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Original Research Article

PRACTICES AND OUTCOMES OF NEONATAL RESUSCITATION FOR NEWBORNS WITH BIRTH ASPHYXIA IN TERTIARY CARE HOSPITALS IN LAHORE, PAKISTAN

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ABSTRACT

Background :*Neonatal resuscitation (NR) is a critical intervention to reduce neonatal morbidity and mortality associated with birth asphyxia. The effectiveness of NR practices by healthcare professionals (HCPs) significantly influences newborn outcomes. However, gaps in NR training and adherence to standardized resuscitation protocols may impact survival and long-term health. Evaluating NR practices and their association with neonatal outcomes can help identify areas for improvement and optimize neonatal care.* ***Objective:*** *To observe the NR practices of HCPs and their outcomes and to determine the associations between practices and outcomes.* ***Study Design:*** *Observational Cross-sectional study.* ***Setting:*** *The study was conducted in the neonatal resuscitation unit of a tertiary care hospital.* ***Duration of Study:*** *March 2024 to August 2024.* ***Methods:*** *One thousand six hundred and forty neonates were followed, and out of them, a total of 138 newborn resuscitations were observed by 46 HCPs using a predetermined adopted checklist. Newborns with birth asphyxia by the WHO criteria, as well as criteria defined by the American Academy of Pediatrics, were included in the study. The complete bio-data of health care professionals was documented with their way of resuscitation. The observer was present in the resuscitation area every time a delivery was being conducted. Data was analyzed using the SPSS software. The chi-square test was used to determine the association between NR practices and outcomes at one hour.* ***Result:*** *45.7% of the HCPs were within the age group of 26-30 years, with 55.2% as females. The majority of them are doctors, followed by nurses. 50.7% HCPs prepared the area for resuscitation, and only 18.8% identified a helper. 95.7% dried the baby, and 76.8% removed the wet cloth. 96.4% HCPs cleared the baby's airway. Meconium was present in 42% of neonates. Only 27.9% HCPs started BMV within the Golden minute (60s), 75% used the correct mask size and 96.9% observed chest movement. According to the level of practices by HCPs, good scores were as follows: 74.6% in Drying/Stimulating, 89.7% for Support Ventilation, 39.9% in Open Airway, 27.9 % for BMV, and in ABMW, 44.8% of HCPs demonstrated good practices. 16.7% neonates recovered well, 47.1% needed oxygen therapy, 29% required intensive care, and 7.2% died after 01 hour. Suctioning before the baby breathes (p-value .001), placing the baby's head in a neutral position (p-value = .013), initiation of BMV (p-value <.05), and checking the baby's heart rate after 1 minute (p-value = .022) were associated with newborn outcomes at 1 hour.* ***Conclusion:*** *The Majority of the HCPs were inadequately trained for NR practices. However, a significant association among HCPs' NR practices (airway management and advanced resuscitation practices) and outcomes was observed. Structured and ongoing NR training for HCPs can improve practices and contribute to reduced newborn morbidity and mortality rates. Consequently, it will be helpful for lowering healthcare costs for families and the healthcare system and will contribute to the national economy..*

Keywords: *Neonatal Resuscitation, Birth Asphyxia, APGAR, Healthcare Professional, Newborn*

INTRODUCTION

Globally, approximately four million neonatal deaths occur annually, with birth asphyxia accounting for around 23% of these fatalities. Birth asphyxia is a significant contributor to infant morbidity and mortality, resulting from disrupted placental blood flow, decreased oxygen saturation, and increased blood acidity (1, 2). According to the World Health Organization, birth asphyxia is defined as the inability to begin and sustain breathing at birth. It can manifest as fetal heart rate abnormalities or fetal distress, leading to generalized organ damage, acute kidney injury, or long-term neurological disorders (3, 4).

In Pakistan, birth asphyxia is a leading cause of neonatal deaths, with approximately 500 newborns dying daily. However, most birth asphyxia-related morbidity and mortality can be avoided or treated with adequate neonatal resuscitation. Neonatal resuscitation is an emergency procedure that assists newborns who do not begin breathing immediately, reducing the risk of organ damage and death. Trained healthcare professionals can encourage neonates to breathe independently, restoring a regular heart rate (5-7).

The procedure involves establishing an airway, breathing, and circulation in newborns with respiratory difficulties. Simple investments in neonatal resuscitation equipment and training can significantly increase survival rates after birth asphyxia. Every year, an estimated 10 million babies require assistance in starting to breathe, with 5-10% of neonates delivered in facilities requiring some form of resuscitation (8).

Identifying newborns requiring resuscitation is crucial for delivering adequate care. Preparation is vital for successful resuscitation, and neonatal life support includes various phases to ensure a safe and efficient birth process. The present study was focused on identifying and analyzing the actual practices of health care professionals and evaluating the outcomes of resuscitation among newborns suffering from birth asphyxia (9, 10). The results of this study presented highly significant data, which was beneficial in assessing the practical needs of training within health care professionals and the importance of resuscitation for newborns having birth asphyxia.

