# Survey of Basic Neonatal Resuscitation Program (NRP) Participants in India

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## ABSTRACT

**Objective**: To assess the effectiveness of the Basic Neonatal Resuscitation Program (NRP) course and to evaluate the perceived utility of the skills acquired during the course.

**Methods**: This cross-sectional survey aimed to assess the perceptions of participants who attended the Basic NRP course, comprising online video modules and offline workshops, across India. Data were collected between October 2023 and November 2023 for the courses held from May 2022 to April 2023, using a semi-structured questionnaire distributed electronically or via telecommunication.

**Results**: Out of 10,000 participants approached, 6,066 responded which included nurses (60.4%), pediatricians (20%), and medical officers (19.7%). Majority were females (76.4%), in private healthcare (62.1%), with the highest participation from West Bengal (14.72%) among the different states. Satisfaction with online videos was reported as very high by 48.5% and reasonable by 51.5% and one participant reported dissatisfaction. Compared to private healthcare settings, exposure to labor room experience was lesser in government facilities (48.8% vs. 42.5%, $P < 0.001$). The overall functional equipment was greater in government set-ups compared to private facilities (49.8% % vs. 45.2%, $P = 0.001$).

**Conclusion**: Participants reported improved neonatal resuscitation skills as well as opportunities and facilities to practice after Basic NRP course.

**Keywords**: *Hybrid learning, Newborn, Resuscitation, Skills training*

## INTRODUCTION

The Basic Neonatal Resuscitation Program (NRP) is a pivotal intervention for reducing neonatal mortality [1,2]. Spearheaded by the Indian Academy of Pediatrics (IAP) since 2009, the program has undergone updates including the release of an updated module in November 2020. Recognizing the urgency amidst the COVID-19 pandemic, the IAP NRP FGM (first golden minute) academic group devised a hybrid Basic NRP course, combining online modules with subsequent physical sessions for enhanced accessibility.

While previous research predominantly focused on immediate knowledge and skill assessments post-training [3,4], gaps persist in understanding the sustained effectiveness and practical application of acquired skills in clinical settings.

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Received: Feb 01, 2024; Initial review: Mar 23, 2024; Accepted: Aug 18, 2024.

In this study, we aimed to expand beyond traditional assessments by exploring participant feedback on the effectiveness of the NRP course and to identify challenges related to practical implementation and facility-specific factors.

## METHODS

This cross-sectional survey collected data over two months, from October 2023 to November 2023, for the courses conducted from May 2022 to April 2023.

A semi-structured questionnaire was designed for Basic NRP participants, covering various aspects such as training, instructor friendliness, online videos, clinical exposure (deliveries attended, opportunities for bag and mask ventilation, etc), available facilities such as various resuscitation equipment, implementation of practices, confidence levels, the need for repeat training, and impact on neonatal mortality. The questionnaire included items with responses graded on a Likert scale. The questionnaire was sent to all participants enrolled in the course via Google Forms, with survey invitations sent through phone calls and individual WhatsApp messages. A follow-up call

was conducted to encourage survey participation. Before the survey, a pilot test involving 20 participants was conducted to refine and modify question options, ensuring consensual validity. Translations to English, Bengali, Malayalam, Tamil, Hindi, Kannada, and Gujarati and back translations were done to ensure the fidelity of questions. To ensure the sample's representativeness, respondents' demographic and professional characteristics were compared with those of non-respondents. The study was initiated after clearance from Ethics Committee. The invite to participate in the survey was accompanied with a statement of consent.

*Statistical Analysis*: STATA 14.2 was used for analysis. Descriptive statistics (frequency, percentage mean, standard deviation) were used to depict baseline characteristics and analysis. Chi-square test was used to find the association between categorical variables. *P* value less than 0.05 was considered as statistically significant.

## RESULTS

Of the 10,000 participants contacted, 6066 responded. The majority (66.1%) of participants received training from May 2022 to October 2022.

Among the respondents, 76.4% were females. The mean (SD) age of respondents was 28.29 (7.55) years. 19.97% of the respondents were pediatricians, 19.68% were clinicians who were not pediatricians, 60.35% were nurses. Overall, 62.1% were working in the private sector and 37.9% were working in government set-up.

