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Original Research Article

STUDY OF FACTORS CONTRIBUTING TO CLINICAL OUTCOME OF NEWBORNS REFERRED FROM PERIPHERY TO TERTIARY CARE TEACHING INSTITUTE

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ABSTRACT

Background: This study evaluated the condition of referral and quality of transportation of newborns referred to our institution, clinical status at the time of admission and the outcome of these newborns.

Materials and Methods: This Hospital-based descriptive type of Prospective Observational study enrolled 256 newborns from the Department of Paediatrics, SMS Medical College, Jaipur from May 2017 to April 2018. All newborns were assessed by a structured case performa relating to pre-transport and intra-transport conditions. The TOPS score of each newborn was recorded on arrival and they were followed concerning their final diagnosis and outcome.

Results: The maximum referrals were from government hospitals (75.8%), and most of the referral notes were incomplete (70.56%). The incidence of poor outcomes was directly proportional to the TOPS score on the arrival of the newborn.

Conclusion: The neonatal referral system needs to be improved urgently to improve the outcomes of referred newborns.

Keywords: neonatal transport, referral, neonatology, TOPS score

INTRODUCTION

Our country has significantly reduced the infant mortality rate (IMR) from 81 per 1000 live births in 1990 to 34 per thousand live births in 2016. However, the same is not true for neonatal mortality rate (NMR).[1] The government with the active support of UNICEF has established special newborn care units (SNCUs) at the district level. To establish at least 1000 such units, more than 600 such units have already been established all across the country. The SNCUs provide free treatment, medicines and supplies under the Government's Janani Shishu Suraksha Karyakram (JSSK).[2,3] The history of neonatal transport began in the late 1960s when police vans or other public modes of transport were used but nowadays the transport team functions as an extension of NICU.

In 2005, the National Ambulance System (NAS) was launched under the National Health Mission (NHM). NAS is classified into two services 108 and 102. 108 services are Emergency Response Systems (ERS) transporting accident victims, critical cases, trauma and other emergency patients. 102 services consist of a basic public transport system for the needs of pregnant women and children.

Before commencing the transport, the referring physician should contact and inform the referral hospital physician regarding the need for transport and the condition of the neonate before transport. Most of the time ground-level transport is ideal since it delivers the care door to door, several treating personnel can be accommodated and the family members also can be accommodated

moreover it is efficient for rural and remote areas. When the long duration of travel is a concern and the general condition of the baby is so critical that long duration is detrimental to the health of the baby then air mode can be used but it carries the risk of high pressure and low oxygen content.[4]

The most common indications for referral include very low birth weight, surgical conditions and hemodynamically unstable patients. The referring hospital should stabilize the neonates and refer the child with proper referral details and indications for referral. Stabilisation includes maintenance of airway, oxygenation, circulation, blood glucose and temperature, securing umbilical venous and arterial access, if possible; obtaining appropriate cultures and blood investigations, chest X-ray and giving first doses of antibiotics; inserting a Nasogastric tube and decompressing the stomach; obtaining initial transport consent from parents and obtaining copies of obstetric and neonatal charts for the transport team. The referral institute should be informed before transport so that there is no delay in the institution of care.

Neonates transported by the trained team had favourable outcomes when compared to the unorganized transport or by using their own modes of transport. The major contributor to neonatal morbidity and mortality is temperature instability hence it is also more important to be maintained during the transport, especially in preterm neonates. Hypothermia is the forerunner of hypoxemia, hypoglycaemia, metabolic acidosis and persistent pulmonary hypertension. In stable preterm babies, KMC and in unstable incubator can help.

Normal Spo2 for a room-air-breathing term or healthy preterm infants is reportedly greater than 93%, with Pao2 levels above 70 mm Hg. In neonates, supplemental O2 is usually administered using a headbox, mask, nasal cannula, nasal continuous positive airway pressure (CPAP) or a mechanical ventilator. The risks of hyperoxia need to be balanced with that of hypoxia.

Proper perfusion of the newborn should be maintained and treatment of shock should occur before transport during the stabilization phase of management. While managing seizures, periodic assessment of vitals should be started with the commencement of anticonvulsant therapy.