METHODOLOGY

This cross-sectional study conducted at University of Health Sciences (UHS), Lahore with the collaboration of four tertiary care hospitals (Jinnah Hospital, Services Hospital, Lahore General Hospital and Social Security Hospital) of Lahore from March, 2024 to August, 2024of healthcare professionals (doctors & nurses) working in NR room and the neonates born with birth asphyxia were

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enrolled. The samples were collected from four tertiary care hospitals in Lahore. The current study was an observational study which was ethically approved by the institutional review board and priorly informed through a written consent endorsed by all the participants. The opted method was non-intrusive with no interruption in the work (resuscitation) of health care professional by the observer. A total of 1640 neonates were followed, and out of them, a total of 138 newborn resuscitations were observed. The sample size was generated using the WHO sample size calculator method using the Kish Leslie formula where 95% CI, 80% power of test and 5% margin of error were applied. The estimated proportion of required neonatal resuscitation was considered to be 10%. Further, each health care professional (HCP) was observed three times during the resuscitation performance in NR; therefore, the sample size of HCP was taken as 46. Newborns with birth asphyxia by the WHO criteria, as well as criteria defined by the American Academy of Pediatrics, were included in the study. Accordingly, any newborn who failed to initiate spontaneous respirations at birth or within a minute after delivery with gasp breathing at 30 seconds post-birth. Further, having a floppy or bluish or centrally cyanosed condition (blue tongue) was considered to indicate asphyxia. Twin or multiple pregnancies, as well as neonatal anomalies affecting breathing or stillbirths, were excluded. Additionally, the newborn unit, wherein routine resuscitation is performed, was also kept in exclusion. The resuscitation areas were inside the operation theater of the gynecology unit and in the labor room. HCP is available for active participation to provide resuscitation to the newborn. Each HCP was assigned a numeric code (001, 002, 003, 004……) by the researcher and was observed three (03) times till the completion of the process. The researcher/observer purposefully positioned herself near the resuscitator to have a close and keen view of the entire resuscitation process. Firstly, data was collected to assess the availability of healthcare professionals, the proper functioning of equipment, and the efficiency of the essential NR equipment at the resuscitator site. This practice reduced the Hawthorne effect related to observational studies. During the preparatory phase, the HCP were briefed once on the intentions of the observer (resuscitation observing without an intrusion in the process). The complete bio-data of HCP was documented with its way of resuscitation. The observer was present in the resuscitation area every time a delivery was being conducted. In the case of two resuscitations at similar timings, the observer was the delivery that began first. The information regarding complete availability, functionality of NR room, and steps taken by HCP were documented on a well-structured checklist. A predetermined checklist was used for the purpose. The airway, breathing, and circulation preparation was assessed. The NR practices for preventing infection through disinfecting equipment and face masks were also recorded. The resuscitation steps include drying/stimulation, as well as airway clearing and adequate bag and mask ventilation. Other outcomes, e.g. death, were captured indirectly under the "others" since they may be attributed to different factors (confounders) not directly related to NR. This helped us assess the specific intervention for each newborn resuscitated differently during the resuscitation process based on the outcome at each step of resuscitation undertaken. The overall practice score was categorized using Bloom's cut-off point with 00 – 59.9% as poor, 60 – 79.9% as moderate and 80-100% as good. The APGAR score was observed immediately and at 5 minutes, followed by 10 minutes, and was documented. The APGAR score comprises of appearance pulse, grimace, activity and respiration with a score of 0 – 3 as poor, 4 – 6 as moderate, and 7 – 10 as usual. The outcome after one-hour newborn status was considered as primary outcome as binary and documented as alive/dead, yes/no. Data was analyzed using SPSS version 26.0, wherein chi square was used for analyzing multivariable. A p-value < 0.05 was considered significant.

RESULTS

The present study results identified that 45.7% of the health care professionals were within the age group of 26-30 years, with 55.2% being females. There was a majority of the HCP serving in the NR room as doctors followed by nurses. The qualification of these doctors was 67.6% as FCPS. The supervision of the NR room was provided to the majority for more than 6 months with 26.96% of those HCP who have NR room training for 1-2 years. The newborn demographics showed that 65.9% had been delivered at <37 weeks, with 53.6% having LBW. The mode of delivery varied in cases with a significant number of deliveries done as cesareans (Table 1).

Preparation for Newborn Resuscitation, more than half (50.7%) Healthcare Professionals (HCPs) prepared the area for resuscitation. The majority of HCPs (96.4%) checked the availability of resuscitation equipment, and 97.1% of HCPs checked the equipment, including a ventilation bag, full-term mask, preterm mask, suction bulb, and warmth. However, only a small proportion (18.8%) identified a helper. **Drying/Stimulating,** the majority (95.7%) of HCPs dried the baby thoroughly, and 76.8% HCPs removed the wet cloth. All HCPs (100%) kept the baby warm. **Check/Open Airway,** almost all HCPs (99.3%) checked the newborn's airway, 76.1% HCPs assessed the baby for meconium. Most HCPs (77.6%) suctioned the airway before drying/stimulating. Almost 96.4% of HCPs cleared the baby's airway with a suction bulb, and 92.8% of HCPs placed the baby's head in a neutral position. **Bag and Mask Ventilation (BMV)**: nearly all HCPs (99%) initiated BMV, but 27.9% of HCPs did so within the Golden minute (60s). Most of the HCPs (75%) used the correct mask size during BMV, and almost all (96.9%) observed chest movement with each ventilation. The majority (85.4%) checked the baby's heart rate after 1 minute of BMV, and all HCPs (100%) continued BMV if the baby remained unresponsive. **Support Ventilation**, most HCPs (89.7%) initiated effective breaths with every three compressions for 1 minute. All HCPs (100%) provided supportive oxygen if the baby still required it, and all observed that the baby responded after support ventilation (Table 2).

