

Outcomes of Neonatal Resuscitation Practices in Tertiary Care Hospital

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ABSTRACT

Background: neonatal birth asphyxia is a major cause of neonatal death and severe complications. It is associated with gestational complications as well as criticalities during delivery.

Objective: To determine the outcomes of neonatal resuscitation practices in tertiary care hospital

Study Design: Observational cross-sectional study

Place and Duration of Study: Department of Paediatric, Ghulam Muhammad Mahar Medical College, Sukkur from 1st March 2023 to 31st August 2023.

Methodology: One thousand two hundred and fifty deliveries were enrolled. Out of the total observed neonatal population, 138 newborns were identified with birth asphyxia. The neonatal resuscitation was performed by positive pressure ventilation (PPV) (20-30 seconds) by using a bag-valve-mask. Supplemental oxygen was initiated with 21% oxygen. Chest Compressions (if heart rate remains <60 bpm) was observed as 3:1 ratio with PPV (90 compressions, 30 breaths per minute). The AGPAR scoring method was applied. The overall practice score was categorized using the Bloom's cut-off point as 80-100% Good, 60-79.9% Moderate and 00-59.9% poor. A resuscitated newborn was evaluated through APGAR score at post 05 min, followed by 10 minutes.

Result: The majority of the neonates born were <37 weeks of their gestational age with a mean of 34.9±3.0 weeks of age. 53.6% of the neonates' birth weight was less than 2.5 kg, bringing their birth health status to a very critical state. It was well noted that 15.2% of the neonates born through cesarean were breached. The present study has elaborated the fact that 16.7% of the neonatal cases resuscitated timely recovered well, 23 (16.7%) while 47.1% of the neonates required oxygen therapy, and 29% went into intensive care.

Conclusion: The neonatal outcomes are significantly dependent on resuscitation technique and health professional skills.

Keywords: Resuscitation, Neonatal, Asphyxia, Ventilation

INTRODUCTION

Neonatal resuscitation is a critical medical procedure for newborn with a global 4 million morbidities in neonates occurring in the low as well as middle income countries.¹ The term birth asphyxia is termed as breathing failure and sustainability which leads to neonatal death in almost 75% of cases.² The indication of asphyxia includes apnea (not breathing), respiratory distress, heart rate <100 beats per minute and reduced oxygen saturation.

Within the aforesaid mortality rate maximum deaths occurs within the first week of neonatal life specifically in the first 24 hours of birth.³⁻⁵ The mortality and morbidity from birth asphyxia can be prevented and treated in 30% of the cases through effective resuscitation at birth.^{6,7} Resuscitation is highly significant in averting 5-10 percents of mortalities due to preterm birth complications.⁸ The global evidence presents a 30 second delay death rate in initial ventilation results in death rate as high as 16%.⁵

This exclusively highlights the important of resuscitation at first minute for reducing the critical risk of neonatal mortality. Evidence further suggests that successful resuscitation by a skilful practitioner can prevent from asphyxia in units and reduce rate of mortality. It is also supported that timely resuscitation can significantly reduce the neonatal death in asphyxia cases. The prevention rate is reported as up to 2 million cases in general neonatal population.^{8,9}

The present study was designed to assess the primary outcomes of resuscitation in neonatal asphyxia cases. The result of the study has provided substantial evidence of positive resuscitation outcomes in decreasing neonatal mortality and also highlights the time sensitive significance of resuscitation in neonates.

