≥35	32	7.8
Educational level		
BSc Degree	338	82.6
MSc Degree	6	1.5
Physician/doctors	65	15.9
Working department		
Delivery unit	211	51.6
NICU	198	48.4
Work experience		
<5 years	240	58.7%
≥5 years	169	41.3%

**Provider’s institutional characteristics**

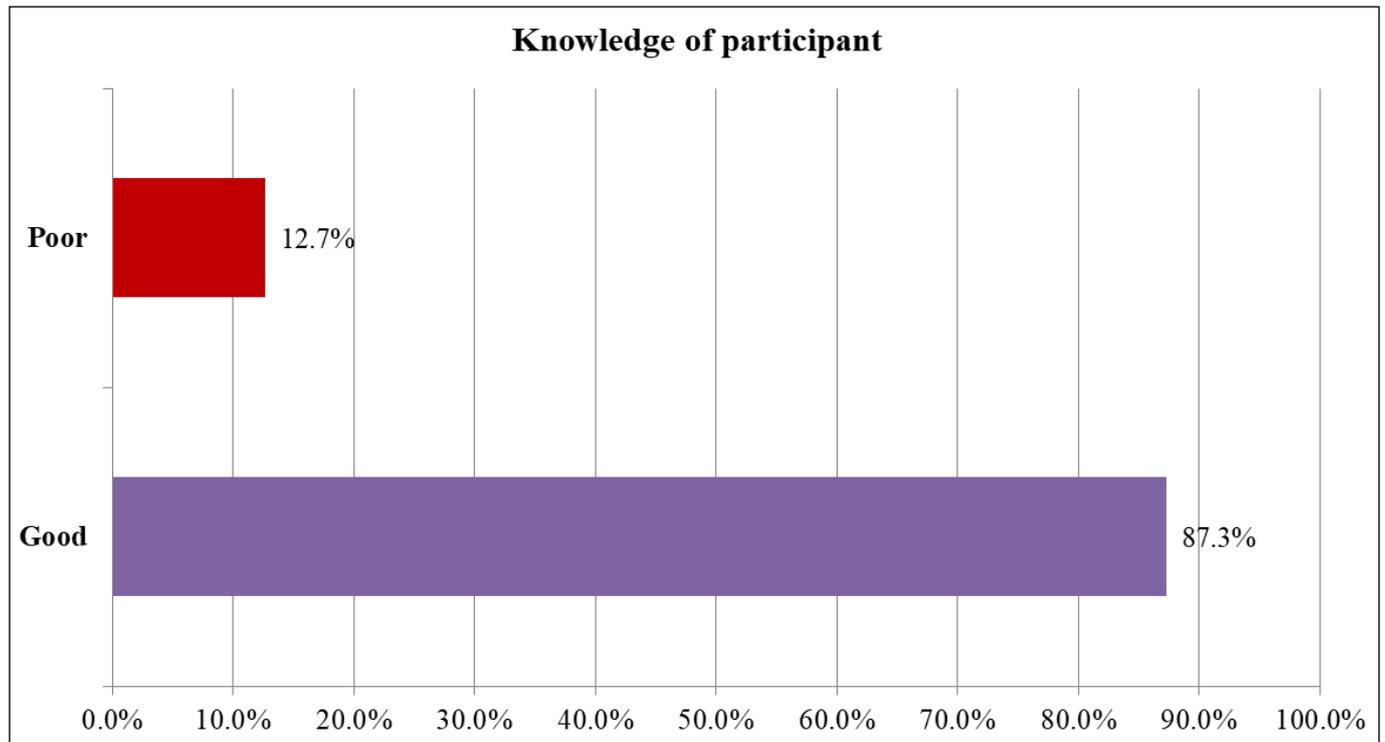
About 266 (65.0%) of the health care providers had taken neonatal resuscitation training. Nearly two-thirds 282 (68.9%) of the participants were used to monitor oxygen saturation. About 290 (70.9%) of the institutions deliver resuscitation guidelines (Table 2)

**Knowledge scores in different groups of participants for selected neonatal resuscitation procedures**

Most participants in this study correctly answered the majority of knowledge components. Most 374 (91.4%) of the participants) had answered the question about preparing resuscitation for the newborn correctly. Most 348 (85.1%) health care providers keep the baby in the mother’s abdomen immediately after delivery. About 329 (80.4%) of health professionals had resuscitated high-risk or unstable newborns after delivery in the dedicated newborn corner at the delivery room (Table 2).

