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Assessment of pre- and post-Neonatal Resuscitation Program (NRP) training in a neonatal intensive care unit in Pakistan

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ABSTRACT

BACKGROUND & OBJECTIVE: Approximately 300,000 newborns arrive daily, but 5-10% require resuscitation, and 1-10% need ventilation. Globally, 4 million infants die within four weeks due to inadequate healthcare resources and training. Neonatal Resuscitation Programs (NRP) aim to reduce infant mortality by training healthcare professionals in essential skills for newborn resuscitation.

METHODOLOGY: In this comparative descriptive study, we aimed to assess the efficacy of the Neonatal Resuscitation Program (NRP) training conducted at the Neonatal Unit of CMH Hospital in Rawalpindi on December 20, 2022. We selected a cohort of 111 participants, including healthcare professionals like physicians, specialists, nurses, and others, regardless of age or gender, through non-probability purposive sampling. The training spanned eight hours, equipping participants with vital skills and Knowledge in neonatal resuscitation. We administered pre-training and post-training questionnaires to gauge their proficiency and comprehension of neonatal resuscitation protocols. Responses were collected, documented, and statistically analyzed using SPSS v-26.

RESULTS: The study population demonstrated a mean pre-training score of 61.72±19.65%, significantly increasing to 85.8±10.9% after completing the NRP training (P<0.0001). These results indicate the remarkable success of the Neonatal Resuscitation Program in enhancing the Knowledge and skills of healthcare professionals engaged in neonatal care, thereby contributing to improved patient outcomes.

CONCLUSION: The Neonatal Resuscitation Program (NRP) proved highly impactful in refining the aptitudes and proficiency of healthcare professionals involved in neonatal care. These findings highlight the importance of such training programs in reducing neonatal mortality rates and enhancing the quality of care provided to newborns.

KEYWORDS: Neonatal Resuscitation, Knowledge, Healthcare Workers, Birth Asphyxia.

INTRODUCTION

Globally, approximately 300,000 newborns arrive each day, with around 90% smoothly transitioning from the intrauterine to the extra-uterine environment, initiating spontaneous respiration within 15-30 seconds of birth [1]. Roughly 5-10% of neonates require active resuscitation, and within this group, 1-10% receive assisted ventilation [2]. In South Asia, the neonatal death rate stands at 43 per 1000 live births, and there's also a stillbirth rate of 35 per 1000 live births [3]. Approximately 40-45% of these deaths in South Asia happen in perinatal time and within one day after birth. [3] The situation in Pakistan matches these statistics with a mortality rate of 42 deaths per 1000 live births in newborns [4]. The main contributor to this high mortality rate is the fact that 48% of births occur outside of healthcare facilities, often lacking the necessary resuscitative equipment and expertise. Hence, neonatal resuscitation training programs (NRP) are paramount in reducing infant mortality rates [5,6].

Neonatal resuscitation is vital in reviving newborns unable to initiate and maintain regular breathing independently. NRP is a cornerstone of clinical neonatology education, particularly for healthcare workers in delivery rooms and neonatal intensive care units. It encompasses airway, breathing,

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circulation, and medication management [7]. Proficiency in neonatal resuscitation is crucial for all healthcare personnel involved in deliveries. Consequently, competent assistance during childbirth is imperative, with nurses playing a pivotal role in newborn resuscitation [7]. Studies indicate that interventions to improve newborn resuscitation can enhance infant viability rates [8]. Comprehensive research across multiple continents found a significant correlation between NRP training and reduced infant mortality rates [9].

Maintaining capabilities and expertise over time is a challenge, especially in resource-limited settings. A systematic review revealed that refresher NRP training sustains Knowledge for nine months to 2 years, with minimal to no decline in Knowledge and skills [10].However, there is limited research on the knowledge level of healthcare professionals before and after NRP training in our country. To address this gap, our study aims to compare the knowledge levels of healthcare professionals before and after NRP training.

Operational Details of NRP:

The Neonatal Resuscitation Program (NRP) involves a series of critical steps to address newborns' immediate distress needs [11]. These steps are as follows.

