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# Knowledge Levels of Neonatal Resuscitation Among Service Providers of Primary and Secondary Healthcare Facilities: A Cross-Sectional Study

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***Abstract***
***Introduction:*** *Adequate knowledge of newborn resuscitative procedures plays an important role in early diagnoses and suitable management. However, there is limited data on healthcare professionals' knowledge about neonatal resuscitation in Bangladesh. Therefore, this study aimed to assess the neonatal resuscitation practice and related factors among doctors, nurses, and midwives in Narayanganj, Bangladesh.*
***Methods:*** *This was a cross-sectional study conducted among the doctors, nurses, and midwives in Narayanganj, Bangladesh to assess the essential newborn care practices and related factors. A total of 140 healthcare providers were enrolled in the study. A well-designed and pretested set of structured questionnaires was used to collect the information.*
***Result:*** *The majority (50%) of the participants were aged between 25 to 35 years followed by 32.1% were >35 years and 17.9% were <25 years. The mean age of the participants was 30.53±5.92 years. Among all, 57.2% were midwives, 30.7% were nurses and 12.1% were doctors. Among all, 64.3% were working in a clinic and 35.7% were in a hospital. The majority (52. I %) had working experience below 5 years followed by 17.9% had 5-10 years and 30% had working experience years. 52.7% (n=73) of the participants had good knowledge and 47.9% (n=67) had poor knowledge of the practice of neonatal resuscitation. Multivariate logistic regression showed place of work, working experience, and training on neonatal resuscitation were significantly associated with knowledge of neonatal resuscitation.*
***Conclusion:*** *Overall knowledge of neonatal resuscitation was insufficient. Competency and simulation-based in-service training and refresher training complemented by supportive supervision and mentorship are helpful ways to improve providers' capability to perform neonatal resuscitation.*
***Keywords:*** *Neonatal Resuscitation, Healthcare Providers, Midwife, Knowledge*

## I. INTRODUCTION

The first 28 days of a child's existence are considered to be the most precarious time for the child's chances of surviving. Every year, there are around 130 million infants born all over the world, yet almost four million of them do not survive their first four weeks of life. Twenty-nine percent of all fatalities in neonates are the result of asphyxia (1). About ten percent of the newborn infants who are brought into the world need a little help getting their breathing started, while about one percent of newborns need significant resuscitative procedures. The majority of newborn fatalities (99%) occur in nations that are classified as having a low or moderate income (2). Asphyxia during pregnancy and delivery is responsible for about one-fourth of all fatalities that occur in neonates all over the globe. Asphyxia at birth is the cause of death for 23 percent of newborns in nations with poor incomes and 31.6% of newborn fatalities in Bangladesh. This research sheds light on the unfortunate reality that prenatal asphyxia is still a problem not just in Bangladesh but also globally (3). Every day, around 9357 infants are born in the country of Bangladesh. There are between 5 and 10 percent that are required to promote respiration. Only a very small fraction of the neonates in this group need resuscitation, with or without the use of a bag mask. Preliminary research indicates that there are 17.5 newborn fatalities for every thousand live births in Bangladesh each year. The majority of them pass away as a result of hypoxia, in addition to several other key reasons throughout the newborn period; this accounts for 24 percent of infant mortality. Which are truly amenable to reduction if the appropriate procedures are taken. It is feasible to lower the fatality rate, particularly by ensuring that a suitable environment and sufficient numbers of trained

personnel are available to care for infants who have birth asphyxia (3). Monebenimp et al. evaluated the competency of healthcare personnel, including midwives, in neonatal resuscitation through direct observation in a level-one health facility in Cameroon. The study included 10 professionals managing 340 neonates, revealing significant deficiencies in hand hygiene, equipment handling, and medical waste disposal. They concluded that inexperience contributes to high neonatal mortality rates (4). In South Asia, this skill gap is severe, with projections indicating that only half of the women would have access to skilled birth attendants by 2015 if current trends persisted (5). A quasi-experimental study in 10 hospitals in Pakistan assessed 370 healthcare providers in maternal and neonatal care (6). Similarly, research in Kenya involving 192 healthcare personnel found inadequate knowledge of neonatal resuscitation (4). Another study in Pakistan highlighted neonatal resuscitation as a challenging task for health practitioners (7). In Ethiopia, training midwives in neonatal resuscitation was identified as a crucial factor in reducing neonatal mortality, underscoring the need to assess their conceptual knowledge (8). Studies in Poland and Kenya further emphasized that a lack of expertise among healthcare workers remains a major concern. In Poland, inadequate knowledge of neonatal resuscitation among midwives was linked to prenatal asphyxia (9),(10).

