

Evaluation of Effectiveness of Neonatal Resuscitation Programme (NRP) Course Among Paediatric Residents of BPKIHS

Yadav SK¹, Bhatta NK², Yadav SP³, Kanodia P⁴, Moktan D⁵

Abstract

Introduction: Neonatal resuscitation is an essential skill for neonatal care providers, especially for junior doctors who are often the first persons to attend to a newborn in need of resuscitation. The Neonatal Resuscitation Programme (NRP) training course offers a comprehensive and systematic training programme that has been adopted in 130 countries worldwide. Reports from different countries attributed the improvements in neonatal mortality and morbidity over the past two decades partly to the implementation of a systematic neonatal resuscitation training programme. The objective of this study was to evaluate the effectiveness of Neonatal Resuscitation Programme (NRP) in improving the knowledge of the paediatric resident doctors after completion of the course. **Materials and Methods:** This was a cross-sectional interventional study. The resident doctors who attended the NRP course were enrolled. The knowledge was evaluated by written 30-item questionnaire pre- and post- course score. Statistical analysis was done by descriptive statistics and paired t-test. *p*- value of <0.05 was taken as significant. **Results:** Data of 18 paediatric residents who attended the course were analyzed. There were four female and 14 male residents. Out of 18 residents, eight were from first year, seven were from second year and three were from third year. Their mean scores (out of 30) were 13.84 (SD 2.57) (pre-course) and 16.68 [(SD 3.15) (post-course) (*p*=0.001)]. **Conclusions:** NRP course produced a modest gain in residents' knowledge on neonatal resuscitation at the end of their course. NRP training has the potential to substantially improve knowledge of neonatal resuscitation.

Key words: Health care, Methods, Newborn, Resuscitation

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Introduction

The life of a foetus in utero and the independent existence of a newborn are two vastly varied conditions requiring complex transitions. Birth asphyxia contributes to 23% of the 4 million neonatal deaths worldwide every year. In addition to its contribution to mortality, birth asphyxia can result in cognitive impairment, epilepsy, cerebral palsy, and chronic diseases in later life¹. These numbers assume significance in Indian settings where neonatal mortality rate of 33 contributes to about 75% of the infant

mortality rate of 47 as figures from 2010 reveal. There is similar scenario in Nepal where neonatal mortality is 24.2 and infant mortality rate is 33.6². This contribution of neonatal mortality to infant mortality rate has been increasing over the past decade as measures to reduce infant mortality are becoming effective³. Approximately 10% of newborns (4–7 million per year) require some form of assistance at birth. This makes

neonatal resuscitation a frequently performed medical intervention^{4,5,6}. As per the updated (October 2010) recommendations of International Liaison Committee on Resuscitation (ILCOR), Neonatal Resuscitation Program (NRP) of American Heart Association (AHA) and American Academy of Paediatrics (AAP), at least one trained person is required to be present during delivery⁵. This requires that the healthcare personnel involved need to be abreast with the latest recommendations and should follow them in their clinical practice. The Indian Academy of Paediatrics (IAP) and National Neonatology Forum (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 Programme (BNCRP) of Navjaat Shishu Suraksha Karyakram (NSSK) adopted from NRP guidelines for grass root workers as well as paediatricians⁷.

Neonatal resuscitation is an essential skill for neonatal care providers, especially for junior doctors who are often the first persons to attend to a newborn in need of resuscitation. The Neonatal Resuscitation Provider (NRP) training course, jointly developed by the American Academy of Paediatrics (AAP) and the American Heart Association, offers a comprehensive and systematic training programme that has been adopted in 130 countries worldwide⁸. Reports from different countries attributed the improvements in neonatal mortality and morbidity over the past two decades partly to the implementation of a systematic neonatal resuscitation training programme^{9,10,11}. Neonatal resuscitation program guidelines (NRPG) is indeed a very effective and feasible technique during the delivery process in the reduction of neonatal mortality. It is important to disseminate widely the knowledge and technique of NRPG in places where traditional resuscitation is still being widely practiced especially in developing countries^{12,13}. However, reports also showed that many involved in the care of newborn infants felt unprepared to perform neonatal resuscitation^{14,15,16}. Three-quarters of all births in New South Wales (NSW) and Australian Capital Territory (ACT) take place in rural or urban non-tertiary hospitals where one-third of health personnel are inadequately trained in neonatal resuscitation and many do not feel confident in their skills. Effective neonatal resuscitation training for these areas is urgently required^{17,18,19}.