1. Rapid Assessment: The first step is to assess whether the baby can remain by the mother's side or needs to be moved to a baby warming unit for further assessment.
2. Airway Management: Ensuring a clear airway is a priority, and initial actions are taken to establish and maintain a patent airway, facilitating independent breathing.
3. Breathing Support: Positive-pressure ventilation (PPV) is delivered to facilitate the baby's breathing in cases of apnea or bradycardia. Additional measures such as continuous positive airway pressure (CPAP) or surplus oxygen may be needed if the baby exhibits respiratory distress with hypoxia.
4. Circulatory Support: If the heart rate remains below 60/ second despite the ventilatory support, chest compressions are initiated in a ratio of 3 chest compressions to 1 breath. (Cardiopulmonary resuscitation CPR)
5. Medication: If the heart rate still does not improve, epinephrine is given while continuing CPR.

These steps constitute a structured approach to neonatal resuscitation to address potential issues and provide timely interventions to improve the baby's condition.

METHODOLOGY

It was a Comparative descriptive study planned to assess the Knowledge of the study population pre- and post-NRP. A total of 111 participants were included through non-probability purposive sampling. The study was conducted at the neonatal unit of CMH, Rawalpindi, where NRP training was conducted on September 20, 2022, after seeking approval from the Ethical Committee Board at Combined Military Hospital, Rawalpindi (IRB#.478). Verbal informed consent was taken before enrolling participants. Healthcare workers, including doctors and nurses from different hospitals (CMH Hospital, Rawalpindi Medical University, KRL Hospital, and PIMS) in Rawalpindi and Islamabad, regardless of age and gender, were included in this program.

A neonatal resuscitation program (NRP) training was conducted at CMH Hospital, Rawalpindi. It was an 8-hour training program conducted during 0800 – 1600 hours. It comprised five steps that were followed to evaluate and resuscitate a newborn. Different groups comprising 4-5 candidates were made, and each group was given equipment and a different scenario for resuscitation. The assessment was repeated at the end of each step, and it determined that the participant needed to proceed further. All the participants were given a questionnaire prior to training, which comprised 22 questions focusing on demographic details and Knowledge regarding the neonatal resuscitation of study participants.

After the training, participants were assessed for the Knowledge they gained using a post-training questionnaire comprising 15 questions. Pre- and post-evaluation of the questionnaires was done. Anonymity of the data was maintained. Data was entered and analyzed on SPSS version-26. Mean±SD and frequency (percentage) were calculated for descriptive statistics. In inferential statistics, a comparison of the pre- and post-educational evaluation was done using a paired sample T-test. P value <0.05 was considered significant by taking a 95% confidence interval with a margin error of 5%.

Inclusion criteria: Participants, including trainee doctors, specialists, nurses, etc., who attended the NRP training of any age and both genders were included.

Exclusion criteria: Participants who did not complete the training and were unwilling to participate were excluded.

RESULTS

The study included a total of 111 participants who attended the NRP training. The mean age of the study population was 36.4±11.3 years. Gender distribution of the study population showed 37% (n=41) males and 63% (n=70) females, as depicted in Figure I. The study recruited the majority of consultants/ physicians (44;38.6%) and only 6(5.3%) medical officers, as shown in Table-I.

Table-I:Profession-wise distribution of Study Population.

Profession	n(%)
Nurses	29(25.4)
Physician/ consultants	44(38.6)
Residents/ trainees	32(28.1)
Medical Officers	6(5.3)

The overall pre- and post-score of the participants was calculated to make a comparison. The mean score percentage of pre- and post-training assessment was calculated to be 61.72±19.65% and 85.8±10.9%, respectively, which shows that the post-training score was improved after training, as depicted in Table II. A comparison of pre-training Knowledge and post-training Knowledge of the study population was made by applying a paired sample T-test with a mean difference of 24.1%, and significant findings were observed (P<0.0001) and shown in Table-III.

Table-II:Pre- and post-training assessment mean score percent.

