Effectiveness of Neonatal Resuscitation program training among MBBS interns in a Tertiary care hospital of South India

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Abstract

Background: Use of simulation-based learning methodologies enhance performance in both simulated resuscitations and real-life clinical situations. Retention of skill is very important for the MBBS doctors who hardly get any exposure to such learning before entering post-graduate courses. The major cause of early neonatal death is neonatal asphyxia, which can be prevented by neonatal resuscitation. Effective resuscitation at birth can prevent neonatal deaths to a greater extent. Training in cardio-pulmonary resuscitation is critical in determining successful outcomes in perinatal asphyxia. Hence the present study was done to check the retention of knowledge after Neonatal Resuscitation Program (NRP) training.

Methods: A prospective interventional study was carried out among the MBBS interns who started their internship program from March 2020 - February 2021 in ACSR Government Medical College, Nellore. All the Interns were given training in NRP as a part of internship orientation programme during the first week of internship. Out of 150 interns, 143 participated in the study. The interns were oriented to the study and a pretest questionnaire was administered to them to assess their knowledge and skill regarding NRP which was followed by NRP training by the faculty of pediatrics and neonatology. The same questionnaire was administered immediately at the end of the training, 1 and 6 months post NRP training for assessing their knowledge and skill.

Results: As compared to pre intervention score, the mean scores of the immediate post intervention score and at 1 month after intervention the mean score was increased with respect to knowledge and skills. After 6 months the mean scores pertaining to knowledge and skill decreased which were statistically significant.

Conclusions: A significant decrease in the level of knowledge and skills regarding neonatal resuscitation was observed. Therefore, maintaining resuscitation skill requires continuous practice, supplemented by simulation training as needed.

Keywords: Neonatal Resuscitation Program, Birth asphyxia, interns.

Background

Nearly 760,000 neonates die every year in India, the highest for any country in the world. The Neonatal Mortality Rate (NMR) of the country decreased from 52 per 1000 live births in 1990 to 28, 22.6 in 2018 and 21.7 in 2019 per 1000 live births. According to NFHS 5 data in Andhra Pradesh, in 2015, NMR was 23.6 and now it is 19.9 per 1000 live births[2]. Around one-third of all neonatal deaths occur on the first day of life. About 19% of the new born deaths[3] are due to birth asphyxia. Birth asphyxia is defined simply as the failure to initiate and sustain breathing at birth[4]. Birth asphyxia also results in impairment of cognitive function, epilepsy, cerebral palsy, and chronic diseases in later life. In the first few days after birth rapid physiological changes takes place and most babies go through this without special help. Approximately 10 in every 100 newborns require some form of assistance at birth. This makes neonatal resuscitation a frequently performed medical intervention[5,6]. The Neonatal Resuscitation Program (NRP), established by the American Academy of Pediatrics and the American Heart Association, is the accepted standard for teaching neonatal resuscitation. The initial idea of the NRP was to provide effective intervention for newborns requiring resuscitation by a trained healthcare professional

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and develop a standardized educational program that would provide better care in the resuscitation of sick newborns[7]. Effective neonatal resuscitation efforts depend on critical and timely actions that must be executed in rapid succession to maximize the chances of survival. Health care providers require training and opportunities to acquire the knowledge and skills required to manage neonates with critical illness and cardio-respiratory arrest. Competency in cardio-pulmonary resuscitation is a critical factor in determining successful outcomes in neonates with birth asphyxia[8].

Interns being crucial health care providers available in the unit round the clock at all levels of health care delivery system can contribute significantly in promotion of newborn's health if they have adequate knowledge and skill in provision of newborn care. Thus, improving their knowledge and making them competent in neonatal resuscitation can help to identify and manage the asphyxiated baby in time and ensure intact survival of newborn baby for which they require adequate training and understanding. As the interns outnumber the specialists or pediatricians, and post completion of internship as MBBS doctors they work in various health settings like in Primary Health Centers, Community Health Centre and rural, semi urban areas they are ubiquitous and are at disposal in delivering health services. Training interns in neonatal resuscitation can help save numerous neonatal lives in rural setting and have huge impact on neonatal mortality. Simulation-based learning methodologies offers advantages compared with traditional teaching methods in that they enhance performance in both simulated resuscitations and real-life clinical situations allowing for repetitive and deliberate practice of the skills necessary for managing complex, high-risk, and rare clinical events in an environment that is safe for both patients and trainees[9,10]. Studies show that cognitive and technical skills achieved in such standardized courses are retained for only 6 to 12 months. The goal of a simulation-based training curriculum is to improve sustained learning and skill in the care of newborns requiring resuscitation at the time of delivery. Retention of skill is more important in our setup for the doctors who pass out from medical college to enter practice as they hardly get any exposure to such learning before entering post-graduate course[7-9]. Hence our study is an attempt to know the level of knowledge and skill among interns before and after a training on neonatal resuscitation. The study also tries to assess the retention levels of knowledge and skill at 6 months of completion of training.