The Neonatal Resuscitation Program (NRP), a widely adopted training program endorsed by the American Heart Association (AHA) and the American Academy of Paediatrics (AAP)²⁰, has shown to provide good retention of knowledge in the participants^{21,22},

but information regarding its efficacy in relation to the specialty training of the attendants is lacking. We evaluated the effectiveness of the NRP course in improving the knowledge of paediatric resident doctors in BPKIHS.

Material and Methods

This was a cross-sectional interventional study involving a cohort of 18 paediatric residents (first, second and third year) of B.P. Koirala Institute of Health Sciences (BPKIHS) which is a tertiary care centre and medical college located in eastern Nepal. It is running a seven bedded level II neonatal intensive care unit (NICU) with two neonatal ventilators. BPKIHS enrolls five to eight students per year for post graduation study in department of paediatrics.

Educational Intervention: The neonatal resuscitation classes were adapted from the American Academy of Paediatrics (AAP) Neonatal Resuscitation Programme (NRP) 6th edition. The course consisted of eight classes of one hour duration every day. The eight lessons of NRP 6th edition were systematically taught:

- i. Overview and principles of resuscitation
- ii. Initial steps of resuscitation
- iii. Positive pressure ventilation
- iv. Chest compressions
- v. Endotracheal intubation
- vi. Medications
- vii. Special considerations
- viii. Ethics and care at the end of life.

The classes included the following components:

- a. Overview lectures: using the slides from the standard NRP course, the major concepts in neonatal resuscitation were highlighted, including cardiopulmonary adaptations, apnoeas, important equipments and an overview of the NRP algorithm focusing on the initial steps in resuscitation.
- b. Demonstration of key skills such as bag and mask ventilation and cardiac compression, followed by hands-on practice on the manikins.

Evaluation of effect of course on cognitive knowledge: The NRP evaluation multiple choice and fill-in questions were administered for each lesson taught. The results of the 30-item questionnaire pre- and post-classes which cover all aspects of the resuscitation were used to assess change in cognitive knowledge. The pre-test was administered before the class and the post-test immediately after the class. The NRP passing

criterion was followed for this paper and considered a score of 25.5 or above.

The test script: The standard teaching materials, including the test script, from the NRP programme were used. The multiple-choice and fill-in questions were taken from AAP/NRP 6th edition. In the test script, there were 30 questions which were distributed as shown in Table 1.

Table 1

Question number	Topic
1,2,3,4	Overview and principles of resuscitation
5,6,7,8,29	Initial steps of resuscitation
9,10,11,12	Positive pressure ventilation
13,14,15	Chest compressions
16,17,18	Endotracheal intubation
19,20,21,22,30	Medications
23,24,25,26	Special considerations
27,28	Ethics and care at the end of life

Data were analyzed with SPSS 20. The results were analyzed by descriptive statistics and we used paired t-test to compare the difference between pre-and post-test scores for resident doctors.

This study was approved by the Institutional Ethics Review Board (IERB) of BPKIHS.

Results

The entire cohort of resident doctors ($n = 18$) participated in the course, sat for the tests, and agreed to have their scores included in the research. All 18

resident doctors completed the pre-test and post-test; among them four were females and 14 were males (eight from first year, seven from second year and three from third year). Table: 2 display the mark distribution among resident doctors before and after the course. Out of 18 resident doctors, 17 (94.4%) scored between 10-20 and one resident doctor scored less than 10 in pre-course test whereas 16 resident doctors (88.9%) scored between 10-20 and two (11.1%) scored between 21-30 in post-course test. Their mean scores (out of 30) were 13.84 (SD 2.57) [(pre-course) and 16.68 (SD 3.15) (post-course)] which is depicted in Table 3. The increment in mean score from 13.84 (pre-course) to 16.68 (post-course) was significant ($p=0.001$) which is shown in Fig 1. Though there was improvement in mean score in post-course test, no resident attained the NRP criteria for passing by scoring 25.5 or above.

