

## Neonatal resuscitation guidelines - A survey among pediatricians attending a newborn conference in North Kerala

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### ABSTRACT

**Background:** Meticulous understanding and adequate skills for prompt neonatal resuscitation by health-care personnel working in the labor, maternity, and newborn units is important. Various studies have identified areas of non-uniformity among pediatricians regarding neonatal resuscitation practices. **Aim:** The aim is to evaluate the knowledge among pediatricians regarding the current neonatal resuscitation guidelines and the practices they follow in their unit. **Materials and Methods:** A cross-sectional survey of 17 questions, based on guidelines of Neonatal Resuscitation Program (NRP) 2015 and Navjaat Shishu Suraksha Karyakram, was conducted using a questionnaire distributed to pediatricians attending a neonatology conference. The responses were noted and analyzed using SPSS. The relation of knowledge score with demographic profile and status of training was assessed. **Results:** The response rate was 66%. Majority (52%) of the participants were working in private hospitals. Neonatal intensive care unit with mechanical ventilation facilities was available for 60% of respondents. Nearly 40% were trained in neonatal resuscitation. About 85% reported correct knowledge regarding effective chest compressions. Nearly 50% reported the use of room air for bag and mask ventilation during resuscitation in babies more than or equal to 35 weeks. Tracheal suction was practiced by 54% in meconium-stained liquor, and 55% practiced delayed cord clamping for 30-60 s. Nearly 62% did not have oxygen blender in the resuscitation corner, whereas 33% had cardiac monitor. No significant association was found between the place of work and knowledge score (using Chi-square test for association,  $p=0.280$ ). Designation of the delegate did not have a significant association with knowledge score ( $p=0.300$ ). Knowledge score of delegates from teaching hospitals was not superior to those from the non-teaching hospitals. No significant association was found between knowledge score and training ( $p=0.999$ ). **Conclusions:** Knowledge about neonatal resuscitative practices in pediatricians as well as infrastructural facilities needs to be improved with regular NRP training.

**Key words:** Knowledge score, Neonatal resuscitation, Survey, Training

The 1<sup>st</sup> min after birth is very crucial; however, most of the neonates go through the transition from the intrauterine to the extrauterine phase smoothly [1]. Only around 10% of them may need some assistance, and 1% of them require extensive resuscitation measures making neonatal resuscitation a frequently performed medical intervention [2]. For resuscitation to be successful, it is essential that the health-care personnel are adequately trained [3].

India contributes to nearly one-fifth of the total live births and 27% of global neonatal deaths [4]. The current neonatal mortality rate in India is 27.7/1000 live births, and birth asphyxia contributing to 26.8% (5.2/1000 live births) [5]. Neonatal care provided within the first few minutes of life plays a major role in the reduction of neonatal morbidity and mortality. Neonatal Resuscitation Program (NRP) courses had been held since 1987 by the American Academy of Pediatrics and American Heart Association (AHA) [6]. National Neonatology Forum (NNF) has organized training programs for instructors and providers in India since 1990 [7]. As per

the latest guidelines on neonatal resuscitation from the AHA and European Resuscitation Council released in October 2015, changes have been made [8,9].

This requires that the health-care personnel involved needs to be abreast with the latest recommendations and should follow them in their clinical practice. The Indian Academy of Pediatrics (IAP) and NNF of India currently follow NRP guidelines. IAP in collaboration with National Rural Health Mission of Government of India developed basic newborn care and resuscitation programmer of Navjaat Shishu Suraksha Karyakram (NSSK) adopted from NRP guidelines for grassroot workers as well as pediatricians [10]. The survey conducted among pediatricians in Gujarat has identified areas of non-uniformity and lack of awareness among pediatricians for practices followed for neonatal resuscitation [11]. In this study, we aim to evaluate the knowledge among pediatricians who attended a neonatology conference in North Kerala regarding the current neonatal resuscitation guidelines and the practices they follow in their unit.

## MATERIALS AND METHODS

After obtaining Institutional Research and Ethics Committee approval, a questionnaire based on guidelines of NRP 2015 and NSSK was distributed among pediatricians attending a neonatology conference. The questionnaire included 17 questions covering demographic profile, knowledge regarding the current neonatal resuscitation guidelines, equipment available in their facility, and current practices followed by them. The questionnaire was validated by three neonatologists and changes were made before the study. The participation was voluntary, and anonymity was maintained. Incomplete forms and those with duplicated answers were excluded from the study.