Severe hypoglycaemia is a well-known risk factor for neuronal cell death and adverse neurodevelopmental outcomes. Therefore, the hypoglycaemia should be recognized and treated promptly. During transport, non-invasive means of measuring the vital parameters using pulse oximetry is crucial.[4]

MATERIALS AND METHODS

This Hospital based Descriptive type of Prospective Observational study was conducted at the Pediatric Emergency Department, SPMCHI, Jaipur from May 2017 to April 2018 after getting ethical clearance from the Institutional Ethics Committee. A total of 265 newborns referred from the periphery to our institute were enrolled after stabilisation and obtaining informed consent from their parents. Those with gross congenital malformations were excluded.

A structured case performa was used to obtain information relating to pre and intra-transport conditions. Initially, demographic details of the baby and parents were obtained. The details of the referral were obtained from the referral note and supplemented by interviewing parents/ accompanying persons. The referral slip was analysed based on four dimensions – pre-transport investigations, pre-transport treatment, pre-transport stabilisation and reasons for referral. Pre-transport information obtained will include the details of the referring hospital, duration of stay before referral, distance between the referral centre and referral note.

The nature of transport that was used, the vehicle, the accompanying personnel, facilities like oxygen, thermoregulation and pulse oximetry available during transport and the duration of transport were also assessed.

On receiving the newborn in the emergency room, the TOPS Score and the basic Triage classification were done and recorded on the performa. Temperature, Oxygenation, Perfusion and Sugar (TOPS), a simplified assessment of neonatal acute physiology gives a good prediction of mortality in these neonates. Hypothermia, hypoxia, prolonged CFT and hypoglycaemia were defined as temperature<36.5C,SpO2<90%,CRT,≥3s and blood sugar <40 mg/dl respectively. Each parameter is assigned a score of 1 if abnormal and 0 if normal. All the enrolled newborns were followed for their final diagnosis and their outcome. The relation between the pre-transport, intra-transport conditions and the TOPS Score on admission was correlated with the outcome of the newborn.

The results were described as a percentage and mean (standard deviation) or median (inter-quartile range) according to the distribution of data. Comparison of proportions were done by Chi-Square test or Fischer exact test as applicable. The mean and median were compared using a t-test or Man Whitney U test as applicable.

RESULTS

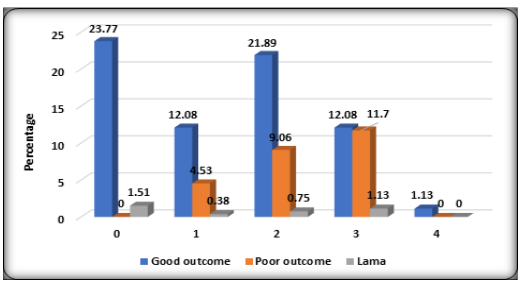

Figure 1: Relation between TOPS score and mortality

Table 1: Referral notes and final outcome

	Discharge (No/%)		Death (No/%)		Lama	
	No.	%	No.	%	No.	%
Complete	31	11.70	25	9.43	3	1.13
Incomplete	141	53.2.1	39	14.72	7	2.64
Not provided	3	1.13	0	0.00	0	0
No/lost	11	4.15	3	1.13	0	0
Total	196	73.96	69	26.04	10	3.77

Chi-square = 13.759 with 6 degrees of freedom; P = 0.032

Table 2: Pre-transport Care

	Yes (%)		No (%)		Not known (%)		Total no
Temp. Maintained	34	12.83	0	0.00	231	87.17	265
Saturation Maintained	61	23.02	33	12.45	171	64.53	265
RBS(mg/dl)	42	15.85	12	4.53	211	79.62	265
IV Fluid	232	87.55	33	12.45	0	0.00	265
Antibiotics	196	73.96	69	26.04	0	0.00	265
Haemodynamic Stability	18	6.79	12	4.53	235	88.68	265