Table 2: Marks distribution before and after the course

Range of Marks (Max 30)	Distribution of Residents	
	Pre course	Post course
<10	1 (5.6%)	0 (0%)
10-20	17 (94.4%)	16 (88.9%)
21-30	0 (0%)	2 (11.1%)

Table 3: Mean mark before and after the course

	Mean	Standard deviation
Pre course mark	13.84	2.57
Post course mark	16.68	3.15

Figure 2 illustrates resident doctor performances in eight lessons assessed before and after the NRP course. In initial steps of resuscitation and medication (five marks in each) resident mean percentages were 66.4% and 69% respectively in post-course test.

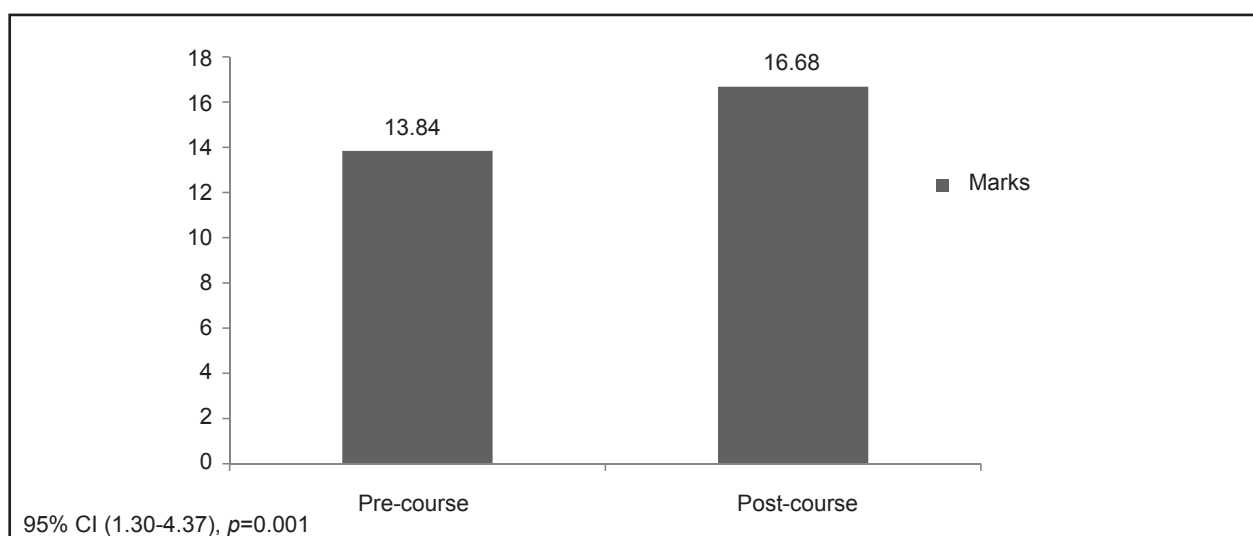


Fig 1: Mean mark before and after course

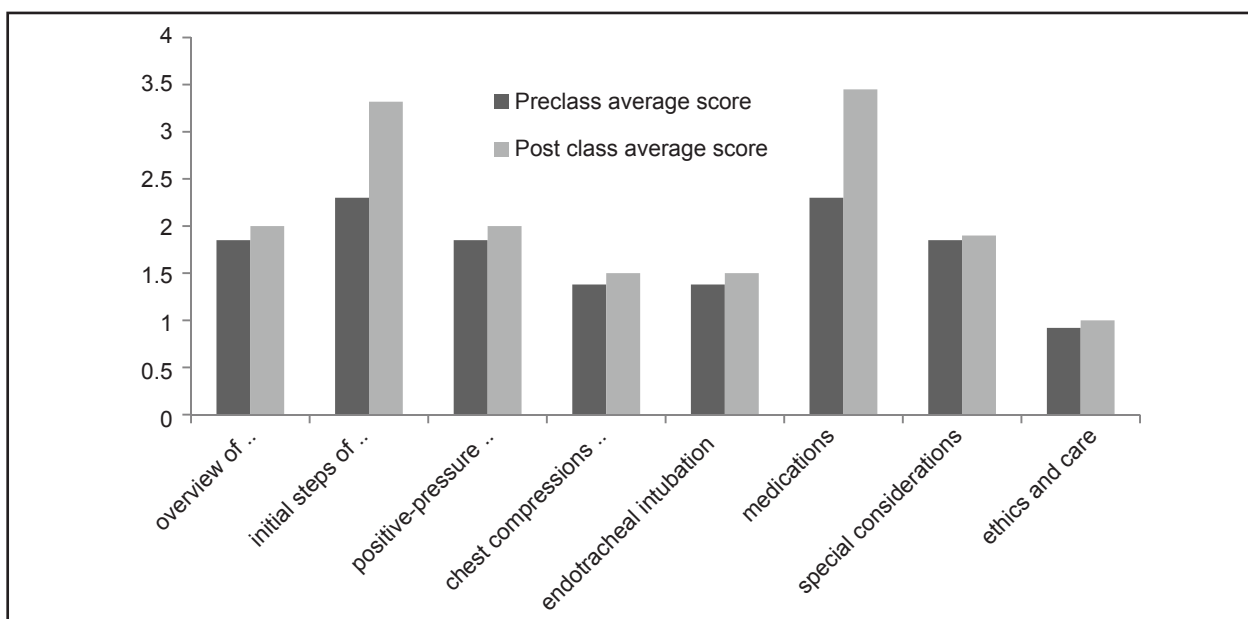


Fig 2: Mean mark before and after course in each topic assessed

Discussion

This study shows that our one-hour simulation-based neonatal resuscitation course for eight days produced a substantial learning gain immediately after the course. The overall degree of learning gain was below our expectation.

The degree of learning gain from pre- to post-tests in our study was consistent with previous studies on medical students^{23,24} although neither of these studies followed up the participants and assessed knowledge retention.

Questions on infant evaluation received the lowest scores compared with practical actions and theory. Possible reasons for this included the difficulties in remembering algorithms and specific clinical signs or numbers, such as the critical heart rate and the size and length of the endotracheal tube in relation to the infant's weight, and these areas deserved more emphasis in our future training classes.

The following were the strengths of this study: First, we assessed knowledge acquisition as well as short-term knowledge retention, using a test script from a well-established training programme, with questions covering three major domains in neonatal resuscitation. The format, educational resources and the delivery of our classes followed that of the NRP programme. The majority of the questions in our test scripts were related to practical aspects of neonatal resuscitation (i.e. evaluation and action), and all items