Objectives:

1. To assess the pre-intervention and post intervention knowledge among interns on NRP
2. To assess the pre-intervention and post intervention skill of Interns on NRP.
3. To assess the retention of knowledge and skill at 6 months of completion of NRP training.

Methods

A Prospective Interventional study was conducted from March 2020 to February 2021 at ACSR Medical College, Nellore, Andhra Pradesh, India on 143 interns

Inclusion criteria: All the MBBS interns of batch March 2020 - February 2021 who consented for the study. Exclusion criteria: Interns who did not attend the NRP training program were excluded from the study. Study tool and technique: Knowledge and practice regarding NRP was assessed among the interns through standard questionnaire which was modified to pre-designed semi structured questionnaire based on revised 2015 NRP guidelines with few modifications.

Method of Data Collection: Per day a batch of 20 interns were trained. They were divided into 4 small groups of 5 each with one faculty per batch. Likewise, 4 faculty were involved in the training program. Pre-test and Post-test took 30 min roughly. Training was given for a duration of 2hrs. Likewise entire batch of interns were trained.

Phase 1: (pre-intervention phase): The MBBS interns were oriented to the study before recruiting them using lecture and hands-on training using mannequin and equipment.

Consent was obtained from each MBBS intern after they had thoroughly understood the research. A questionnaire was administered to assess their knowledge and skill regarding NRP. NRP training is given as a part of their internship orientation program. Phase II:(Intervention phase): It was followed by NRP hands on training with simulation exercise. Phase III: (Post intervention phase): After completion of their training the same questionnaire was administered for knowledge and skill assessment. After 6 months, each of them was evaluated with the same questionnaire and then the skill and knowledge retention of NRP was assessed. Knowledge was assessed by a validated pretested semi-structured questionnaire. The semi-structured questionnaire was prepared and given to subject experts for validation. The Cronbach's alpha was calculated as 0. 8. Pilot study was conducted for making necessary modifications in the questionnaire. Semi structured questionnaire was based on 2015 NRP guidelines on how to identify when resuscitation is needed, mouth and nose suction, ratio of chest

compressions to bag ventilation. Skill was assessed by establishing workstations to demonstrate different skills namely bag mask ventilation, checking heart rate, chest compression, and initial steps of resuscitation correctly. Based on the assessment of knowledge scores and performance of skill pertaining to Neonatal Resuscitation Programme, Interns were categorized as having good knowledge, poor knowledge and having good skill, poor skill. Good knowledge was defined as able to answer more than 5 questions correctly out of 10. Good skill was defined as able to perform all the skills correctly.

Statistical Analysis

Data was entered in Microsoft excel sheet and was analyzed using (SPSS) -17 Version. Data was analyzed using repeated measures ANOVA to find out the difference in knowledge and skill at different times of assessmenti.e., immediately, 1month after and after 6 months of training in Neonatal Resuscitation Program.

Results

This study was done among interns of ACSR medical college, Nellore. They were given NRP training as a part of internship orientation program during their 1st week of internship. Out of 150 interns, 143 participated in the study as the remaining 7 opted to do their internship elsewhere. Majority of the interns were 81 (56.65%) females while 62 (43.35%) were males.

Descriptive Statistics

Table 1. Shows the mean scores of knowledge at various phases of intervention on applying repeated measures ANOVA analysis of knowledge

	Mean±SD (n=143)	F-value	Effect -size	P value
Pre-Intervention	5.63 + 0.976	101.050	0.684	0.000
Immediate Post intervention	6.20 + 0.744	101.050	0.316	0.000
Post intervention 1 month (theory)	6.13 + 0.762	101.050	2.165	0.000
Post intervention 6 months (theory)	5.05 + 0.561	101.050	2.165	0.000

Multivariate Tests[a]

Table 2: shows the repeated measures ANOVA analysis of knowledge.