MATERIALS AND METHODS

This observational cross-sectional study was carried out at Department of Paediatric, Ghulam Muhammad Mahar Medical College, Sukkur from 1st March 2023 to 31st August 2023 and 1250 deliveries were calculated which were observed. Out of the total

observed neonatal population 138 newborns were identified with birth asphyxia. The sample size was calculated through online available software where in estimated proportion of required neonatal resuscitation 10 % with the confidence level equal to 95% and the margin of error equal to 5%. The doctors/practitioners assigned for performed NR on aforesaid newborns were keenly observed for their adapted procedure in cases of birth asphyxia. The inclusion criteria consisted of one-year experiences registered nurses and medical doctors and the newborns fail to initiate spontaneous respiration. Those neonates born with congenital life-threatening anomaly and still birth were excluded. A written informed consent was taken from each included participant and from the parents/guardians of the neonates before the initiation of the observations research study. Data was collected to assess the availability of healthcare professional, proper functioning of equipment, and efficiency of the essential NR equipment at the resuscitator site. The medical practitioners were observed post neonatal delivery. The resuscitation procedure in cases where NR was performed in cases where resuscitation (met the eligibility requirements) was required. The ideal procedure which was evaluated was in lines with available guidelines. In accordance with those guidelines the preliminary assessment (0-20 seconds) the breathing, pulse, and color were checked with dry and stimulates of the baby. The neonatal resuscitation was performed by positive Pressure Ventilation (PPV) (20-30 seconds) by using a bag-valve-mask (BVM) or T-piece resuscitator and providing 30-60 breaths per minute. Supplemental Oxygen was initiated with 21% oxygen, adjust as needed. Chest Compressions (if heart rate remains < 60 bpm) was observed as 3:1 ratio with PPV (90 compressions, 30 breaths per minute). Complete demographic detail of participants of study, neonate gestational age, mode of delivery was documented. The AGPAR scoring method was applied wherein 7-10 was considered as normal, 4-6 as moderate and 0-3 as poor. The overall practice score was categorized using the Bloom's cut-off point as 80-100% Good, 60-79.9% Moderate and 00-59.9% poor. Each medical professional skill evaluation was performed based on preparation, airway, breathing, and circulation. A resuscitated newborn was evaluated through APGAR score at post 05 min, followed by 10 minutes. Data was analyzed

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using SPSS version 26.0 through analytical chi square tool. The p value less than 0.05 was considered as significant.

RESULTS

The majority of the neonates born were <37 weeks of their gestational age with a mean of 34.9 ± 3.0 weeks of age. There were only 34.1% of the neonates above or equal to 37 weeks of age. Similarly, 53.6% of the neonates' birth weight was less than 2.5 kg, bringing their birth health status at a very critical state (Table 1).

In the current study there were 26.8% of the cases wherein spontaneous vaginal delivery (SVD) has occurred while only one case was delivered through vacuum assisted delivery. The majority of the cases were delivered through cesarean section followed by spontaneous vaginal delivery. It was well noted that 15.2% of the neonates born through cesarean were breached (Table 2).

A progressive recovery was noticeable in the neonate's requiring resuscitation. This was recorded through the application of the APGAR scores which presented their health status across three-time intervals. At 1 minute, the mean APGAR score was 2.8 ± 1.0 , extending from 1 to 5, representing a vital requirement for resuscitation. Within five minutes, the mean-score enhanced to 4.9 ± 1.1 , reaching from 2 to 8, indicating a positive effect to resuscitation attempts. Lastly, at 10 minutes, the mean APGAR score achieved 6.6 ± 0.9 , extending from 4 to 9, implying meaningful progress in the overall health of the neonate (Table 3).

The present study has elaborated the fact that 23 (16.7%) of the neonatal cases resuscitated timely recovered well, while 65 (47.1%) of the neonates required oxygen therapy, and 40 (28.9%) went into intensive care. There were 10 (7.2%) those cases who could not be saved even from resuscitation (Fig. 1)

Table 1: Demographic age and weight distribution among enrolled neonatal cases (n=138)

Variable	No. (%)	Mean \pm SD
Gestational age (weeks)		
<37	91 (65.9%)	34.9 ± 3.0
≥ 37	47 (34.1%)	
Birth weight (kg)		
<2.5	74 (53.6%)	2.31 ± 0.66
≥ 2.5	64 (46.4%)	

The professional practices including baby dried by gently rubbing the back, wet cloth removed, baby kept warm, looked into airway, meconium, suctioning before drying in meconium, head in neutral position were found to be highly significant ($p < 0.05$) practices for keeping baby alive (Fig. 2).