Mean scores across five domains, with Support Ventilation scoring the highest at 0.97 ± 0.10. Drying/Stimulating comes in second at 0.91 ± 0.16, followed by Check/Open Airway at 0.72 ± 0.15, Advanced BMW at 0.66 ± 0.18, and Preparation at 0.66 ± 0.19. Meanwhile, BMW scores the lowest at 0.64 ± 0.23, indicating room for improvement in this area. Fig. 1

Figure 2 reveals varying levels of proficiency across five essential domains of the newborn resuscitation practice assessment. Notably, the "Drying/stimulating" domain shows good practices, with 74.6% of respondents demonstrating "Good" skills. Similarly, "Support Ventilation" shows excellence, with 89.7% achieving "Good" proficiency. Meanwhile, the "Check/Open Airway" domain requires attention, with 17.4% "Poor," 42.8% average and only 39.9% "Good". However, the "BMV" (Bag Mask Ventilation) domain raises concerns, with 72.1% of respondents rating "Poor" and only 27.9 % "Good". The "Advanced BMW" domain also shows 18.8% "Poor," 36.4% average, and"44.8%"Good".

The results on NR practices indicate that the majority of the healthcare professionals demonstrated good practices in drying/stimulating and support ventilation components of NR; however, they required training/ practice in BMV, Advanced BMW and airway management as the majority of them were observed as poor and average for these NR practice components.

The newborn APGAR scores needing neonatal resuscitation presentive progressive health development within three-time intervals. For one minute, the APGAR score was presented as 2.8±1.0, which indicated the critical resuscitation requirements, while at five minutes, the score enhanced to 4.9±1.1, with a range of 2 to 8, presenting a positive response to resuscitation endeavors. At

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ten minutes, the mean APGAR score was 6.6±0.9, showing substantial improvement in newborn general health. **Fig.3**

In the current study, after one-hour outcomes of NR, it was elaborated that the 23 (16.7%) newborns receiving early resuscitation recovered well, while 65 (47.1%) of the newborns required oxygen support, and 40 (29%) needed additional intensive care. Unfortunately, 76.1% of the newborns developed morbidities, while 10 (7.2%) could not survive. Fig 4

The table 3 indicates the association between healthcare provider (HCP) practices during neonatal resuscitation and neonatal outcomes, emphasizing the critical role of timely interventions. Significant findings include the strong association between keeping the baby warm and improved outcomes across all categories. Drying and stimulating the baby was linked to better survival and oxygen use outcomes, highlighting its relevance in neonatal care. Practical bag and mask ventilation (BMV), especially within the "Golden Minute," showed significant improvements in neonatal health, underscoring the need for rapid and skilled response during resuscitation. Practices like initiating breathing before suctioning and timely checking the baby's heart rate after BMV were also significantly associated with reduced complications and better survival. While airway management and advanced BMV techniques demonstrated variable effectiveness, these findings collectively stress the importance of standardizing critical resuscitation practices to optimize neonatal outcomes Table 3.