	Effect	Value	F	Hypothesis df	Error df	Sig.
factor1	Pillai's Trace	.684	101.050b	3.000	140.000	.000
	Wilks' Lambda	.316	101.050b	3.000	140.000	.000
	Hotelling's Trace	2.165	101.050b	3.000	140.000	.000
	Roy's Largest Root	2.165	101.050b	3.000	140.000	.000

Table 1 shows that on performing repeated measures ANOVA F value was found to be 101.05 and p value was <0.01. As compared to pre intervention score, the immediate post intervention score was increased. At 1 month after intervention the mean score was slightly decreased. After 6 months the mean score pertaining to knowledge was decreased to less than the pre intervention level. This trend was found to be statistically significant (p value <0.01)

Table 3. Shows the mean scores of skill at various phases of Intervention on applying repeated measures ANOVA analysis of skill

	Mean±SD (n=143)	F-value	Effect -size	P value
Pre-Intervention	0.98 + 0.436	465.884	0.909	0.000
Immediate Post intervention	2.83 + 0.494	465.884	.091	0.000
Post intervention 1 month (theory)	2.83 + 0.375	465.884	9.983	0.000
Post intervention 6 months (theory)	1.90 + 0.675	465.884	9.983	0.000

Multivariate Tests[a]

Table 4: shows the repeated measures ANOVA analysis of skill.

	Effect	Value	F	Hypothesis df	Error df	Sig.
factor1	Pillai's Trace	.909	465.884b	3.000	140.000	.000
	Wilks' Lambda	.091	465.884b	3.000	140.000	.000
	Hotelling's Trace	9.983	465.884b	3.000	140.000	.000
	Roy's Largest Root	9.983	465.884b	3.000	140.000	.000

Table 3 shows that on performing Repeated measures ANOVA F value was found to be 465.884 and p value was <0.01. As compared to pre intervention score 0.9, the immediate post intervention score was increased to 2.83. At 1 month after intervention the mean score pertaining to skill remained same at 2.83. After 6 months the mean score pertaining to skill was decreased to 1.9. This trend was found to be statistically significant with p value <0.01)
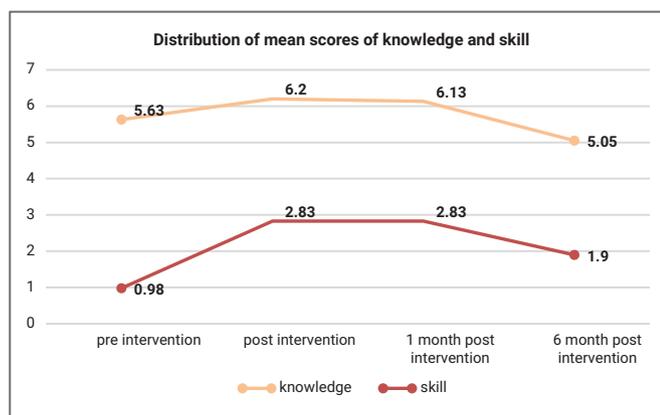
Figure 1: shows the mean score of knowledge and skill various phases of intervention

Table 5. Distribution of interns based on their knowledge and skill

Knowledge	Poor knowledge	Good knowledge
Pre intervention knowledge	58(40.6%)	85(59.4%)
Post intervention knowledge	26(18.2%)	117(81.8%)
Post intervention 1 month Knowledge	29(20.3%)	114(79.7%)
Post intervention 6 months knowledge	117(81.8%)	26(18.2%)
Skill		
Pre intervention skill	142(99.3%)	1(0.7%)
Post intervention skill	18(12.6%)	125(87.4%)
Post intervention 1 month skill	24(16.8%)	119(83.2%)
Post intervention 6 months skill	117(81.8%)	26(18.2%)

Only 59.4% of the interns had good knowledge during the pre-intervention phase. Post intervention the percentage increased to 81.8%. Which show the effect of NRP training. There is not much of difference in knowledge post intervention and post intervention 1 month assessment. But during the post intervention 6-month assessment there is a greater decrease in the percentage of interns with good knowledge (18.2%) a decrease of 61.5%. This dip may be due to lack of retention of knowledge. This could be due to lack of retention of knowledge over a period of time. Periodic refresher programs can help reinforce knowledge. During the pre-intervention phase a meagre 0.7% of the interns demonstrated all the skills correctly. Post intervention 87.4% demonstrated good skill. Though there was not much of the decrease 83.2% in the skill post intervention phase 1 month. But during the post intervention 6-month assessment there was a massive decrease in the percentage of interns demonstrating good skill (18.2%) a dip of 65%. This could be due to lack of opportunity to apply the acquired skill in days to day practice which might have led to forgetting the steps involved in doing the skill correctly. This can be addressed by periodic simulated workshops on neonatal resuscitation for better retention of skill.