Nine questions were used to assess the knowledge among the delegates, and the percentage of correct answers was calculated. Correct answer was given a score of 1 and incorrect answer was given a score of 0. Based on the knowledge, the score can vary from 0 to 9, hence divided into 2 groups: 0-4 unsatisfactory and 5-9 satisfactory. The knowledge level of residents, consultant, and faculty was classified as satisfactory for those who answered correctly at least 5 out of 9 questions and unsatisfactory for those who correctly answered <5 of 9 questions. Three questions were used to assess the practices and the percentages were calculated. The relation of knowledge score with demographic profile and status of training was assessed.

The data were coded, entered, and analyzed using SPSS version (13). General characteristics of the delegates were expressed as numbers and percentages. Median and interquartile ranges were provided. Variables were compared using Chi-square test and a  $p < 0.05$  was considered statistically significant.

## RESULTS

A total of 156 delegates attended the conference. Totally, 103 of them returned the forms. About 3 forms had to be discarded as they were incomplete. The response rate was 66%. A total of 27 residents, 54 consultants, and 19 faculty members completed the survey. The demographic data are summarized in Table 1. Majority of the delegates (52%) were from the private hospitals, and 54% were practicing as consultants. About 60% of them were working in a level 3 neonatal unit.

Regarding adherence to the 2015 NRP guidelines, 55% of the delegates followed the recommended time for clamping of the cord, 25% practiced placing the newborn on the chest/abdomen soon after delivery. Adhering to the 2015 NRP guidelines, 33% had cardiac monitor and 31% had the facility of neopuff resuscitator. Oxygen blender was available only with 38% of respondents. The details are shown in Table 2.

The knowledge score of the study individuals ranged from 2 to 9, with a median of 6 and an interquartile range of 3. About 70% of the delegates had satisfactory knowledge scores which included 76.2% of the government doctors, 73.1% working in private hospitals, and 61.5% of doctors in teaching hospitals. No significant association was found between the place of work and knowledge score (using Chi-square test for association,  $p = 0.280$ ).

**Table 1: Demographic profile of the study participants**

Variable	Demographic data (n=100)	
	Number	(%)
Place of work		
Teaching hospital	26	(26)
Government hospital	21	(21)
Private hospital	52	(52)
Clinic	1	(1)
Type of work		
Resident	27	(27)
Consultant	54	(54)
Faculty	19	(19)
Level of neonatal care		
Level 1	2	(2)
Level 2	38	(38)
Level 3	60	(60)

**Table 2: Practices followed by the delegates in their setup**

Questions	Response (%)
Time of cord clamping	
Immediately after birth	35
Delayed for 30-60 s	55
After cord pulsation stops	4
After milking of cord	6
Care of newborn immediately after delivery	
Kept under radiant warmer	40
Given to bystander after routine care	35
Kept over chest/abdomen of mother	25
Instruments in the resuscitation corner	
Pulse oximeter	83
Oxygen blender	38
Cardiac monitor	33
Neopuff	31
Underwent NSSK/NRP training	40

NSSK: Navjaat Shishu Suraksha Karyakram, NRP: Neonatal Resuscitation Program

Even though consultants comprised the majority (75.9%) among those satisfactory scores, there was no significant association between designation and knowledge ( $p = 0.300$ ). Nearly 61.54% of those who were working in teaching hospitals had satisfactory knowledge, and 72.97% of those working in non-teaching hospitals had satisfactory knowledge. The association between knowledge and the type of hospital was not significant (using Chi-square test,  $p = 0.274$ ).

Awareness of the use of room air for resuscitation in babies more than or equal to 35 weeks was there in 50% of respondents. In resuscitation of babies <35 weeks, 59% were aware about the latest recommendations. Nearly 63% correctly answered that free-flow oxygen cannot be given through self-inflating bag and mask. Only 37% of the doctors were following the recommended care in meconium-stained amniotic fluid (MSAF) (non-vigorous) of following the initial steps as of clear amniotic fluid, whereas 54% still resorted to direct tracheal suction. About 57% knew

that a rising heart rate is the important indicator of successful positive pressure ventilation. Nearly 79% had correct knowledge about the initiation of chest compressions. Only 38% were aware about the correct recommendation of stopping resuscitation in a newborn with no cardiac activity (Table 3). Nearly 40% of the delegates had undergone either NRP or NSSK training. However, the knowledge score was not higher among them. No significant association was found between knowledge score and training ( $p=0.999$ ).

## DISCUSSION

This study on knowledge and practices of neonatal resuscitation among pediatricians attending a neonatology conference in North Kerala reflects the differences from the latest 2015 NRP guidelines. Delayed umbilical cord clamping (not earlier than 1 min after birth) is recommended for improved maternal and infant health and nutrition outcomes [12]. About 55% followed the latest recommendation of delayed cord cutting for a minute, whereas in a study from Gujarat, it was only 38.1% though 58.7% of them were trained in neonatal resuscitation compared to 40% in our study [11].