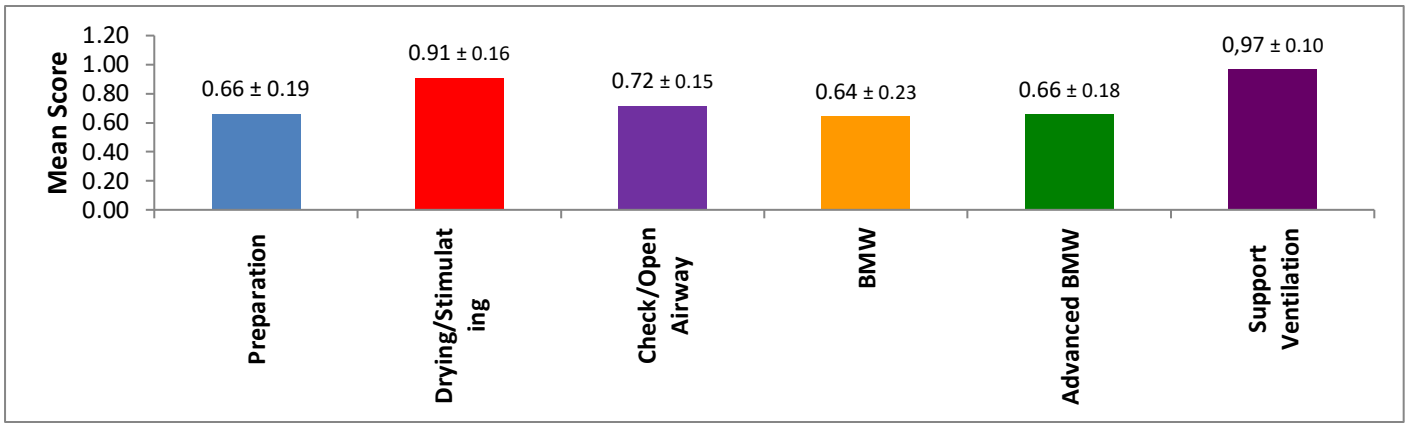

Fig.1: Distribution of Mean Score of 6 Domains of Practices

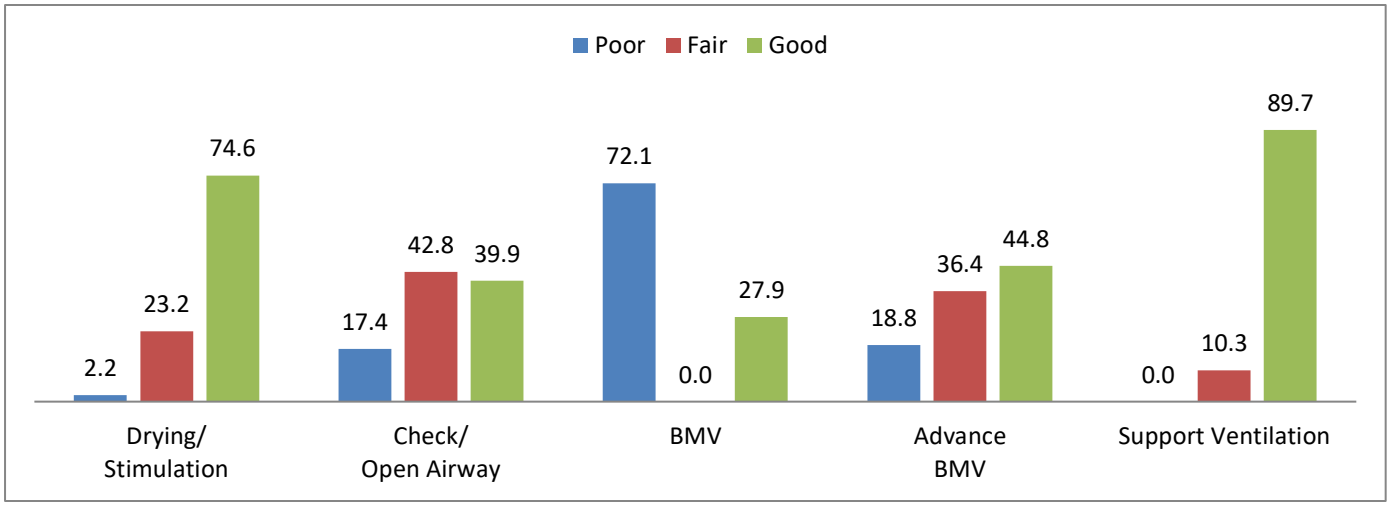

Fig.2:Distribution of Level of HCPs NR practice score

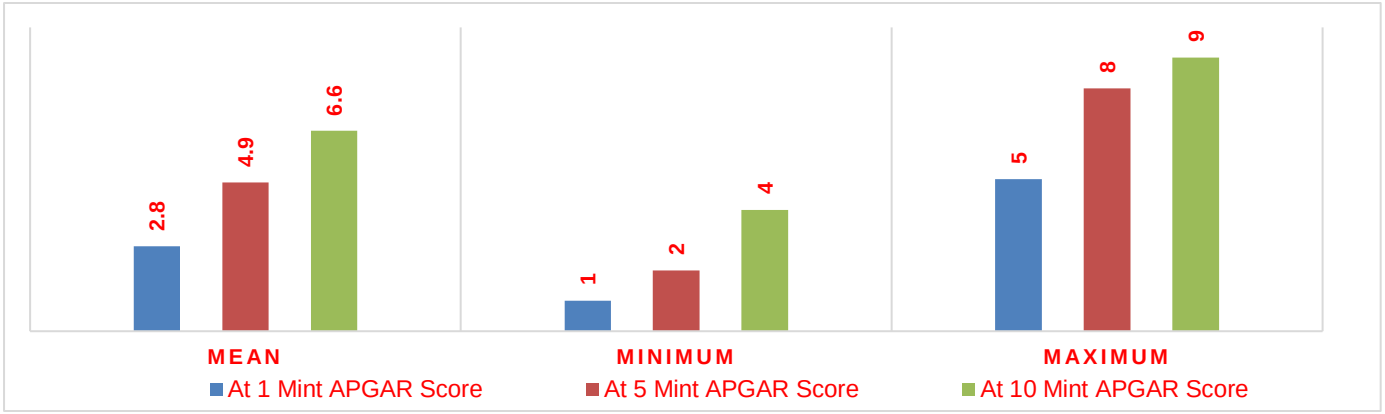

Fig. 3: Comparison of newborn resuscitation outcomes with AGPAR score

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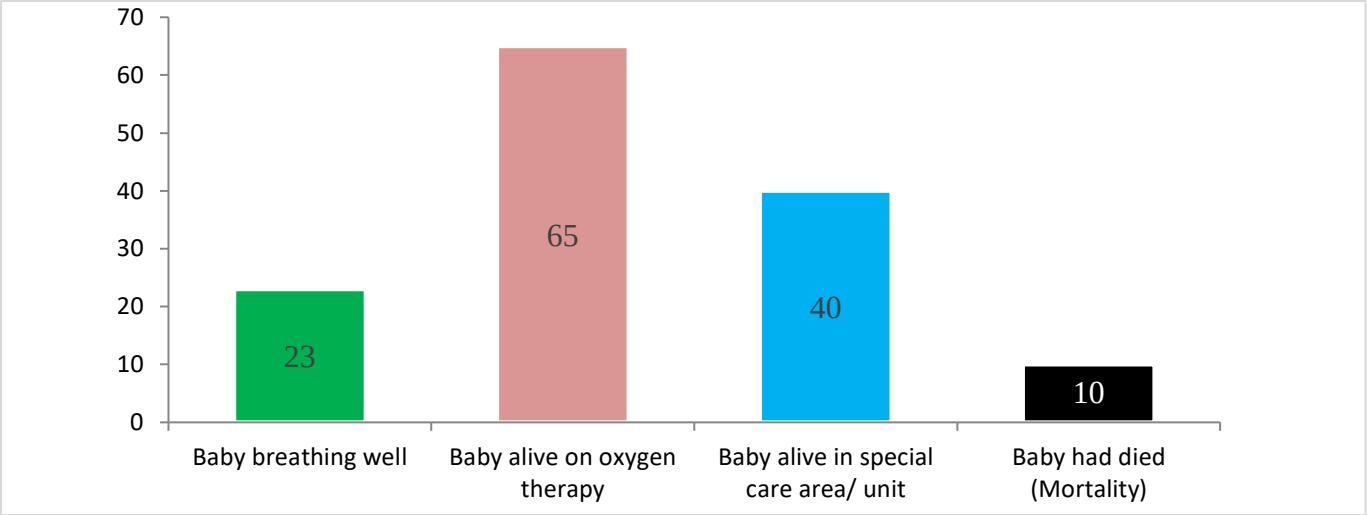