Discussion

In our study, we found that before training interns had adequate knowledge about evaluation of newborn, but they lacked proper skill required for conducting a proper neonatal resuscitation code in neonatal ward. After the NRP and hands-on training, we found the knowledge and skills of the MBBS interns have significantly improved. Mean score of knowledge and skill increased from 5.6 to 6.2 and 0.98 to 2.83 respectively. These findings are similar to the results in study conducted by Boo NY et al.[11] and Dr Himanshu Sekhar Sahoo et al[12].

Assessment at 1 month post training revealed a slight decrease in mean score of knowledge i.e., from 6.2 to 6.13 whereas the mean score of skill remained unchanged i.e.at 2.83.When a post-intervention survey was conducted after 6 months post training, it was found that there was a significant decline in knowledge

and skills of interns i.e. from 6.13 to 5.05 and 2.83 to 1.9 respectively. This is in line with studies done by C Levitt et al., May soon M Jabir et al. and Danielle trevisanutoet al[13,-15]. In our study on comparing the mean score of knowledge before training with that of 6 months post training there was a decline in with score from 5.63 to 5.05 which was intriguing. This decline can be attributed to poor retention of knowledge and lack of opportunity to apply the learnt skill. On comparing the mean scores of skill pre training and 6 months post training it was observed that there was no decline. During Pre-intervention survey only 59.4% of the interns had good knowledge about NRP. But after competition of NRP training we conducted a post-intervention survey immediately and found that there was considerable increase in the number of interns with good knowledge from 59.4% to 81.8%. When the same questionnaire was administered after 1 month post NRP training it was found that 79.7% of the interns had good knowledge and6 months after the NRP training revealed that the number of MBBS interns with good knowledge (18.2%) had significantly decreased from that of immediate post-intervention and that of pre-intervention. Our results are consistent with that of the findings of Dr Himanshu Sekhar Sahoo et al[12]. In contrast they reported that 6 months Post-intervention knowledge was higher than Pre-intervention. Coming to skills assessment, during pre-intervention that is before conducting training on NRP only (0.7%)of the interns were able to elicit correct response. But immediately after completion of training during postintervention (87.4%) could be able to elicit correct response. There was a significant increase in the performance. When we assessed the interns after 1month post NRP training (83.2%) could be able to elicit correct response. Again, when we assessed the interns after 6month post NRP training only (18.2%) could be able to elicit correct response. We found that skills were higher in 6 months post-intervention than that of pre-intervention. Our results are consistent with that of the findings of Dr Himanshu Sekhar Sahoo et al[12]. This shows that the retention of knowledge and skills were poor. So frequent Neonatal Resuscitation training needs to be organized for better retention of the knowledge and skills acquired and better performances during Neonatal Resuscitation. As our medical curriculum fails to incorporate the much-needed NRP training involving simulation labs, it becomes difficult to train interns in Neonatal Resuscitation skills. Hectic internship schedules and lack of resources act as barriers for learning new skills[16]. This warrants a need for organizing Periodic Neonatal Resuscitation training programs for better retention of the acquired knowledge and skills and recommended to do real setting resuscitation under the supervision of trained faculty.

Conclusions

There is a significant decline of knowledge and skills among interns from Pre-intervention to 6-months post intervention which may be due to lack of retention of acquired knowledge and skills.

Recommendations

There is a need to introduce routine and periodic NRP training programs to improve the expertise. Periodic refresher training programs will help in retention of knowledge and skill.

References

1. Mortality Rate, Neonatal per 1000 live births. [Place unknown]: [Publisher unknown]. Available at https://data.worldbank.org/indicator/SH.DYN. NMRT (accessed on June 1, 2022)

2. National Family Health Survey, India. National, State and Union Territory, and District Fact Sheets - 2015-16 National Family Health Survey (NFHS-4) Database that strengthen India's demographic and health policies and programmes.