## II. METHODS

This cross-sectional study was conducted in Naraynganj, Bangladesh, from September 2022 to December 2022, to assess the level of knowledge of neonatal resuscitation among the service providers in primary and secondary healthcare facilities of Narayanganj district in Bangladesh. The Doctors, nurses, and midwives who are contributing to maternal and neonatal care services in the hospitals and clinics of Naraynganj district were included in the sample population during the study period. A total of 140 participants were selected as study subjects fulfilling inclusion and exclusion criteria. Respondents were selected by convenience sampling. A well-designed and pretested set of structured questionnaires was used to collect information. Data was collected through face-to-face interviews. Data was first analyzed by the STATA 16 version. Collected data was sorted, cleaned, maintained with accuracy, and will be preserved for statistical analysis. Frequency tables are been further used for categorical variables summarization. Continuous variables were used as measures of central tendency and dispersion. To compare the proportions of categorical variables and student t-test to compare the mean of continuous variables a Chi-square test was used. Multivariable logistic regression was used to find factors related to poor knowledge. P value $< 0.05$ was considered statistically significant. Ethical approval of the study was taken from the Institutional Review Board (IRB) of North South University.

**Inclusion criteria:**

- Doctors from OBGYN, pediatricians, and general doctors working in maternal and neonatal care facilities were included in the study.
- Service providers who have been working in the labor ward for more than one year were considered for selection.
- Those who have already worked for more than one year were also considered eligible for the study.

**Exclusion criteria:**

- Service providers who were unfit to participate in the study.
- Service providers who did not agree to participate.

## III. RESULTS

**Table 1:** Demographic Characteristics of Participants (N=140)

| Characteristic | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Age Group (years) | <25 | 25 | 17.9 |
| | 25–35 | 70 | 50.0 |
| | >35 | 45 | 32.1 |
| Mean Age | - | 30.53 ± 5.92 years | - |
| Gender | Female | 77 | 55.0 |
| | Male | 63 | 45.0 |
| Marital Status | Married | 88 | 62.9 |
| | Single | 28 | 20.0 |
| | Divorced | 24 | 17.1 |
| Profession | Midwife | 80 | 57.2 |
| | Nurse | 43 | 30.7 |
| | Doctor | 17 | 12.1 |
| Workplace | Clinic | 90 | 64.3 |
| | Hospital | 50 | 35.7 |
| Work Experience | <5 years | 73 | 52.1 |

| | | | |
|---|---|---|---|
| | 5–10 years | 25 | 17.9 |
| | >10 years | 42 | 30.0 |

Among the 140 participants, the majority (50%) were aged between 25 to 35 years, with a mean age of 30.53 ± 5.92 years. Females constituted 55% of the sample, while males made up 45%. Most participants were married (62.9%), followed by 20% who were single and 17.1% who were divorced. Regarding profession, 57.2% were midwives, 30.7% were nurses, and 12.1% were doctors. A significant proportion (64.3%) worked in clinics, while 35.7% were employed in hospitals. In terms of work experience, 52.1% had less than five years, 17.9% had 5 to 10 years, and 30% had more than ten years of experience. [Table 1]

**Table 2:** Neonatal Resuscitation Performance and Training (N=140)

| Characteristic | Yes (n, %) | No (n, %) |
|---|---|---|
| Baby Resuscitation Performed | 36 (25.7%) | 104 (74.3%) |
| Received Training on Neonatal Resuscitation | 36 (25.7%) | 104 (74.3%) |

Among the 140 participants, neonatal resuscitation was performed in 25.7% (n=36) of cases. Similarly, 25.7% (n=36) had received training on neonatal resuscitation. [Table 2]