Fig. 4: Newborn resuscitation Post an hour outcomes

Table 1: Demographic details of HCP and newborns

Socio-Demographic Variable		Categories	Frequency	Percentage	Mean, SD
Age (years)		21-25	4	8.7	29.8±4.20
		26-30	21	45.7	
		31-35	16	34.8	
		36-40	5	10.9	
Gender		Male	22	47.8%	
		Female	24	52.2%	
Professional Job Levels		Doctor	34	73.9%	
		Nurse	12	26.1%	
Qualification	Doctors	MBBS	8	23.5	
		FCPS	23	67.6	
		MCPS	1	2.9	
		DCH	2	5.9	
	Nurses	G. Nursing Diploma	7	58.3	
		PRN/ B.Sc.N	4	33.3	
		M.S.N	1	8.3	
Attended Neonatal Resuscitation Training		Yes	29	63.04	
		No	17	36.96	
Duration since last NR training		1 - 2 Years	17	36.96	1.88 ± 0.98
		≤ 3 - 4 Year	11	23.91	
		> 4 Years	1	2.17	
Time Since Most Recent Staff Supervision		< 6 months	13	43.33	4.2 ± 3.12
		6 -12 months	7	23.33	
		> 12 months	10	33.33	
Duration of Practice in Maternity and Pediatric Unit		< 5 years	34	73.9	
		≥ 5 years	12	26.1	
Demographic of Newborns (N=138)					
Gestational Age(weeks)		< 37	91	65.9	34.9 ± 3.0
		≥ 37	47	34.1	
Birth weight		< 2.5 Kg	74	53.6	2.31 ± 0.66
		≥ 2.5 Kg	64	46.4	
Mode of Delivery		SVD	37	26.8	
		Assisted delivery (Vacuum Extraction)	1	.7	
		Caesarean section	66	47.8	
		SVD + Assisted	7	5.1	
		Assisted + C. Section	4	2.9	
		C. Section + Breach	21	15.2	
		Assisted + C. Section + Breech	2	1.5	

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Table 2: Distribution of Newborn resuscitation practice

Preparation for Resuscitation (n=138)	**Practice**	**Frequency**	**Percentage**
Prepare area	Yes	70	50.7
	No	68	49.3
Availability of Equipment	Yes	133	96.4
	No	5	3.6
Check equipment	Yes	134	97.1
	No	4	2.9
Helper identified by HCP	Yes	26	18.8
	No	112	81.2
Drying/Stimulating (n=138)			
Baby dried thoroughly	Yes	132	95.7
	No	6	4.3
Remove the wet cloth	Yes	106	76.8
	No	32	23.2
Baby kept warm	Yes	138	100.0
	No	0	0
Airway Clearance (n=138)			
Checked airway	Yes	137	99.3
	No	1	0.7
Assess for meconium	Yes	105	76.1
	No	33	23.9
Suction done before drying/ stimulating (n=58)	Yes	45	77.6
	No	13	22.4
Child breath before suctioning	Yes	44	31.9
	No	94	68.1
Airway clear with a suction bulb	Yes	133	96.4
	No	5	3.6
Head in a neutral position	Yes	128	92.8
	No	10	7.2
Bag And Mask Ventilation (BMV) (n=104)			
Initiate BMV	Yes	103	99.0
	No	1	1.0
BMV initiated within the Golden minute	Yes	29	27.9
	No	75	72.1
Advanced BMV (n=96)			
HCP call for help	Yes	9	9.4
	No	87	90.6
Use the correct mask size during BMV	Yes	72	75.0
	No	24	25.0
Chest movement Observed	Yes	93	96.9
	No	3	3.1
Check the baby's heart rate after 01 minute of BMV	Yes	82	85.4
	No	14	14.6
Support Ventilation (n=58)			
Chest compressions	Yes	52	89.7
	No	6	10.3
Supportive oxygen	Yes	58	100.0
	No	0	0

The bar chart shows mean scores across five domains, with Support Ventilation scoring the highest at 0.97 ± 0.10.

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Table 3: Association between HCPs NR practices and neonatal outcome