Table 3: Care during Transportation

		Number of cases	%
Thermo regulation during transport	a. Hot water bottle	-	-
	b. Preheated mattress	42	15.85
	c. KMC	-	-
	d. Blanket	75	28.30
	e. Incubator	-	-
	f. Towel	139	52.45
	g. None	3	1.13
	h. Warmer	6	2.26
Ventilation	Ventilator	-	
	CPAP	-	
	AMBU Bag	15	5.66
	None	250	94.34
Monitoring	Pulse oximeter	29	10.94
	BP monitor	-	-
	Multipara monitor	-	-
	Manual monitoring by accompanying person	-	-
	None	236	89.06

	Yes (%)		No (%)		Not known (%)	
Oxygen administered	204	76.98	61	23.02	0	0
IV fluid given	201	75.85	64	24.15	0	0

Table 4: Individual component of TOPS

Temperature	No	%		
<36.5 C	190	71.69		
≥ 36.5	75	28.30		
Total	265	100		
	Good outcome (No/%)	Poor outcome (No/%)	LAMA (No/%)	Chi square test P value 0.017
Hypothermic (<36.5 C)	127 (47%)	57 (21%)	6 (2%)	
Euthermic (≥ 36.5)	61 (23)	10 (3%)	4 (1%)	
SPO2	No	%		
≥94%	76	28.68		
91%-93%	27	10.19		
85%-90%	46	17.36		
<85%	110	41.51		
Spo2 not recorded	6	2.26		

Table 5: Triage classification and outcome

Triage classification	Total	Good outcome (No/%)		Poor outcome (No/%)		Lama (No/%)	
Stable	89	76	28.68	9	3.40	4	1.51
Respiratory distress	92	73	27.55	15	5.66	4	1.51
Respiratory failure	3	0	0.00	3	1.13	0	0.00
Respiratory failure with hypotensive shock	42	18	6.79	23	8.68	1	0.38
Primary brain dysfunction	12	12	4.53	0	0.00	0	0.00
Cardiopulmonary failure	9	6	2.26	3	1.13	0	0.00
Primary brain dysfunction with resp. failure	18	3	1.13	14	5.28	1	0.38
Total	265	196	70.94	69	25.28	10	3.77

Chi-square = 75.714 with 12 degrees of freedom; P = 0.000

DISCUSSION

Neonates are at much higher risk than any other age for life-threatening events and it is considered to be the highest mortality period of human development. At-risk fetuses identified during intrauterine evaluation need to be delivered in medical centers where intensive care can be provided at birth itself. Unfortunately, preterm delivery, perinatal illness and congenital malformations cannot always be anticipated, resulting in a continuing need for the transfer of these neonates after delivery to a higher centre capable of providing care for such infants. Transport services are also required for back-referral to the level II unit once the infant has improved and no longer needs intensive care.

We found that mortality among the incomplete referral slip group (24.5%) was less as compared to the complete referral slip (40%). The reason for this paradoxical result is probably that more sick babies were referred with complete referral slips while less sick babies were referred with incomplete referral slips. A similar study was conducted in Saudi Arabia in which they found poor quality referral slips in 23% of cases.[7] Similarly, VMMC Safdarjung, New Delhi in 2014 received 1/3rd of babies without any referral notes(8), Muhydeen Abiodun Abdul Raheem et al found only 42.0% had referral letters,[9] Dr B. Shalini et al. found that referral letter was given for 82% referrals and only 10% were accompanied by trained paramedic or doctor.[10] whereas P. Sampath Kumar et al. found that 11% of babies did not have any referral slip.[11]

In the hypothermic group (about 71% of total patients) poor outcome was 30% whereas in the euthermic group poor outcome was 13.3% which was statistically significant. Similar results were obtained by Kambarami et al where hypothermia in the neonatal period is associated with poor outcomes,[12] Ekta Dalal et al in BJMC Ahmedabad India found mortality was 52%,[13] Suresh Kumar Verma et al in 2017 found 46.67% neonates hypothermic and mortality was 34%,[7] Dr B. Shalini et al found 60% were hypothermic and mortality in 36%.[10]

The incidence of poor outcomes in the hypoxic group (56% of the total patients) was 34.8%, while it was 7.4% in the non-hypoxic group which was significant. The same results were with Ekta Dalal et al where 27.4% were hypoxic and had a mortality of 56%,[13] Suresh Kumar Verma et al found a mortality of 40% among all hypoxic (39.23%) patients,[7] Dr B. Shalini et al found 50% were hypoxemic and mortality was in 44%,[10] P. Sampath Kumar et al found 15% had hypoxia and a mortality of 15%.[11] Prolonged CFT was associated with poor outcomes (26% of total patients) in 52.8% whereas the incidence of poor outcomes in babies in the normal CFT group was 15.38%.