NRP Training	Mean ±SD	Std. Error Mean
Pre-training percent score	61.72 ± 19.65	1.86
Post-training percent score	85.80 ± 10.91	1.03

Table-III:Comparison of pre-and post-training scores.

Variables	Paired Differences					t	d.f	P-Value
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pre- and post-training score	-24.08	17.27	1.64	-27.33	-20.83	-14.7	110	<0.0001

***Paired Sample t-test**

DISCUSSION

The primary aspiration of the Neonatal Resuscitation Program (NRP) is to provide dexterity about the essential procedures required to facilitate breathing in a neonate suffering from asphyxia [1]. The results of the present study highlighted the effectiveness of this educational scheme in improving the skill set of healthcare professionals relevant to neonatal resuscitation. This aligns well with the results of another study done recently, revealing the pre-interventional mean score of 22.62 and post-interventional score of 34.15, with a statistically significant difference (P<0.0001) [12].

A similar study conducted by Nirmala et al. to assess the effectiveness of an autodidactic course on the management of birth asphyxia supported the results of the present study and displayed that the mean knowledge score after the course was higher than the mean knowledge score prior to the course, showing the effectiveness of the self-taught course [13]. In a study by Koonwar et al., 50 persons participated from the delivery room and neonatal intensive care units. Paired sample T-test showed overall improved mean scores post-training [14]. Likewise, a study by Subbiah N et al. determined the effectiveness of NRP training, and the findings showed that the pre and post-test mean percent scores were 19.11% and 30.71%, respectively, with statistically significant results (P<0.0001) [15]. Carlo WA et al. published a study on the impact of the NRP program in low-risk delivery centers and observed a significant improvement in the participants' scores [16].

Neonatal Resuscitation Program (NRP) training is imperative regularly to enhance expertise and comprehensive understanding. Ding et al. observed that revision courses led to superior knowledge-keeping compared to a single instructional session [17]. Similar findings were witnessed in studies from underdeveloped nations like Bangladesh and Ethiopia, where theoretical and practical performance increments were noted at one year and 18 months past NRP training, respectively [18]. Bang et al. accentuated the indispensable need for repetitive training sessions, particularly in repressive settings, as they can remarkably intensify the sustenance of skills and learning [19].

Effective development and implementation of training programs in resource-constrained environments remain challenging and require collaborative efforts with colleagues outside these settings. Although evidence supporting an optimal resuscitation training interval is scarce, it is recommended to employ effective strategies for teaching, assessing, and maintaining Knowledge and skills [20].

The main causes of neonatal fatalities include preterm, hypoxia, and sepsis. Regardless, the acquisition of competence in the field of neonatal resuscitation has the potential to reduce infant mortality rates and instances of neonatal hypoxia. The newborn resuscitation training curriculum showed a significant improvement in both core understanding and operational skills immediately following the training session as well as in the long term. Subsequently, any such training program must prioritize the long-term maintenance of proficiency and the effective application of acquired information in clinical settings. This approach is necessary to address medical challenges, mitigate infant mortality and morbidity, and achieve desired outcomes.

Recommendations:

1.Ongoing Training: Maintain continuous neonatal resuscitation training programs tailored to local needs, ensuring healthcare professionals stay updated and confident in their skills.
2. Local Expertise: Foster the development of local neonatal resuscitation experts who can serve as trainers and mentors within the community.
3. Quality Improvement: Implement quality improvement initiatives to monitor and enhance neonatal resuscitation practices, with regular audits and feedback mechanisms in place.

CONCLUSION

The NRP has proven effective in improving the resuscitation practice in the neonatal population. Regular skill-building sessions in resource-limited countries are vital to allow healthcare professionals to perform adequate resuscitation and improve newborn outcomes. In addition, further research needs to be undertaken on a comprehensive level to augment our understanding of the information and competencies related to the practice of neonatal resuscitation and the extent to which the primary competencies are maintained throughout time.

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Sughra Zulfiqar :The acquisition, analysis, and interpretation of data for the work.
Nauman Naseer : Drafting the work .
Saima Shabbir:Reviewing it critically for important intellectual content.
Tasleem Bano: Final approval of the version to be published.