Practices		Baby Well[a] (23)	Oxygen[b] (65)	NICU[c] (40)	Died [d] (10)	X^2	P-Value
Drying/Stimulating (n=138)							
Dried the baby (n=138)	Yes	22 16.7%	62 47.0%	39 29.5%	9 6.8%	a: 0.000 b: 0.021 c: 0.462 d: 0.828	a: 1.000 b: 1.000 c: .672 d: .369
	No	1 16.7%	3 50.0%	1 16.7%	1 16.7%		
Remove Wet Cloth	Yes	16 15.1%	51 48.1%	31 29.2%	8 7.5%	a: 0.814 b: 0.188 c: 0.015 d: 0.062	a: 0.367 b: 0.665 c: 0.903 d: 0.804
	No	7 21.9%	14 43.8%	9 28.1%	2 6.3%		
Baby kept warm	Yes	23 16.7%	65 47.1%	40 29.0%	10 7.2%	a: 0.00 b: 0.00 c: 0.00 d: 0.00	N.A
	No	0 0.0%	0 0.0%	0 0.0%	0 0.0%		
Airway Clearance (n=138)							
Checked airway	Yes	23 16.8%	65 47.4%	39 28.5%	10 7.3%	a: 0.201 b: 0.897 c: 2.468 d: 0.079	a: 0.654 b: 0.344 c: 0.116 d: 0.779
	No	0 0.0%	0 0.0%	1 100.0%	0 0.0%		
Assess for meconium	Yes	17 16.2%	47 44.8%	32 30.5%	9 8.6%	a: 0.072 b: 0.965 c: 0.474 d: 1.147	a: 0.789 b: 0.326 c: 0.491 d: 0.284
	No	6 18.2%	18 54.5%	8 24.2%	1 3.0%		
Suctioned airway before drying (n=58)	Yes	9 20.0%	19 42.2%	15 33.3%	2 4.4%	a: 0.140 b: 1.513 c: 0.496 d: 0.598	a: 0.708 b: 0.219 c: 0.481 d: 0.439
	No	2 15.4%	8 61.5%	3 23.1%	0 0.0%		
Child breath before suctioning	Yes	14 31.8%	24 54.5%	6 13.6%	0 0.0%	a: 10.677 b: 1.437 c: 7.393 d: 5.047	**a: 0.001** b: 0.231 **c: 0.003** **d: 0.018**
	No	9 9.6%	41 43.6%	34 36.2%	10 10.6%		
Airway Clear with a suction bulb	Yes	21 15.8%	62 46.6%	40 30.1%	10 7.5%	a: 2.034 b: 0.346 c: 2.118 d: 0.405	a: 0.154 b: 0.556 c: 0.146 d: 0.526
	No	2 40.0%	3 60.0%	0 0.0%	0 0.0%		
Head in a neutral position	Yes	21 16.4%	64 50.0%	36 28.1%	7 5.5%	a: 0.086 b: 5.956 c: 0.635 d: 8.305	a: 0.769 **b: 0.013** c: 0.425 **d: 0.004**
	No	2 20.0%	1 10.0%	4 40.0%	3 30.0%		
Bag and Mask Ventilation (BMV) (n=104)							
Initiate BMV	Yes	3 2.9%	51 49.5%	39 37.9%	10 9.7%	a: 25.243 b: 0.972 c: 0.606 d: 0.107	**a: 0.001** b: 0.324 c: 0.436 d: 0.734
	No	1 100.0%	0 0.0%	0 0.0%	0 0.0%		
BMV within the Golden minute	Yes	1 3.4%	15 51.7%	8 27.6%	5 17.2%	a: 0.017 b: 0.116 c: 1.686 d: 2.691	a: 0.896 b: 0.733 c: 0.194 d: 0.101
	No	3 4.0%	36 48.0%	31 41.3%	5 6.7%		
Advanced BMV (n=96)							
Call for help	Yes	0 0.0%	4 44.4%	4 44.4%	1 11.1%	a: 0.211 b: 0.024 c: 0.060 d: 0.005	a: 0.646 b: 0.878 c: 0.806 d: 0.943
	No	2 2.3%	41 47.1%	35 40.2%	9 10.3%		
Use the correct mask size	Yes	2 2.8%	31 43.1%	30 41.7%	9 12.5%	a: 0.681 b: 1.687 c: 0.130 d: 1.340	a: 0.409 b: 0.194 c: 0.719 d: 0.247
	No	0 0.0%	14 58.3%	9 37.5%	1 4.2%		
Chest movement	Yes	2	42	39	10	a: 0.066	a: 0.797

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with each Ventilation		2.2%	45.2%	41.9%	10.8%	b: 3.510 c: 2.119 d: 0.360	b: 0.061 c: 0.145 d: 0.548
	No	0 0.0%	3 100.0%	0 0.0%	0 0.0%		
Check the baby's heart rate after 1 minute of BMV	Yes	2 2.4%	35 42.7%	37 45.1%	8 9.8%	a: 0.349 b: 3.968 c: 4.714 d: 0.263	a: 0.555 **b: 0.033** **c: 0.022** d: 0.608
	No	0 0.0%	10 71.4%	2 14.3%	2 14.3%		
Support Ventilation (n=58)							
Initiate chest compression	Yes	0 0.0%	11 21.2%	31 59.6%	10 19.2%	a: 0.00 b: 0.459 c: 0.112 d: 1.394	a: 0.00 b: 0.498 c: 0.738 d: 0.238
	No	0 0.0%	2 33.3%	4 66.7%	0 0.0%		

DISCUSSION

This study examined the practices of 46 healthcare professionals (HCPs) in neonatal resuscitation (NR). The HCPs had a mean age of 29.8 years, with 47.8% being male and 52.2% female. These results are aligned with a study by Guta(10), which found that the mean age of HCPs was 28.6%, with 51.8% of them being men and 48.3% being women. In contrast to the results of our study, Ali et al.(11) reported that all HCPs were female and that their average age was 34.3 ± 6.95. The study found that 73.9% of HCPs were doctors, while 26.1% were nurses. Though just 28.6% of medical professionals practiced NR, Shikuku et al.(8) found that nurses (71.4%) were more likely to be active in NR practices than doctors.

The study observed that 95.7% of HCPs dried the newborn. These results align with a study by Guta(10) in Ethiopia, which indicated that 89% of the HCPs kept the infant warm, 84.6% removed the wet towel, and 82.4% gently dried the neonate. In contrast to what we found, a tiny percentage of nurses (45.6%) in the entire sample dried the baby, and only 26.7% kept it warm (11). Different study designs could be the cause of this disparity. Around 76.8% of healthcare professionals removed wet clothes, and 100% kept the baby warm.

Additionally, 99.3% of HCPs checked the airway, 76.1% assessed the airway for meconium, and 77.6% suctioned the airway when necessary. The current study's results are comparable to those of a study done in Kenya by Shikuku et al (8), which found that 83% of healthcare professionals put the baby's head in a neutral position, 100% of healthcare professionals cleared the baby's airway, and 98% of healthcare professionals checked the baby's airway. However, our findings differ from those of a study conducted in Rwanda by Muganwa et al.(2), which found that 58.7% of HCPs suctioned the airway and 41.0% examined it. 99 % of the HCPs initiated BMV for those newborns who did not respond after airway clearance; only 27.9% initiated BMV in the golden minute. Somehow congruent, 11.1% of the HCPs started BMV in Golden Minute, according to a study by Chaulagain et al. (12) Contradictory findings, however, have been reported by Shikuku et al (8), Guta(10) and Lawn et al[13]who discovered that the majority of HCPs in their research began BMV in the golden minute (78% and 55%, respectively). The discrepancy in results could be caused by a lack of training and refresher courses opportunities and inadequate supervision for HCPs in Pakistan.