English was the preferred language by 96.6% participants for the Basic NRP training; Hindi, Tamil, Kannada, Malayalam, Bengali, and Gujarati were less commonly preferred. The distribution of participants across different states of India indicated highest participation from West Bengal (14.72%), followed by Kerala (12.36%) and Maharashtra (9.54%). States like Gujarat, Tamil Nadu, Rajasthan, Uttar Pradesh, and Karnataka also had substantial representation.

Online training had a 48.19% easy access rate, and 51.25% reported minor difficulties as per the feedback collected. Satisfaction with online videos was high (48.48% very satisfied, 51.37% reasonably satisfied, 0.15% dissatisfied). 44% found online training extremely to very helpful for the offline workshop. Offline training received positive responses for time allocation (48.48% 'to a great extent,' 51.37% 'somewhat sufficient', insufficient 0.15%). Instructors were able to explain neonatal resuscitation concepts (99.3% agreement), equipment conditions were generally satisfactory (48.17% perfect, 51.62% working conditions), and instructors were friendly (42.91% strongly agreed, 57.01% agreed).

**Table I** compares response based on institute facilities and course recommendations. A total of 3383 (55.8%)

### Table I Institutional Facilities for Neonatal Resuscitation as Recommended by the Course

| Facilities | Total (n = 6066) | Private (n = 3383) | Government (n = 2068) | P value |
|---|---|---|---|---|
| *Deliveries attended in labor room after the completion of NRP course* | | | | |
| Never been posted in labor room | 2751 (45.35) | 1438 (42.5) | 1009 (48.8) | < 0.001[a] |
| < 10/mo | 329 (5.42) | 233 (6.9) | 78 (3.8) | |
| 11-30/mo | 2915 (48.05) | 1670 (49.4) | 958 (46.3) | |
| > 30/mo | 71 (1.17) | 42 (1.2) | 23 (1.1) | |
| *Radiant warmer in delivery area* | 6041 (99.59) | 3358 (99.3) | 2068 (100) | < 0.001 |
| *Hand washing facility with 24*7 water supply* | 6057 (99.85) | 3377 (99.8) | 2065 (99.9) | 0.776 |
| *Equipment in labor room for neonatal resuscitation* | | | | |
| Functional ventilation bag and mask | 125 (2.06) | 86 (2.5) | 34 (1.6) | 0.001 |
| Two clean cloths for each delivery | 3038 (50.08) | 1743 (51.5) | 999 (48.3) | |
| Disposable suction device | 25 (0.41) | 17 (0.5) | 6 (0.3) | |
| None of the above | 8 (0.13) | 8 (0.2) | 0 (0) | |
| All of the above | 2870 (47.31) | 1529 (45.2) | 1029 (49.8) | |
| *Accessibility of neonatal resuscitation manikins* | 6000 (98.91) | 3342 (98.8) | 2044 (98.8) | 0.865 |
| *Recommendation of course to your colleagues* | | | | |
| Definitely will | 2757 (45.45) | 1492 (44.1) | 966 (46.7) | 0.246 |
| Probably will | 3298 (54.37) | 1884 (55.7) | 1098 (53.1) | |
| Probably won't | 10 (0.16) | 6 (0.2) | 4 (0.2) | |
| Definitely won't | 1 (0.02) | 1 (0) | 0 (0) | |

*Data expressed as n (%)*

respondents worked at Private facility and remaining at government facility.

**Table II** analyses skill proficiency and post-delivery practices based on participants' designations. No significant differences in confidence were observed during bag and mask ventilation training ($P = 0.147$). However, significant differences emerged in post-training ventilation opportunities ($P < 0.001$), with higher affirmative responses from nurses (98.9%) and pediatricians (98.8%). The majority agreed the need for repeat training. No differences were observed in where the baby is kept in normal labor ($P = 0.530$), but significant differences were noted in immediate placement after cesarean section ($P < 0.001$), with pediatricians preferring radiant warmers (64.2%).