Keep the baby immediately after delivery		
In the mother's abdomen	348	85.1
Clean and separate place/ table	61	14.9
If the baby did not cry after delivery		
Suction if there is secretion	161	39.4
Stimulating the baby	184	45.0
Call help & start CPR	64	15.6
Newborn has persistent apnea		
Continue tactile stimulation	49	12.0
Give PPV quickly	214	52.3
Give free flow oxygen	146	35.7
Effective bag and mask ventilation		
Rising heart rate & audible breath sounds	120	29.3
Rise in oxygen saturation	46	11.2
Chest movements symmetrically	211	51.6
None of the above	32	7.8
Term babies born through meconium stained liquor		
Suction of oral cavity and nose after delivery	364	89.0
Endotracheal suction of active baby vigorous	28	6.8
Endotracheal suction all babies born through MAS	17	4.2
Pressure of chest compression		
Depress the sternum to 1/3rd to 1/2 diameter chest	346	84.6
There is no strict guideline, it varies weight of baby	83	15.4
Resuscitate high-risk/unstable newborn after delivery		
In the dedicated newborn corner in the delivery room	329	80.4
In a separate room near the delivery room	37	9.0
In the NICU or separate adjacent room	35	8.6
Anywhere	8	2.0
Initial step of neonatal resuscitation		
Provide warm environment	9	2.2
Head position "neutral position"	19	4.6
Clear airway and drying baby stimulation for breath	53	13.0
Both steps	328	80.2
Resuscitation started		
After 1st minute APGAR score	96	23.5
After 5th minute APGAR score.	15	3.5
Immediately	298	72.9
Stop resuscitation		
When baby is cried	180	44.0
When breathing rate < 30 breaths per minute (BPM)	15	3.7
When the bay is gasping	9	2.2
When heart rate (HR) > 100 beats per minute (BPM)	205	50.1
Technique of chest compression		
Two thumbs	243	58.4
Two fingers	97	23.7
One hand	11	2.7
Two hands	58	14.2
Before reassessing heartbeat CPR continued for		
15 sec.	66	16.1
20 sec.	140	34.2
30 sec.	73	17.8
60 sec	130	31.8
Ratio of neonate chest compression to ventilation is		
2:1	83	20.3
3:1	280	65.8
4:1	17	4.2
5:1	29	7.1

The majority, 357 (87.3%) of the participants, had good knowledge, while only 52 (12.7%) of them had poor knowledge about neonatal resuscitation (Fig 1).



**Fig 1:** knowledge scores in different groups of participants for selected neonatal resuscitation among health care providers in selected public hospitals in Addis Ababa, Ethiopia, 2022. (n=409).

#### Attitude of participants towards neonatal resuscitation

A total of 128 (31.3%) of the participants disagreed with the statement that attitudes toward delays in resuscitation may be influenced by how nurses and midwives are perceived. Half of them 207 (50.6%) of health professionals, strongly concur that preparation for resuscitation is necessary. About 102 (24.9%) providers strongly disagreed with the statement that their motivation for newborn resuscitation was based on rewards or benefits.

#### Practice scores of participants towards neonatal resuscitation.

Almost all participants 365(89.2%) participated in different procedures of neonatal resuscitation. Majority of them 211(93.8%) correctly checked resuscitation materials, and 208 (92.4%) of the participants resuscitated preterm infants in respiratory distress with intranasal oxygen. About 196 (87.1%) of the participants use a saturation monitor during neonatal resuscitation, and 173 (76.9%) use oxygen attached to a bag and mask with a reservoir for a term neonate with bag and mask during resuscitation (Table 3).

**Table 3:** Responses most frequently given for selected practice questionnaires neonatal resuscitation among health professionals from public hospitals in Addis Ababa, 2022 (n=409).