The study also found that the HCPs' practices varied across four essential domains of NR. The "Drying/Stimulating" domain showed good practices, with 74.6% of respondents demonstrating "good" skills. Our findings are similar to the findings of Muganwa(2), who reported that 74.7% of the HCPs demonstrated good practices. However, Shikuku et al. (8)reported that 60% of the participants were observed to be good. Meanwhile, in the "Check/Open Airway" domain, 42.8% of the HCPs were demonstrating "Fair" practices. However, Muganwa(2)reported contradictory findings: 85.1% had fair scores. In the domain of BMV, unfortunately, our findings revealed that a higher number of 72.1% HCPs performed poorly. While Shikuku et al. (8) observed only 45% of HCPs performed poor practices. This discrepancy might be due to a lack of support supervision in NR practices in our study, as only 65.2% of HCPs had received support supervision, while Shikuku et al. (8) revealed that 89.3% of HCPs had received support supervision. In the domain of ABMV, the current study showed that 44.8% of HCPs were presented with good practices. Our results are in line with the findings of research conducted by Muganwa (2), who reported that 46.7% of HCPs demonstrated good practices. However, the results of a study conducted by Ahmed(21)reported that 34.5% of HCPs demonstrated good practices. The disparity in findings might be due to differences in HCPs' job titles and experience as in the contradictory study, 30% of the HCPs were nurses and 70% were midwives. Only 15% of them had more than 5 years' experience, whereas in our study, 73.9% of the HCPs were doctors and 26.1% were nurses, and 26% of them had more than 5 years of experience.

The study observed that the mean APGAR score at one minute was 2.8, and at five minutes was 4.9. Furthermore, these results are in agreement with Meena et al.(16), who reported mean APGAR scores of 2.7 at one minute and 5.8 at five minutes. Contrary findings were reported by Guta(10), who revealed mean scores of APGAR 5.9 and 6.8 at one and five minutes of birth, respectively. This disparity may be due to differences in gestational age and birth weight of neonates as in our study, most of the babies were pre-term with low birth weight, while 73.7 % of the babies in Guta's(10) study were delivered at full term and 82% with normal birth weight.

The outcomes of NR practices after one hour revealed that 16.7% of neonates were well, 76.1% were alive on oxygen therapy and admitted in NICU (morbidity), and 7.2% died(mortality). Results of the current study are contradicted with research conducted by Shikuku et al.(8) who reported that 57.9% neonates were observed as well baby, 28.6% neonates were observed as morbidity and 13.5% neonates were died.

The results of the current study revealed that the HCPs' practice of "suctioning before the baby breathes" has a significant association with the neonatal outcome "well-baby" with a p-value of 0.001. Our findings are similar to the findings of Shikuku et al. (8), who reported that suctioning before breath has a significant association with neonatal outcome "alive baby" with (p-value = 0.037). However, according to a meta-analysis on neonatal life support, Wyckoff et al. (22) documented that there is minimal evidence to support the possible advantages of suctioning. Suctioning had no effect on liquid evacuation from the lungs.

The HCPs practice of "placing the baby's head in a neutral position" also has significant association with neonatal outcome "baby alive on oxygen therapy" (p-value = 0.013), it is supported by Wyckoff et al. (22) that proper placement of head promotes optimum airflow while lowering the likelihood of airway blockage. Contrary to our findings, Shikuku et al. (8) documented no significant association between HCPs' practice of "placing the head of newborn in neutral position" and neonatal outcomes of "baby alive" with (p-value = 0.068).

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Also, the current study found a significant association between HCPs' practice of "initiation of bag-and-mask ventilation (BMV)" with neonatal outcome "well-baby" with (p-value <0.05). The findings of the current study are similar to the results of a quality improvement intervention study conducted in Nepal by Chaulagain et al. (12), which reported that the association of HCPs' practice of "initiation of bag-and-mask ventilation (BMV)" was significant (p-value = 0.016) with the outcome "baby breathing well". However, our finding is dissimilar to the study by Shikuku et al. (8), who revealed no significant association between HCPs' practice of "initiate BMV" and neonatal outcomes of "baby alive" with a p-value of 0.84.

Moreover, the current study findings revealed a significant association between HCPs practice "checking the baby's heart rate after 1 minute of advanced bag-and-mask ventilation (ABMV)" with neonatal outcome "alive in NICU" with (p-value = 0.022). A study conducted by Nerdrum Aagaard et al. (23) found that ABMV has been found effective in increasing heart rate, thereby increasing oxygenation, which ultimately results in an increased rate of neonate survival. Another study, conducted by Shikuku et al. (8), found no significant association between HCPs' practice of "checking the baby's heart rate after 1 minute of bag-and-mask ventilation (ABMV)" and neonates' outcome "alive with NICU"(p-value = 0.275).

Each year, around 10 million newborns need assistance to begin breathing. It is estimated that about 5 to 10 percent of all neonates born in healthcare facilities require some form of resuscitation, including tactile stimulation, airway clearance, or positioning. Additionally, approximately 3% to 6% of neonates require basic neonatal resuscitation, which involves these initial steps along with assisted ventilation (17-20).

CONCLUSION

The majority of the health care professionals were inadequately trained for neonatal resuscitation practices. A significant association among health care professionals, neonatal resuscitation practices, and neonatal outcome was observed. About 92.7% of neonates were found alive after resuscitation either with mothers as "well babies" and/or in the nursery as oxygen dependents and/or in the neonatal intensive care unit on ventilator support..