Government facilities had more post-training ventilation opportunities ($P < 0.001$). The perceived need for repeat training differed in government and private health facilities ($P = 0.003$). Majority believed training all healthcare workers would have a greater impact on mortality/morbidity reduction and higher impact on newborn care at birth.

For post-delivery practices, 333/4008 (9.8%) vs 151/2052 (7.3%) practiced placing the baby on the mother's abdomen during normal labor, in government and private settings, respectively ($P = 0.009$), and 376/4008 (9.4%) vs 129/2052 (6.3%) among those who did the course in initial six months of study duration than the last six months ($P < 0.001$). Likewise, after cesarean section, 969 (46.9%) and 1404 (41.5%) respondents in government and private

**Table II Skill Proficiency and Post-Delivery Practices Based on Designation**

| Skills | Total (n = 6066) | Pediatrician (n=1186) | Clinician (n =1169) | Nurse[a] (n = 2308) | BSc Nurse (n =1276) | P value |
|---|---|---|---|---|---|---|
| *Confidence in bag and mask ventilation on manikin during training* | | | | | | |
| Very confident | 540 (8.9) | 93 (7.8) | 91 (7.8) | 235 (10.2) | 109 (8.5) | 0.147 |
| Confident | 5514 (90.9) | 1092 (92.1) | 1075 (92) | 2068 (89.6) | 1165 (91.3) | |
| Not very confident | 12 (0.2) | 1 (0.1) | 3 (0.3) | 5 (0.2) | 2 (0.2) | |
| *Opportunity to perform bag-mask ventilation post-course* | 5963 (98.3) | 1172 (98.8) | 1144 (97.9) | 2282 (98.9) | 1240 (97.2) | 0.001 |
| *Need for repeat NRP training* | | | | | | |
| Strongly agree | 276 (4.55) | 52 (4.4) | 34 (2.9) | 119 (5.2) | 65 (5.1) | 0.097 |
| Agree | 5702 (94) | 1115 (94) | 1119 (95.7) | 2159 (93.5) | 1192 (93.4) | |
| Disagree/ Strongly disagree | 88 (1.45) | 19 (1.6) | 16 (1.4) | 30 (1.3) | 19 (1.5) | |
| *Impact of universal healthcare worker training on newborn mortality/morbidity* | | | | | | |
| To a great extent | 3027 (49.9) | 482 (40.6) | 539 (46.1) | 1243 (53.9) | 700 (54.9) | < 0.001 |
| Somewhat | 3022 (49.82) | 703 (59.3) | 628 (53.7) | 1053 (45.6) | 574 (45) | |
| Very little/ Not at all | 17 (0.19) | 1 (0.1) | 2 (0.2) | 12 (0.5) | 2 (0.2) | |
| *Effectiveness of IAP basic NRP course on newborn care* | | | | | | |
| To a great extent | 3024 (49.85) | 482 (40.6) | 543 (46.4) | 1237 (53.6) | 701 (54.9) | < 0.001 |
| Somewhat | 3014 (49.69) | 700 (59) | 622 (53.2) | 1056 (45.8) | 571 (44.7) | |
| Very little/Not at all | 28 (0.46) | 4 (0.3) | 4 (0.3) | 15 (0.7) | 4 (0.3) | |
| *Placement of baby after normal delivery* | | | | | | |
| Mother's abdomen | 505 (8.33) | 93 (7.8) | 81 (6.9) | 205 (8.9) | 111 (8.7) | 0.530 |
| Radiant warmer | 5545 (91.41) | 1091 (92) | 1087 (93) | 2095 (90.8) | 1162 (91.1) | |
| Hand over to relatives of mother | 15 (0.25) | 2 (0.2) | 1 (0.1) | 7 (0.3) | 3 (0.2) | |
| In hospital nursery | 1 (0.02) | 0 (0) | 0 (0) | 1 (0) | 0 (0) | |
| *Placement of baby after cesarean section?* | | | | | | |
| Mother's abdomen | 2677 (44.13) | 424 (35.8) | 477 (40.8) | 1098 (47.6) | 625 (49) | < 0.001 |
| Radiant warmer | 3365 (55.47) | 761 (64.2) | 690 (59) | 1195 (51.8) | 647 (50.7) | |
| Hand over to relatives of mother | 13 (0.21) | 0 (0) | 1 (0.1) | 9 (0.4) | 1 (0.1) | |
| In hospital nursery | 11 (0.18) | 1 (0.1) | 1 (0.1) | 6 (0.3) | 3 (0.2) | |