Variables	Frequency	Percentage (%)
What was the procedure (n=365)		
CPR	102	27.9
Bag and musk ventilation	253	69.3
Other	10	2.7
What problems did you face during NR (n=365)		
Lack of equipment	270	74.0
Lack of trained assistant	28	7.7
Lack of oxygen	48	13.2
Absence of guideline	19	5.2
Correct position of baby resuscitation (n=365)		
A baby should be neutral positioned	335	91.8
Flexed neck	23	6.3
Hyper extended neck	7	1.9
Suctioning baby's nose and mouth (n=365)		
Sucking the nose then mouth	86	23.6
Sucking mouth then nose	272	74.5
Sucking mouth only	3	0.8
Sucking nose only	4	1.1
Begin ventilation of term neonate with bag & mask (n=365)		
Oxygen attached to bag and mask but without reservoir	15	4.1
Oxygen attached to bag and mask with reservoir	343	94.0
Only bag and mask without any reservoir or oxygen	7	1.9

Routine practice in your delivery room (n=365)		
Cord is cut immediately after the delivery of the baby	101	27.7
Cord is cut after a delay of a minute of the delivery	153	41.9
Cord is cut after pulsations stop	86	23.6
Cord is cut after 5 minutes	125	6.8
Resuscitative materials use (n=365)		
Bulb syringe & suction catheter	24	6.6
Bag and mask	337	92.3
Endotracheal tube	4	1.1

Majority 209 (92.9%) of the participants had good practice while only 16(7.1%) Of them had poor practice about neonatal resuscitation (Fig 2).

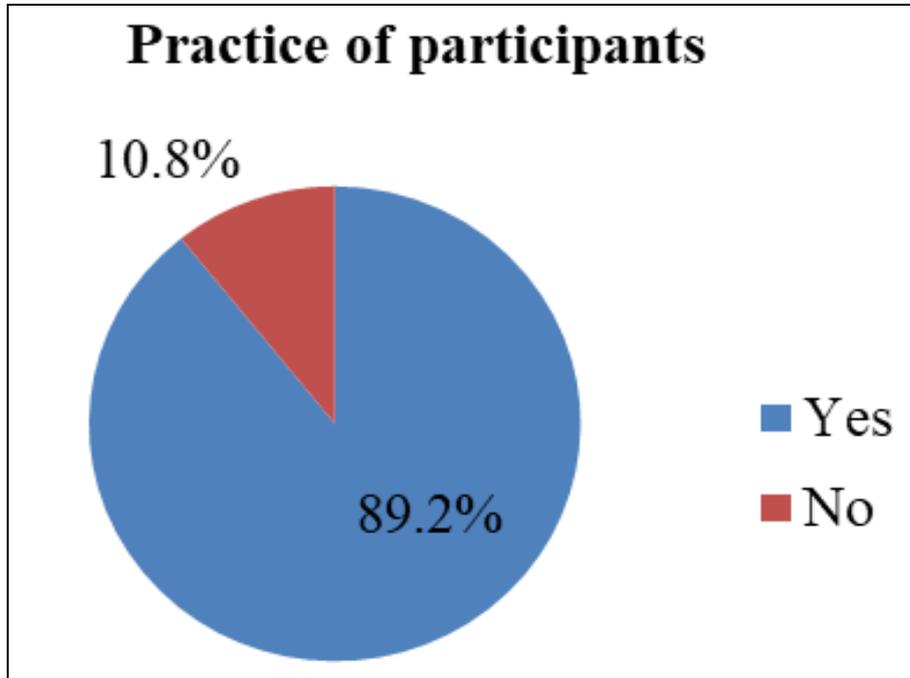


Fig 2: Practice of participants towards neonatal resuscitation at selected public hospitals of Addis Ababa, 2022 (n=409).

**Factors associated with practices about neonatal resuscitation among health care providers**

The associations between the independent and dependent variables were first tested using bivariate analysis, and those that were associated ( $P \leq 0.25$ ) were tested in the final multivariate analysis to see their significance with practice about neonatal resuscitation. As such, Table 4 below lists the bivariate regressions associated with the crude odds ratios (COR) for the practice of neonatal resuscitation, including sex of healthcare providers, work experience, training in neonatal resuscitation, availability of resuscitation guidelines, oxygen saturation monitor, lack of an oxygen source in the resuscitation area, knowledge,

suctioning the neonate's mouth then nose, and proper positioning of the baby resuscitation corner. In Multivariable logistic regression analyses were carried out to determine the effect of various factors on the outcome variable. All variables with a p-value  $\leq 0.25$  were taken into the multivariable model to control for all possible confounders. Multivariable analysis results showed that there was a statistically significant association found between practices of neonatal resuscitation parameters that showed a p-value below 0.05: work experience, receiving training on neonatal resuscitation, knowledge, suctioning, and the correct position of neonates.