Similarly, Ekta Dalal et al found 23.4% hypoperfused and poor outcome in 64%,[13] Suresh Kumar Verma et al found poor perfusion (14.61%), with mortality of 63%,[7] Dr B. Shalini et al found 26% babies hypoperfused and poor outcome in 76%(10); P. Sampath Kumar et al found 15% had prolonged CRT on arrival and 15% were having poor outcome.[11]

Poor outcome was seen in 22 % of euglycemic babies whereas it was seen in 76.5% of the hypoglycemic group (about 5% of total patients). Similarly, Ekta Dalal et al found that 20.6% had hypoglycemia and 67% had poor outcome,[13] Suresh Kumar Verma et al found hypoglycaemia in (21.28%) patients,[7] Dr B. Shalini et al found 10% hypoglycemic and mortality was in 45% of patient,[10] P. Sampath Kumar et al found 35% had hypoglycemia with mortality of 45%.[11]

TOPS scoring of newborns was done at admission and we found a statistically significant relation between TOPS score and outcome. TOPS scores were calculated at arrival and 71.69% of babies were hypothermic, 55.47% hypoxic, 25% with prolonged CFT and 4.9% were hypoglycemic as per TOPS score. The incidence of poor outcome in the group with zero sore was 0%, one score was 26.5%, two score was 28.9% and three score was 46.8% four score was in 1% of cases.

Similarly, Ekta Dalal et al found TOPS score (one 40.3%, two 16%, three 12.4%, four 4.3%), 23.7% expired (septicaemia 46.4%, birth asphyxia 18.3%, meconium aspiration 15.5%),[13] and Dr. D. Manikyamba found that mortality was higher in babies with 3 or more abnormal parameters of TOPS at admission.[15]

We had more than 3/4th newborns referred from government hospitals (N=201, 75.84%) while the rest were from private and charitable hospitals. A large proportion was contributed by SNCUs.In our study we found that the main modality of transport was Govt. ambulance 108/ 102 (N=150, 56.6%), while 27.55% were transported by private ambulance, which is similar to the study conducted at SNCU of Dharmapuri Medical College where 75% of neonates were transported by ambulance and rest by other modalities.[14] Sehgal et al found that only 5% of neonates are transported by ambulance.[16] A study conducted at JIPMER Pondicherry showed that 11% of newborns were transported by Government ambulance,[17] M. Thenmojhi et al found 60% were transported by ambulances(18); Ekta Dalal et al found 47.3% were transported in ambulance.[13] Muhydeen Abiodun Abdul Raheem et al found that private vehicles (43.9%), commercial vehicles (40.6%), motorcycles (9.0%), ambulances (4.0%) and on foot,[9] and in P. Sampath Kumar et al 67% of referrals from PHCs did not utilize ambulance facility.[11]

Among the transported babies 3% were escorted by a doctor and 15.8% of babies were transported by a nurse. 83% of babies were transported without any health care personnel. Mother accompanied baby in only 4.5% of cases. In study by M. Thenmojhi et al, 60% (294) were accompanied by medical personnel

and the remaining 40% (196) were accompanied by family members (18); Ekta Dalal et al found 55.7% were accompanied by untrained relatives, 15% by doctor or nurse and 28% paramedical person.[13]

CONCLUSION

This prospective study revealed an urgent requirement for improvements in the neonatal referral and transport system. The provision of a free ambulance service is only one minuscule component of the system. The other components of communication, pre-transport stabilization, intra-transport monitoring and back referral services require urgent attention to improve the outcomes of referred neonates.

Limitations: We relied on information given in the referral slips and that provided by accompanying family members. We were unable to actually verify the same by visiting or interviewing the referring personnel. It is possible that documentation in referral slips may not have been complete and more investigations, procedures or treatments were performed than known to the family or documented in the slips.

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