*Data expressed as n (%)*
[a]*Nurse denotes General Nursing and Midwifery (GNM) /Auxiliary Nursing and Midwifery (ANM)/Nurses with Bachelor of Science in Nursing/ Midwife/Nursing Assistant/ unqualified staff performing nursing duties*
*Total responses were available for 6,066 participants; however, designation data were available for only 5,939 participants.*

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**WHAT THIS STUDY ADDS?**

- Hybrid Basic NRP course received high satisfaction scores among participants and they expressed a need for repeat/ongoing training.

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sector, respectively, practiced placement of baby on mother's abdomen ($P = 0.002$). Only 1554 (38.8%) and 1121 (54.6%) of participants of initial and last six months of course, respectively, practiced placement at mother's abdomen after caesarean delivery ($P < 0.001$). See **Web Table I**.

## DISCUSSION

The current survey collected responses from 6066 participants across India within one year, a high number compared to the 14,575 responses gathered over eight-year duration in Malaysia [5]. After the course, a significant percentage attended deliveries, and participants expressed confidence in neonatal resuscitation skills. The majority believed NRP training for healthcare workers would reduce newborn mortality/morbidity, with positive perceived impacts on their ability to care for newborns.

Regarding training, nearly half of the participants in this study found online courses to be easily accessible, and helpful in preparing for offline courses, similar to an earlier study by the authors [6]. Thus, online courses enhance theoretical knowledge, while offline courses contribute to refining clinical skills.

More than half felt that the equipment was not operational at their centres. The deficiency in training and equipment for managing common pediatric emergencies in primary healthcare centers has been highlighted earlier [7]. Functional self-inflating bags were reported to be available in only half of the participants' workplaces. Given that bag and mask ventilation is an important step in NRP [8], the absence of working equipment reduces the effectiveness of resuscitation and possibly morale of trained personnel.

An earlier study revealed that knowledge retention after six months and one year of NRP training remained similar, but intubation skills had declined after one year [9]. This finding suggests the potential necessity for annual refresher courses, perhaps every 3-6 months [10]. In the current study, almost all participants preferred repeat training. In resource-limited settings, midwives' performance in simulation exercises indicates that a more comprehensive refresher course one year after initial training could potentially mitigate the skill decay observed post-initial training [11].

An earlier Indian study examined the impact of education and training on neonatal resuscitation practices across 14 teaching hospitals in India and revealed a significant decline in asphyxia-related deaths. However, overall neonatal mortality rates did not decrease [12]. Skill training significantly reduced perinatal mortality in rural India, emphasizing the multifaceted impact of training interventions as crucial steps toward achieving a single-digit Neonatal Mortality Rate (NMR) target [13]. The Helping Babies Breathe (HBB) training demonstrated significant enhancements in newborn care, including notable improvements in skin-to-skin care, breastfeeding within 60 minutes of birth, and delayed cord clamping after 1 minute [14]. The participants in the study expressed the role of NRP training in significantly improving their ability to care for newborns.

Implementing a concise, one-day newborn resuscitation training has yielded immediate and note-worthy improvements in health workers' practices [15]. The assessment in this study focused on assessing health workers' practices 6-12 months after their initial training, acknowledging the importance of long-term effectiveness. We identified a need for continued improvement in practices, as only a handful of participants adhered to the recommended practice of placing the baby on the mother's abdomen after normal and cesarean delivery.

The study relies on self-reported data from participants, which introduced biases. Participants with extreme experiences may be more likely to respond, affecting representativity. The link between perceived effectiveness and actual clinical impact remains indirect in survey methodology. The validation of availability of supplies and practices could not be done as part of the study.