Table 2: Distribution of mode of delivery within neonates (n=138)

Type	No.	%
SVD	37	26.8
Assisted delivery (vacuum extraction)	1	0.7
Caesarean section	66	47.8
SVD + Assisted	7	5.1
Assisted + C. Section	4	2.9
C. Section + Breach	21	15.2
Asste + C. Section + Breech	2	1.5

Table 3: The association of AGPAR scores with resuscitation outcomes

Outcome	Mean \pm SD	Minimum	Maximum
At 1 mint. APGAR score	2.8 ± 1.0	1.00	5.00
At 5 mint. APGAR score	4.9 ± 1.1	2.00	8.00
At 10 mint. APGAR score	6.6 ± 0.9	4.00	9.00

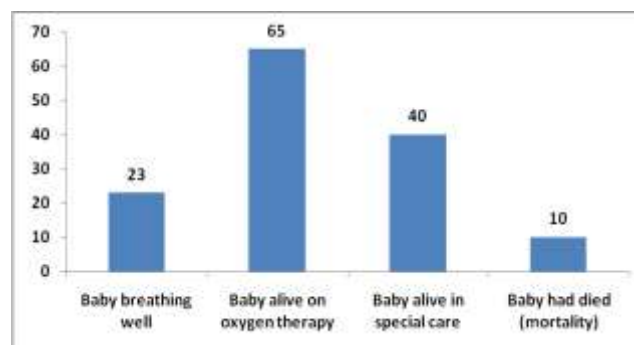


Fig. 1: Post one hour outcome of neonatal resuscitation

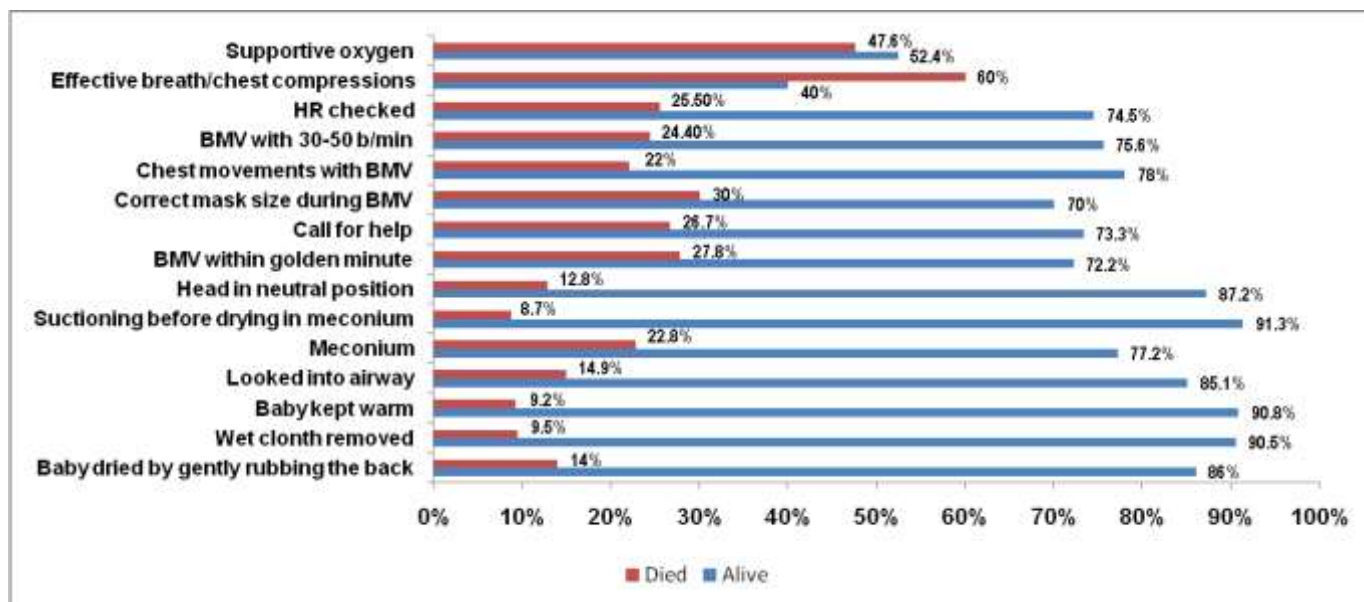


Fig. 2: Linkage of neonatal resuscitation processes, with neonatal outcomes

DISCUSSION

Unit managers or ward in-charges commonly carried out supportive supervision for healthcare providers (HCPs), typically

within six months. However, the lack of regular monitoring and refresher training for neonatal resuscitation (NR) skills, typically every six months, leads to a rapid decline in proficiency over time.

This trend has been observed in a recent multi-country study on the Helping Babies Breathe initiative.¹⁰ In other settings, it has been found that HCPs with more than two years of experience in maternity units possess superior NR skills compared to their less experienced counterparts.¹¹ It is expected that those with greater experience will transfer their knowledge and skills to newer HCPs joining the team.

Our study indicated that HCPs demonstrated proficiency in key NR practices, particularly in airway management and initiating spontaneous breathing. These findings align with similar research conducted at other healthcare facilities in the country.^{12,13} This can likely be attributed to the availability of NR protocols, training, and necessary equipment in the hospital. However, a few newborns did not receive adequate warmth, a crucial step in neonatal care, which could lead to neonatal deaths due to hypothermia. Proper immediate newborn care during the first hour of life is essential to reduce neonatal morbidity and mortality.¹⁴