**Table 3:** Knowledge of Newborn Resuscitation Among the Participants (n=140)

| **Knowledge Level** | **Frequency (n)** | **Percentage (%)** |
|---|---|---|
| **Diagnosis of Birth Asphyxia** | | |
| Breathing, Depressed | 19 | 13.6 |
| Heart rate (below 100 beats per minute) | 20 | 14.3 |
| Central cyanosis | 19 | 13.6 |
| All of the above | 82 | 58.6 |
| **Preliminary Steps of Newborn Resuscitation** | | |
| Place baby face up | 12 | 8.6 |
| Wrapped or covered baby | 14 | 10.0 |
| Position of the head, neck slightly extended | 25 | 17.9 |
| Aspirate mouth-to-nose | 14 | 10.0 |
| All of the above | 75 | 53.6 |
| **When to Do Baby Resuscitation with a Bag & Mask** | | |
| Placement of mask, cover mouth & nose | 29 | 20.7 |
| Ensure seal | 26 | 18.6 |
| Ventilate one or two times and see if the chest is rising | 9 | 6.4 |
| Ventilate 40 times per minute for one minute | 5 | 3.6 |
| All of the above | 71 | 50.7 |
| **What to Do if the Baby is Breathing and There is No Sign of Respiratory Difficulty** | | |
| Keep the baby warm | 70 | 50.0 |
| Initiate breastfeeding within one hour | 28 | 20.0 |
| Monitoring baby | 20 | 14.3 |
| All of the above | 22 | 15.7 |
| **What to Do if the Baby Does Not Begin Breathing, Breathing is Lower Than 30/minute, or if there is Intercostal Retraction.** | | |
| Continue to ventilate | 12 | 8.6 |
| Administer oxygen | 15 | 10.7 |
| Assess the need for special unit care | 22 | 15.7 |
| All of the above | 91 | 65.0 |

The table shows participants' knowledge of newborn resuscitation. A majority (58.6%) correctly identified all signs of birth asphyxia, while 53.6% knew the proper preliminary steps for resuscitation. Half of the participants (50.7%) understood the correct procedure for using a bag and mask, and 50% knew how to keep the baby warm if breathing without difficulty. In cases of respiratory failure, 65% were aware of the need for continued ventilation, oxygen, and special care. Overall, knowledge varied, with some gaps in specific areas. [Table 3]

**Table 4:** Knowledge of Steps of Resuscitation, Ventilation, and Chest Compression (N=140)

| **Knowledge Level** | **Frequency (n)** | **Percentage (%)** |
|---|---|---|
| **Where to Do Resuscitation** | | |
| Labor table | 16 | 11.4 |
| Resuscitation table | 62 | 44.3 |
| Observation room | 10 | 7.1 |
| **Composition of the Resuscitation Team** | | |
| 2SSN/Midwives | 32 | 22.9 |

| | | |
|---|---|---|
| Pediatrician | 46 | 32.9 |
| RMO | 34 | 24.3 |
| Facility manager | 28 | 20.0 |
| **Where is the Neonate Suctioned?** | | |
| Within 1 minute with a penguin sucker | 87 | 62.1 |
| After 1 minute with penguin sucker | 53 | 37.9 |
| **What is the Best Ventilation Support of Neonates During Transport?** | | |
| Positive pressure ventilation | 53 | 37.9 |
| Hamilton Cl neo ventilator | 87 | 62.1 |
| **How is the Newborn Stimulated?** | | |
| After drying only with stimulation | 12 | 8.6 |
| After drying with a bag/mask | 25 | 17.9 |
| Chest compression | 22 | 15.7 |
| All of the above | 81 | 57.9 |

The table highlights participants' knowledge of resuscitation, ventilation, and chest compression. For resuscitation, 44.3% knew it should be done on a resuscitation table, and 62.1% understood that suctioning should occur within one minute using a penguin sucker. Regarding ventilation during transport, 62.1% identified the Hamilton Cl neo ventilator as the best option. When stimulating a newborn, 57.9% recognized that drying with a bag/mask was the correct method, and 57.9% were aware of the proper chest compression steps. Knowledge varied across the different areas, with some gaps observed. [Table 4]