The current study provides participants' perspective after the Basic NRP program in India, highlighting positive outcomes, challenges, and areas for improvement. The findings contribute valuable information for refining the training program, emphasizing standardization, addressing equipment disparities, and optimizing the balance between online and offline components.

*Contributors*: SMN: Conceptualized and designed the study, coordinated data collection, designed analysis, and critically reviewed the manuscript for important intellectual content; PRP: Designed the study, analyzed the data, and wrote the first draft of the manuscript; VG: Helped in designing the study, coordinated

data collection and critically reviewed the manuscript for important intellectual content; MS: Designed the study, analyzed the study, and contributed to the writing of the first draft of the manuscript. All authors approved the final manuscript as submitted and agreed to be accountable for all aspects of the work.

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**Web Table I Skill Proficiency and Post-Delivery Practices by Work Type and by Duration of Course**

| Categories | Private (n = 3383) | Government (n = 2068) | P value | Course done in last 6 mo (n = 2052) | Course done within 6 mo (n = 4008) | P value |
|---|---|---|---|---|---|---|
| *Confidence in bag-mask ventilation on manikin during training.* | | | | | | |
| Very confident | 322 (9.5) | 181 (8.8) | 0.066 | 162 (7.9) | 378 (9.4) | 0.023 |
| Confident | 3050 (90.2) | 1886 (91.2) | | 1889 (92.1) | 3619 (90.3) | |
| Not very confident | 11 (0.3) | 1 (0) | | 1 (0) | 11 (0.3) | |
| *Opportunity to perform bag-mask ventilation post-course* | 3302 (97.6) | 2048 (99) | < 0.001 | 2025 (98.7) | 3932 (98.1) | 0.098 |
| *Consider need for repeat NRP training to perfect skills.* | | | | | | |
| Strongly agree | 175 (5.2) | 83 (4) | 0.003 | 83 (4) | 193 (4.8) | 0.387 |
| Agree | 3143 (92.9) | 1965 (95) | | 1940 (94.5) | 3756 (93.7) | |
| Disagree | 65 (2.0) | 20 (1.0) | | 29 (1.4) | 59 (1.4) | |
| *Impact of universal healthcare worker training on newborn mortality/morbidity?* | | | | | | |
| To a Great extent | 1631 (48.2) | 1076 (52) | 0.022 | 1218 (59.4) | 1807 (45.1) | < 0.001 |
| Somewhat | 1742 (51.5) | 985 (47.6) | | 828 (40.4) | 2190 (54.6) | |
| Very little | 10 (0.3) | 7 (0.3) | | 6 (0.3) | 11 (0.3) | |
| *Effectiveness of IAP basic NRP course on newborn care* | | | | | | |
| To a great extent | 1635 (48.3) | 1072 (51.8) | < 0.001 | 1219 (59.4) | 1803 (45) | 0.003 |
| Somewhat | 1725 (51) | 992 (48) | | 827 (40.3) | 2183 (54.5) | |
| Very little | 23 (0.7) | 4 (0.2) | | 6 (0.3) | 22 (0.5) | |
| *Placement of baby after normal delivery* | | | | | | |
| Mother's abdomen | 333 (9.8) | 151 (7.3) | 0.009 | 129 (6.3) | 376 (9.4) | < 0.001 |
| Radiant warmer | 3039 (89.8) | 1913 (92.5) | | 1920 (93.6) | 3619 (90.3) | |
| Hand over to relatives of mother | 10 (0.3) | 4 (0.2) | | 3 (0.1) | 12 (0.3) | |
| In hospital nursery | 1 (0) | 0 (0) | | 0 (0) | 1 (0) | |
| *Placement of baby after cesarean section* | | | | | | |
| Mother's abdomen | 1404 (41.5) | 969 (46.9) | 0.002 | 1121 (54.6) | 1554 (38.8) | < 0.001 |
| Radiant warmer | 1963 (58) | 1092 (52.8) | | 927 (45.2) | 2434 (60.7) | |
| Hand over to relatives of mother | 9 (0.3) | 4 (0.2) | | 2 (0.1) | 11 (0.3) | |