DECLARATIONS

Data Availability Statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned.

Consent for publication

Approved

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Not applicable

CONFLICT OF INTEREST

The authors declared an absence of conflict of interest.

AUTHOR CONTRIBUTION

SHABANA NASIM (M.S. Scholar, UHS)

Conception of Study, Development of Research Methodology Design, Study Design, drafting article, Review of manuscript, final approval of manuscript. Manuscript revisions, critical input.

DR. SAMINA KOUSAR (HoD of Nursing, UHS)

Study Design, Review of Literature, final approval of manuscript

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Data entry and Data analysis.

REFERENCES

1. Alhassan A, Fuseini AG, Osman W, Basour Adam A. Knowledge and Experience of Neonatal Resuscitation among Midwives in Tamale. Nurs Res Pract 2019; 2019:3652608.
2. Muganwa K, Muhayimana A, Mukashyaka J, Meharry P. Quality of basic care during neonatal resuscitation at birth among health care providers at three District Hospitals in Kigali City. Rwanda J Med Health Sci 2020; 3(3): 225-37.
3. Techane MA, Alemu TG, Wubneh CA, Belay GM, Tamir TT, Muhye AB, et al. The effect of gestational age, low birth weight and parity on birth asphyxia among neonates in sub-Saharan Africa: systematic review and meta-analysis: 2021. Ital J Pediatr. 2022 Jul 15;48(1):114.
4. Ayebare E, Ndeezi G, Hjelmstedt A, Nankunda J, Tumwine JK, Hanson C, et al. Health care workers' experiences of managing foetal distress and birth asphyxia at health facilities in Northern Uganda. Reprod Health 2021;18(1):29.
5. Becker J, Becker C, Oprescu F, Wu CJ, Moir J, Shimwela M, Gray M. Silent voices of the midwives: factors that influence midwives' achievement of successful neonatal resuscitation in sub-Saharan Africa: a narrative inquiry. BMC Pregnancy Childbirth 2022;22(1):39.
6. Muhe LM, McClure EM, Nigussie AK, Mekasha A, Worku B, Worku A, et al. Significant causes of death in preterm infants in selected hospitals in Ethiopia (SIP): a prospective, cross-sectional, observational study. Lancet Glob Health 2019;7(8):e1130-38.
7. Muzzamil M, Nisa M, Raza S. The survival rate of neonates in Pakistan: Problems in health care access, quality and recommendations. Health PromotPerspect 2022;12(4):355-7.
8. 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):167.
9. Johnson PA, Schmölzer GM. Heart rate assessment during neonatal resuscitation. Healthcare (Basel) 2020;8(1):43.
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. Ali AEM, EldakhakhnyAM, Mohamed BM, Hanfy MMA. Evaluate Nurses' Practices Regarding Neonatal Resuscitation at Zagazig University Hospitals. Zagazig Nursing J 2023; 19(1): 196-215.
12. 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 Serv Res 2021;21(1):362.
13. Dosoo JK. Determinants of quality neonatal resuscitation among nurses and midwives at the Ga West Hospital.University of Ghana 2022.
14. United Nations. Transforming our world: the 2030 agenda for sustainable development goals. 2015.

15. Meena P, Meena M, Gunawat M. Correlation of APGAR score and cord blood pH with severity of birth asphyxia and short-term outcome. Int J ContempPediatr 2017; 4(4): 1325-8.
16. Bang A, Patel A, Bellad R, Gisore P, Goudar SS, Esamai F, et al. Helping babies breathe (HBB) training: what happens to knowledge and skills over time? BMC Pregnancy Childbirth 2016;16(1):364.
17. YaregalMelesse D, EnyewAshagrie H. Simulation-based neonatal resuscitation education for undergraduate anesthesia students: a pre- and post-evaluation of knowledge and clinical skills. Anesthesiol Res Pract 2022;2022:7628220.
18. Ahmed, M. A. 2022. Neonatal Resuscitation: Knowledge and Practices of Nurses and Midwives in Two Hospitals in Mogadishu, Somalia. University of Nairobi.
19. Wyckoff, M. H., Wyllie, J., Aziz, K., De Almeida, M. F., Fabres, J., Fawke, J., Guinsburg, R., Hosono, S., Isayama, T. & Kapadia, V. S. 2020. Neonatal life support: 2020 international consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. Circulation,142(16_suppl_1): S185-S221
20. Nerdrum Aagaard, E., Solevåg, A. L. & Saugstad, O. D. 2023. Significance of Neonatal Heart Rate in the Delivery Room—A Review. Children,10(9): 1551.
21. Weiner, G. M. & Zaichkin, J. 2022. Updates for the Neonatal Resuscitation Program and Resuscitation Guidelines. NeoReviews,23(4): e238-e249.
22. Asadollahi, K., Karimi, A., Rezaei, N., Mussavi, M., Azizi, M. & Daliri, S. 2024. The Apgar Score: A Predictor of Clinical Adverse Outcomes during the Neonatal Period. Journal of Basic Research in Medical Sciences: Volume,11(2).
23. Dawood, Z. & Majeed, N. 2022. Assessing neo-natal mortality trends in Pakistan: an insight using equity lens. Archives of Public Health,80(1): 7.

[Citation: Nasim, S., Kousar, S., Latif, W. (2025). Practices and outcomes of neonatal resuscitation for newborns with birth asphyxia in tertiary care hospitals in Lahore, Pakistan. *Pak. J. Inten. Care Med.* ***2025****: 49.* doi:https://doi.org/10.54112/pjicm.v5i01.49]