**Table 5:** Knowledge of Practice of Neonatal Resuscitation (N=140)

| Knowledge Level | Frequency (n) | Percentage (%) |
|---|---|---|
| Proper Knowledge | 73 | 52.7 |
| Poor Knowledge | 67 | 47.9 |

Among the 140 participants, 52.7% (n=73) demonstrated proper knowledge, while 47.9% (n=67) had poor knowledge regarding the practice of neonatal resuscitation. [Table 5]

**Table 6:** Factors Associated with Knowledge of Neonatal Resuscitation (N=140)

| Factors | Poor Knowledge (n=67) | Good Knowledge (n=73) | P value* |
|---|---|---|---|
| Age Group | | | |
| <25 | 6 (8.2%) | 6 (8.2%) | 0.007 |
| 25-35 | 30 (44.8%) | 40 (54.8%) | |
| >35 | 30 (44.8%) | 27 (36.9%) | |
| Gender | | | 0.396 |
| Male | 33 (49.3%) | 30 (41.1%) | |
| Female | 34 (50.7%) | 43 (58.9%) | |
| Marital Status | | | 0.112 |
| Married | 40 (59.7%) | 48 (65.8%) | |
| Unmarried | 11 (16.4%) | 17 (23.3%) | |
| Divorced/Widow | 16 (23.9%) | 8 (11%) | |
| Occupation | | | 0.046 |
| Doctor | 11 (16.4%) | 6 (8.2%) | |
| Nurse | 25 (37.3%) | 18 (24.7%) | |
| Midwife | 31 (46.3%) | 49 (67.1%) | |
| Place of Work | | | <0.01 |
| Hospital | 11 (16.4%) | 39 (53.4%) | |
| Clinic | 56 (83.6%) | 34 (46.6%) | |
| Working Experience | | | <0.01 |
| <5 years | 48 (71.6%) | 25 (34.2%) | |
| 5-10 years | 9 (13.4%) | 16 (21.9%) | |
| Training on Baby Care Practice | | | <0.01 |
| Yes | 5 (7.5%) | 31 (42.5%) | |
| No | 62 (92.5%) | 42 (57.5%) | |

*P-value was determined by the Chi-square test. Data was expressed in columns.

The table reveals several factors influencing knowledge of neonatal resuscitation. Age (25-35 years), occupation (midwives), place of work (hospital), working experience (>5 years), and training in baby care significantly impacted knowledge. Those with training and experience in hospitals or with more years of experience were more likely to have better knowledge. Gender and marital status did not show significant differences in knowledge levels. [Table 6]

**Table 7:** Risk Factor Analysis of Poor Knowledge of Neonatal Resuscitation by Univariate Logistic Regression (N=140)

| Factors | Odds Ratio | 95% CI | P value* |
|---|---|---|---|
| Age (<25) | 1.598 | 0.778 - 3.281 | 0.202 |
| Occupation (Doctor) | 2.193 | 0.763 - 7.307 | 0.145 |
| Place of Work (Clinic) | 5.840 | 2.642 - 12.909 | <0.01 |
| Working Experience (<5 years) | 4.851 | 2.365 - 9.948 | <0.01 |
| Training on Baby Care Practice (No) | 9.152 | 3.292 - 25.446 | <0.01 |

*P-value was determined by Univariate logistic regression.

Univariate logistic regression showed Lower age, working place in a clinic, low working experience, and no training in newborn baby care practice were significantly associated with poor knowledge of baby resuscitation. [Table 7]

**Table 8:** Risk Factor Analysis of Poor Knowledge Practice of Neonatal Resuscitation by Multivariate Logistic Regression (N=140)

| Factors | Odds Ratio | 95% CI | P value* |
|---|---|---|---|
| Age (<25) | 0.606 | 0.173 - 2.116 | 0.431 |
| Occupation (Doctor) | 1.808 | 0.347 - 9.430 | 0.482 |
| Place of Work (Clinic) | 1.101 | 0.027 - 2.176 | <0.01 |
| Working Experience (<5 years) | 14.213 | 5.646 - 17.758 | <0.01 |
| Training on Baby Care Practice (No) | 16.104 | 10.613 - 19.781 | <0.01 |

*P-value was determined by Multivariate logistic regression.