Bag and mask ventilation (BMV) was performed on all newborns who failed to establish breathing after initial drying and airway clearance. The results suggest that HCPs correctly identified the need for BMV in newborns were not breathing or were only gasping, in line with established guidelines.^{15,16} However, most of the BMV interventions were not initiated within the recommended "Golden Minute" following failed stimulation and airway clearance, as outlined by both national and international guidelines.^{15,17} Delaying resuscitation prolongs the critical window for reversing the effects of asphyxia, such as reduced blood pressure, impaired cerebral blood flow, and potential cardiac arrest. Our findings show that HCPs had limited understanding of the importance of timely BMV initiation. Evidence indicates that when BMV is provided within the first minute, there is significant improvement in myocardial function and cerebral oxygenation.¹⁸

Majority of newborns who require resuscitation will begin breathing spontaneously after simple stimulation, with very few needing advanced interventions like chest compressions or medication.¹⁹ This suggests that, even in resource-limited settings, many cases of birth asphyxia can be successfully managed with basic interventions, such as drying, stimulating, clearing the airway, and ensuring warmth. These measures alone may prevent most neonatal deaths due to asphyxia.

CONCLUSION

Neonates were found alive after resuscitation either with mothers as "well babies" and/or in nursery as oxygen dependents and/or in NICU on ventilator supports. The neonatal outcomes are significantly dependent on resuscitation technique and health professional skills.