3. India RMNCAH factsheet July 2018. Available at https://www.who.int/ docs/default-source/reproductive-health/maternal-health/rmncah-fs-ind.pdf.

4. Guideline on Basic New-born Resuscitation, 2012: Pg2. Available from: https://www.who.int/publications/i/item/9789241503693

5. Perlman JM, Wyllie J, Kattwinkel J, Atkins DL, Chameides L, Goldsmith JP, Guinsburg R, Hazinski MF, Morley C, Richmond S, Simon WM, Singhal N, Szyld E, Tamura M, Velaphi S; Neonatal Resuscitation Chapter Collaborators. Neonatal resuscitation: 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Pediatrics. 2010 Nov;126(5):e1319-44. doi: 10.1542/peds.2010-2972B. Epub 2010 Oct 18. PMID: 20956431.

6. Kattwinkel J, Perlman JM, Aziz K, Colby C, Fairchild K and Gallagher J et al. Neonatal resuscitation: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Pediatrics 2010;126(5):1400−1413.

7. Arnold J. The Neonatal Resuscitation Program Comes of Age. The journal of Pediatrics 2011;159(3):357-8.

8. Cheng A, Brown LL, Duff JP, Davidson J, Overly F, Tofil NM, Peterson DT, White ML, Bhanji F, Bank I, Gottesman R, Adler M, Zhong J, Grant V, Grant DJ, Sudikoff SN, Marohn K, Charnovich A, Hunt EA, Kessler DO, Wong H, Robertson N, Lin Y, Doan Q, Duval-Arnould JM, Nadkarni VM; International Network for Simulation-Based Pediatric Innovation, Research, & Education (INSPIRE) CPR Investigators. Improving cardiopulmonary resuscitation with a CPR feedback device and refresher simulations (CPR CARES Study): a randomized clinical trial. JAMA Pediatr. 2015 Feb;169(2):137-44. doi: 10.1001/jamapediatrics.2014.2616. PMID: 25531167.

9. Montgomery C, Kardong-Edgren SE, Oermann MH, Odom-Maryon T. Student satisfaction and self report of CPR competency: HeartCode BLS courses, instructor-led CPR courses, and monthly voice advisory manikin practice for CPR skill maintenance. Int J Nurs Educ Scholarsh. 2012 Jun 3;9:/j/ijnes.2012.9.issue-1/1548-923X.2361/1548-923X.2361. xml. doi: 10.1515/1548-923X.2361. PMID: 22673961.

10. Schwid HA, Rooke GA, Michalowski P, Ross BK. Screen-based anesthesia simulation with debriefing improves performance in a mannequin-based anesthesia simulator. Teach Learn Med. 2001 Spring;13(2):92-6. doi: 10.1207/S15328015TLM1302_4. PMID: 11302037.

11. Boo NY, Pong KM. Neonatal resuscitation training program in Malaysia: results of the first 2 years. J Paediatr Child Health. 2001 Apr;37(2):118-24. doi: 10.1046/j.1440-1754.2001.00597.x. PMID: 11328464.

12. Sahoo HS, Agrawal SD, Sarangi L, Tripathy G, Swarup S, Mohapatra SD. Knowledge and skill based training on neonatal resuscitation protocol to MBBS interns posted in neonatal ward – A before and after study. J Med Sci Clin Res 2019;7(10):830-6.

13. Levitt C, Kaczorowski J, Outerbridge E, Jimenez V, Connolly B, Slapcoff B. Knowledge gained following Neonatal Resuscitation Program courses. Fam Med 1996 Jun;28(6):403-6.

14. Jabir MM, Doglioni N, Fadhil T, Zanardo V, Trevisanuto D. Knowledge and practical performance gained by Iraqi residents after participation to a neonatal resuscitation program course. Acta Paediatr. 2009 Aug;98(8):1265-8.

15. Trevisanuto D, Ferrarese P, Cavicchioli P, Fasson A, Zanardo V ,Zacchello F Knowledge gained by paediatric residents after neonatal resuscitation program 2005;15(11):944-7.

16. Kambarami RA, Chirenje M, Rusakaniko S. Situational analysis of obstetric care services in a rural district in Zimbabwe. Cent Afr J Med 2000; 46: 154-157.