Multivariate logistic regression showed place of work, working experience, and training on neonatal resuscitation were significantly associated with knowledge of neonatal resuscitation. [Table 8]

## IV. DISCUSSION

During the first week following birth, newborns are particularly prone to illness (11). Giving newborns basic care could avert up to two-thirds of infant fatalities. The majority of neonatal deaths were brought on by problems that could have been avoided or treated if proper newborn care had been provided (ENBC). Babies must get care during a critical period if they are to survive (shortly after birth). Early postpartum care for babies entails providing them with eye, thermal, cord, early breastfeeding, hemorrhage management, and knowledge of when to refer. To provide newborn care interventions, nurses and midwives must possess the necessary knowledge and abilities (12). The current study aimed to find out the current status of knowledge on newborn care services among the health care professionals. A total of 140 Doctors, nurses, and Midwives who are contributing to EmONC services were selected in the study. Half (50%) of the participants were aged between 25 to 30 years with the mean age being 30.53±5.92 years. Among all, 55% were female and 45% were male. Previous study by Abdu et al. about 56% of the study participants were female and the mean age of the study participants was 29.9 ±3.4 years (13). In the study of Ashenef et al., 59.8% were males and nearly half of the participants (48.0%) were aged between 25—29 years (14). Berhe et al. also observed similar age and gender distribution among the participants (15). Females are more prevalent in the study because, in Bangladeshi culture, they are more involved in the obstetrics and gynecology departments. More than half (57.2%) of the participants were midwives, 30.7% were nurses 11.1% were doctors and 64.3% were working in a clinic. A majority (52.1%) had working experience <5 years. Ashenef et al. also found that 40.6% were midwives, 37.5% were nurses and the rest of them were either doctors, emergency surgeons, or health officers whereas 69.9% of the participants were working at the health center and 56.6% had working experience below 5 years (14). Abdu et al. also revealed that nearly 85% of the study participants were working in a health center and the majority had working experience between 1-3 years (13). Since midwives and nurses were always on hand during the study period, they made up the bulk of the participants.

Among all, 25.7% of the participants got training on newborn baby care practice, and in 25.7% of cases, baby resuscitation was performed. The previous study also observed that the percentage of getting training on newborn baby care was not satisfactory (13),(15). Among all, depending on the questions related to newborn resuscitation, Infection prevention and care at birth, Hypothermia prevention, Kangaroo Mother Care, and breastfeeding, 52.7% of SPs had good knowledge and 47.3% had poor knowledge. This was close to the previous study by Abdu et al. found that 53.8% of the health care professionals had good knowledge of immediate newborn care (13). Ashenef et al. found that 62.9% of the healthcare providers had good knowledge of the practice of newborn care activities (14). In the study of Berhe et al., 74.65% had adequate knowledge of newborn care (15). Regarding immediate newborn care practice, 56% have general good knowledge and 13.4% have poor knowledge (16). The current study revealed that age, occupation, working place, working experience, and training in newborn baby care were significantly associated with the practice of newborn baby care. Lower

age, doctor, working in a clinic and no training affected poor knowledge. Logistic regression showed that place of work, occupation, working experience, and training in baby care were significant predictors of newborn baby care.

**Limitations of The Study**

This study has a limited sample size. Also, the findings of this study could associated with information and selection bias. Due to the limitation of resources and lack of financial support, data collection might not be appropriate.

## V. CONCLUSION

The current study found that almost half of the healthcare providers had poor knowledge regarding neonatal resuscitation. The outcomes of this research make it abundantly evident that healthcare workers, on the whole, have an inadequate knowledge base regarding the resuscitation of neonates. No matter how many years of experience a healthcare practitioner has, there are still a lot of them who aren't qualified to do newborn resuscitation since they don't have enough of a background in it. Proper capacity building by refresher training and basic training is needed to improve the knowledge of service providers.

## VI. RECOMMENDATION

It is recommended that healthcare facilities prioritize comprehensive and regular training programs on neonatal resuscitation for all healthcare providers, regardless of their years of experience. Emphasizing hands-on practice, updating knowledge, and ensuring access to the necessary tools and resources can significantly improve neonatal care outcomes. Furthermore, healthcare institutions should integrate resuscitation training into routine professional development to ensure that every practitioner is adequately prepared to manage neonatal emergencies.

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