Table 4: Bivariate and multivariable logistic regression for practice about neonatal resuscitation among health care providers in public hospitals in Addis Ababa, Ethiopia, 2022 (n=409).

Variables	Practice about neonatal resuscitation		COR (95% of CI)	AOR (95% OF CI)
	No	Yes		
Sex				
Male	8(4.7%)	164(95.3%)	3.67(1.66-8.12)*	2.03(0.69-5.90)
Female	36(15.2%)	201(84.8%)	1	1
Experience				
<5 year	15(10.1%)	133(89.9%)	7.85(3.54-17.39)*	3.14(1.20-8.19)**
>5 year	1(1.3%)	76(98.7%)	1	1
Training				
Yes	17(6.4%)	249(93.6%)	3.41(1.79-6.50)*	2.68(1.02-7.03)**
No	27(18.9%)	116(81.1%)	1	1
Resuscitation guideline				

Yes	35(12.1%)	255(87.9%)	0.59(0.28-1.28)*	0.47(0.18-1.23)
No	9(7.6%)	110(92.4%)	1	1
Use oxygen saturation				
Yes	25(8.9%)	257(91.1%)	1.81(0.96-3.42)*	1.09(0.40-2.95)
No	19(15.0%)	108(85.0%)	1	1
Shortage of oxygen				
Yes	27(13.0%)	181(87.0%)	0.62(0.33-1.18)*	0.69(0.28-1.75)
No	17(8.5%)	184(91.5%)	1	1
Knowledge				
Yes	32(9.0%)	325(91.0%)	3.05(1.45-6.39)*	6.18(2.08-18.37)**
No	12(23.1%)	40(76.9%)	1	1
Suctioning (mouth- nose)				
Yes	11(4.0%)	261(96.0%)	7.53(3.67-15.46)*	6.14(2.39-15.74)**
No	33(24.1%)	104(75.9%)	1	1
Correct positioning				
Yes	15(5.0%)	288(95.0%)	7.23(3.69-14.16)*	3.44(1.45-8.16)**
No	29(27.4%)	77(72.6%)	1	1

Key 1= Reference

\* Statistically significant by COR at p-value  $\leq 0.25$

\*\*Statistically significant by AOR at p-value  $< 0.05$

## Discussion

This study was anticipated to assess practice and associated factors related to neonatal resuscitation among health professionals in public hospitals in Addis Ababa. Effective resuscitation is one of the most important procedures to prevent asphyxia related complications. For a good outcome from effective resuscitation, appropriate knowledge and practice by health care providers are needed. Understanding the level of knowledge, practice, and its predictors could provide baseline information for health care planning and quality improvement policy.

In this study the overall adequate knowledge and practice of neonatal resuscitation were 87.3% and 89.2% respectively. This study which was almost similar to the result of studies conducted in Afghanistan<sup>[14]</sup> and in Kenya<sup>[15]</sup>. This might be the fact that the methodologies and study participants professional distribution which may pull out the overall score. The finding of this study was found to be higher than studies conducted in Ghana<sup>[16]</sup>, Gujarat town of India<sup>[17]</sup>, North West Ethiopia<sup>[13]</sup>. This may be owing to the fact that the majority of participants had the opportunity to receive in-service training and that the majority of the study's subject locations were educational institutions, where knowledge transfers may be simple to do. This group of potential factors could raise the overall rating of the newborn resuscitation technique.

In this study, the odds of healthcare professionals practicing proper newborn resuscitation were three times higher for those with work experience in the NICU and labor and delivery units of  $>5$  years than for those with less experience. A large number of them received the training while in school. Observing senior resuscitation for babies, reading about neonatal resuscitation, and participating in specific training courses at workplaces were additional training options. This demonstrates that the participants took advantage of the numerous opportunities they had to receive training in newborn resuscitation.