REFERENCES

1. Singhal N, Lockyer J, Fidler H, Keenan W, Little G, Bucher S, et al. Helping babies breathe: global neonatal resuscitation program development and formative educational evaluation. *Resuscitation* 2012;83(1):90-6.
2. WHO. Guidelines on basic newborn resuscitation: World Health Organization; 2012.
3. Lawn JE, Blencowe H, Oza S, You D, Lee AC, Waiswa P, et al. Every newborn: progress, priorities, and potential beyond survival. *Lancet* 2014;384(9938):189-205.
4. Bang A, Bellad R, Gisore P, Hibberd P, Patel A, Goudar S, et al. Implementation and evaluation of the helping babies breathe curriculum in three resource limited settings: does helping babies breathe save lives? A study protocol. *BMC Preg Child* 2014;14(1):116.
5. Ersdal HL, Mduma E, Svensen E, Perlman J. Birth asphyxia: a major cause of early neonatal mortality in a Tanzanian rural hospital. *Pediatrics* 2012;129(5):e1238-e43.
6. Every Newborn Action Plan. Every newborn: an action plan to end preventable deaths. Every Newborn Action Plan, 2014;
7. Little GA, Keenan WJ, Niermeyer S, Singhal N, Lawn JE. Neonatal nursing and helping babies breathe: an effective intervention to decrease global neonatal mortality. *Newborn Infant Nurs Rev* 2011;11(2):82-7.
8. Wall SN, Lee AC, Niermeyer S, English M, Keenan WJ, Carlo W, et al. Neonatal resuscitation in low-resource settings: what, who, and how to overcome challenges to scale up? *Int J Gynecol Obstet* 2009;107:S47-64.
9. Morales P, Bustamante D, Espina-Marchant P, Neira-Peña T, Gutiérrez-Hernández MA, Allende-Castro C, et al. Pathophysiology of perinatal asphyxia: can we predict and improve individual outcomes? *EPMA J* 2011;2(2):211.
10. Guta NM. Application of Donabedian quality-of-care framework to assess quality of neonatal resuscitation, its outcome, and associated factors among resuscitated newborns at public hospitals of East Wollega zone, Oromia, Western Ethiopia, 2021. *BMC Pediatr* 2022; 22(1): 605.
11. Al-Hadi, A, Dawson J, Paliwoda M, Walker K, New K. Healthcare providers' views of information, support, and services offered to women in the postnatal follow-up care period in Oman: a qualitative study. *Int J Comm Based Nursing Midwifery* 2023; 11(1): 2.
12. Zein H, Baratlou A, Negida A, Safari S. Ventilator weaning and spontaneous breathing trials; an educational review. *Emergency* 2016; 4(2): 65.
13. Shikuku DN, Milimo B, Ayebare E, Gisore P, Nalwadda G. Quality of care during neonatal resuscitation in Kakamega County General Hospital, Kenya: a direct observation study. *BioMed Res Int* 2017; 2017(1): 2152487.
14. Nvonako H, Ojee E, Masika M, Sandie A, Wamalwa D, Wasunna A. Effect of in-hospital training in newborn resuscitation on the competence of health-care workers in resuscitating newborn infants at birth at Mboppi Baptist Hospital, Douala, Cameroon. *Pan Afr Med J* 2022; 42: 169.
15. Qureshi MJ, Kumar M. Laryngeal mask airway versus bag-mask ventilation or endotracheal intubation for neonatal resuscitation. *Cochrane Database Syst Rev* 2018; 3(3): CD003314.
16. Chaulagain DR, Malqvist M, Brunell O, Wrammert J, Basnet O, Kc A. Performance of health workers on neonatal resuscitation care following scaled-up quality improvement interventions in public hospitals of Nepal-a prospective observational study. *BMC Health Services Res* 2021; 21: 1-10.
17. Shikuku DN, Milimo B, Ayebare E, Gisore P, Nalwadda G. Practice and outcomes of neonatal resuscitation for newborns with birth asphyxia at Kakamega County General Hospital, Kenya: a direct observation study. *BMC Pediatr* 2018; 18: 1-11.
18. Iordanova B, Li L, Clark RS, Manole MD. Alterations in cerebral blood flow after resuscitation from cardiac arrest. *Frontiers Pediatr* 2017; 5: 174.
19. Kariuki E, Sutton C, Leone TA. Neonatal resuscitation: current evidence and guidelines. *BJA Educ* 2021; 21(12): 479-85.

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