in the assessment were covered in the course. Besides, identical test scripts were used for pre- and post- tests, and this minimized the issue of non-equivalence in terms of contents across different assessments.

Several limitations were noted in our study. First, we assessed only knowledge and not skills performance in the form of simulated scenarios. It was therefore unclear to what extent the knowledge demonstrated by the resident doctors was translated into actual competence. It has been shown that written test evaluation is a poor predictor of skills performance in resuscitation²⁵. Secondly, we used a single test script with a limited number of questions for assessment. We haven't assessed the knowledge retention after months or year of completion of the course. It was unclear how much of the improvement in performances in between the tests were due to an actual gain in knowledge and how much to increased familiarity with the format of the multiple-choice questions and an improved ability to guess a correct response. Further, the test script appeared not to have been formally validated in any published report, despite that fact that it was from a well-established programme that is widely used around the world. We were also unable to perform a meaningful sample size or power estimation because there has not been a commonly accepted definition on what constitutes an educationally important learning gain in terms of neonatal resuscitation skills. Next, the resident doctors' awareness that they were part of a research project might have influenced their learning and performance. Our small sample size represented further limitations.

Conclusion

This study demonstrates that neonatal resuscitation training classes conducted at the postgraduate level was feasible and produced a modest gain in resident doctors' knowledge on neonatal resuscitation at the end of their course, although it was unclear whether such knowledge gain would translate into a sustained and important gain in the doctors' future practice. The resident doctors' overall gain in knowledge was below our expectation. NRP training has the potential to substantially improve knowledge of neonatal resuscitation.

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Permission from IRB: Yes

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