The odds that health care providers received training were three times more likely to have adequate practice in neonatal resuscitation compared with those who hadn't taken formal training. A similar study conducted in Afghanistan in 2013 assessed the capacity for newborn resuscitation and factors associated with health providers' knowledge and skills. Training was associated with greater knowledge and a

multivariable model that was adjusted for facility type, provider type, and years of experience offering services to help babies breathe<sup>[14]</sup>.

Health care providers had adequate knowledge about neonatal resuscitation were 6 times more likely adequate practice compared those who hadn't poor knowledge. The knowledge of this study participant was identified as 91.4%. This finding was significantly higher than the finding of a study conducted in Nepal<sup>[18]</sup>, cross-sectional study conducted in Ghana (Tamale)<sup>[16]</sup>, in Western Nigeria<sup>[19]</sup>, in Kenya<sup>[20]</sup>, a cross-sectional study conducted in North West Ethiopia and another study conducted in Ethiopia<sup>[21]</sup>. The majority of the participants in this study had taken in-service training in newborn resuscitation, which could be the explanation for this discrepancy. The participants are given the chance to receive current information regarding newborn resuscitation, which allows them to become more informed. This may explain why the study's total knowledge score was so high. Another reason for this discrepancy could be that the majority of the study regions are teaching hospitals, where knowledge transfer concerning neonatal resuscitations could be simple among various professions. This simple transfer of knowledge has the potential to raise the general level of comprehension regarding neonatal resuscitations.

For neonates, proper suctioning about the mouth and subsequently the nose was six times more likely to result in adequate practice of neonatal resuscitation compared to incorrect suctioning. This may have contributed to poor newborn resuscitation practice if there was no supportive monitoring, health care workers' skill levels gradually declined over time, and practice gaps went undiagnosed.

Neonates who were in neutral positioning during resuscitation were three times more likely to have had sufficient training in neonatal resuscitation when compared to those who were positioned incorrectly. Health practitioners might not follow the newborn resuscitation guidelines while conducting incorrect posture, which may result in poor neonatal resuscitation practice, if there are no resuscitation guidelines in place at the workplace. Another explanation for this could be the effectiveness of mentoring, encouraging supervision, and care providers' attitudes regarding newborn resuscitation.

In conclusion, health professionals scored well overall for their practice. In this study, knowledge of newborn resuscitation was substantially correlated with obtaining training in it and the availability of recommendations. Work experience, training, education, suitable suctioning, and proper placement were all substantially linked to newborn resuscitation technique. To keep healthcare professionals' knowledge and skills current, hospital management and decision-makers must also offer supportive supervision and refresher training on a regular basis.

**Table 5:** Acronyms

ACLS	Advanced Cardiac Life Support
BLS	Basic Life Support
BMV	Bag and Mask Ventilation
CPAP	Continues Positive Air way pressure
GDA	Global Development Alliance
GYN-OBS	Gynecology and Obstetrics
HBB	Helping Baby's Breath
HCPs	Health Care Professionals
IEC	Information, Education and Communication
MDG	Millennium Development Goal
NR	Neonatal Resuscitation
SSA	Sub-Saharan Africa

### Acknowledgment

Our appreciation also goes to the study participants, data collectors and supervisors for their contribution and commitment throughout the study period.

### Ethical Considerations

The Addis Ababa Medical & Business College's Department of Public Health Research and Community Service Office provided ethical clearance (RCSO). Following ethical approval, authorization letters were acquired from the General Public Health Department (Mph) and particular government hospitals. Additionally, permission letters should be received from the directors of each different ward at the research hospitals. Verbally asking each participant for their informed consent, outlining the possible hazards, explaining why the research is being done, and asking for their willingness to participate in the study were all done with the study subjects?

### Data Availability

Data will availability upon reasonable request from the corresponding author.

### Conflict of interest

The authors declare no conflict of interest in preparing this article.

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### Author Contributions

Melesse Abebaw (BSc), Mr. Adane Tesfaye (MPH, PhD Candidate) and Mr Yohannes Godie (BSc, MSc) made significant contributions to the work of the report, whether in conception, study design, execution, data acquisition, analysis and interpretation, or all of these areas, participated in the drafting, revision or critical review of the article, and ultimately approved the version to be published, Agreed to

the journal to which the article was submitted and agreed to be responsible for all aspects of the work.

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