The 2015 guidelines recommend initial steps of resuscitation for non-vigorous babies born through MSAF which was followed by 37% of doctors in the present study [8,9]. Majority of the participants, in Gujarat study conducted in 2012, adopted then recommended guidelines of endotracheal suctioning for non-vigorous babies. Studies have shown that the color of the baby cannot predict the exact  $SPO_2$  because even when the baby is pink  $SPO_2$  may range from 10 to 100% [13]. Assessing the color is difficult and therefore is a poor proxy for tissue oxygenation during the first few minutes of life. Recent guidelines recommend ECG to monitor heart rate at birth [14]. Although the pulse oximeter can accurately estimate the heart rate, studies have shown that ECG is better as the former can underestimate the heart rate in the first few minutes after birth most likely due to large hemodynamic changes that occur during transition [15].

The latest NRP guidelines recommend the use of pulse oximeter for monitoring oxygen saturation and cardiac monitor for monitoring heart rate during resuscitation in the delivery

room. Our survey showed that majority had the facility of pulse oximeter which was similar to the study in Gujarat. However, the facility of cardiac monitor was available only in 33% of cases which may be because of the resource-limited settings in which majority are working and to some extent the gap in knowledge of the recent NRP guidelines.

Oximetry studies of both term and pre-term infants have shown that unnecessary exposure to high concentration of supplemental oxygen can lead to hyperoxia and oxygen-related injuries [16]. In our survey, only 38% had blenders in the resuscitation corner; although, 50% were aware of the recent guidelines of using 21% oxygen for infants  $\geq 35$  weeks, and 58% knew that slightly higher oxygen concentration was required for infants  $<35$  weeks during resuscitation. On the contrary, 97% of neonatologists working in tertiary care settings in Canada and 71.7% of participants in the UK were using oxygen blenders [17,18]. This deficiency, though unacceptable, is a reality in a resource-limited nation like India. Basic recommended infrastructural requirements should be made available for effective resuscitation.

Although majority of them were aware that free-flow oxygen cannot be given through self-inflating bag and mask, 37% were still unaware of this. Similarly, 43% did not know that rising heart rate was the most important indicator of successful positive-pressure ventilation and the knowledge, when to initiate chest compressions, was lacking in 19% of cases. These lacunae need to be filled with repeated training in basic as well as advanced neonatal resuscitation. This study found that the majority were ignorant as to when to stop resuscitation in a newborn without any cardiac activity. This emphasizes the importance of addressing medicolegal issues also in neonatal resuscitation training programs.

In the present study, those who were trained in newborn resuscitation did not exhibit a significant improvement in the knowledge and practices; however, since we were not able to differentiate NRP-trained from NSSK-trained delegates, the result fails to be of significance. Another limitation is that the time gap between training and survey was also not considered.

Similarly, a study from Karachi did not show any significant difference between those who had previous training and those who had no such exposure [19]. A study from Kenya observed significant improvement in short-term health-care workers' practices following a simple one-day newborn resuscitation program [20]. Despite 57% being trained in newborn care, in a study from Haryana, only 16% knew all the initial steps of resuscitation. Nearly 48% had knowledge of positive pressure ventilation, whereas only 13% could provide chest compression or drugs during resuscitation. About 57% practiced holding the neonate upside down after delivery [21].

To summarize, though majority had a satisfactory knowledge score, a deficiency among 30% was observed. Even this small gap cannot be ignored as this can affect the neonatal morbidity and mortality in a significant way. A cause of concern is the low knowledge score even in teaching hospitals. Limitations in this study are since the participation was voluntary; many forms could

**Table 3: Knowledge about the current neonatal resuscitation guidelines**

Questions	Correct responses (%)
FiO <sub>2</sub> used for newborns for 35 weeks and above	50
FiO <sub>2</sub> used for newborns for <35 weeks	59
Time of initiation of positive pressure ventilation	79
Indicator of successful resuscitation	57
Resuscitation of MSAF (non-vigorous baby)	37
Indication for chest compressions	79
Knowledge about chest compressions	85
Stopping resuscitation in a newborn baby with no cardiac activity	38

MSAF: Meconium-stained amniotic fluid

not be retrieved. The questionnaire did not distinguish NSSK-/NRP-trained delegate. We also failed to enquire the year of training; therefore, the gap between training and survey could not be assessed. Since the conference was attended by pediatricians interested in neonatology, we could not assess the knowledge and practices of health-care personnel working at grassroot level.

## CONCLUSION

More frequent and regular training of pediatricians in NRP is essential to ensure ideal knowledge and practices and keeps them updated with the recent guidelines. Basic infrastructural facilities have to be improved in the delivery room starting from the primary level.

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