

## PRE TRANSPORT FACTORS AND TRANSPORT QUALITY AFFECTING THE NEONATAL OUTCOME

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### HOW TO CITE THIS ARTICLE:

Sunil Kumar Rao, Naresh Bajaj, Ashok Rawat. "Pre Transport Factors and Transport Quality Affecting the Neonatal outcome". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 12, February 09; Page: 1991-1995, DOI: 10.14260/jemds/2015/287

**ABSTRACT: AIM:** To study the determinant of mortality on extramural arrival of sick newborns and mode of neonatal transport at tertiary care Centre. **BACKGROUND:** Neonatal transport system in our country is major gap in holistic newborn care and acute neonatal physiology is deranged during transport which adversely affects the mortality and morbidity of sick newborns. **MATERIAL & METHODS:** This is prospective observational cohort study carried out in out born neonatal intensive care unit over a period of one year. Inclusion criteria were age up to 28 days, delivered at home or private nursing home or any health centre; and exclusion criteria were age more than 28 days, abandoned newborns and those delivered in the institution of study. A predesigned and tested proforma was used to record information by the pediatric resident on duty at time of neonatal admission. Data were analysed and tabulated, for analysis of data software STATISTIX was used, chi-square test for dichotomous variables and multiple logistic regression for predictors of mortality. **RESULT:** Out of 200 newborns 146 were male and 54 were female, 140 were term and 59 were preterm, 39 newborns expired and common mode of transport was taxi 47%, bus 16%, auto 16% and ambulance 2.5%. The common factors determining the outcome were low admission weight, prematurity, longer duration of transport and deranged physiological factors e.g. hypothermia, respiratory distress, prolonged CRT and central cyanosis. **CONCLUSION:** This study concludes that neonatal transport in our country is self-supported; the ideal element of neonatal transport is major gap in holistic neonatal care. Thus we suggest RUSH-IN FACILITY for neonatal transport.

**KEYWORDS:** Transport, Sick Newborns, RUSH-IN.

**INTRODUCTION:** Neonatal and child health care facilities in our country scaled up in recent years under NRHM. Home visits by community health workers provide skilled care, early detection of danger signs and referral of sick newborns to health facility. There is expansion of Special Care Newborn Unit, still sick neonates do not arrive in time and once irreversible pathophysiology has set in before reach to health facility, the probability of mortality is increased. Early neonatal mortality account for up to 2/3<sup>rd</sup> of all neonatal deaths.<sup>1</sup> The facility of neonatal transport in our country is major gap in Holistic Newborn Care. The present study has been carried out to identify the determinant of mortality on extramural arrival of sick newborns and status of neonatal transport at tertiary care Centre.

**MATERIAL & METHODS:** This is prospective observational cohort study, conducted in Out-born Neonatal Intensive Care Unit, Department of Pediatrics, Gandhi Memorial Hospital, Rewa M.P. over a period of one year from May 2009 to August 2010. Informed consent was taken from the parents before start of study. Inclusion criteria were, age group up to 28 days, delivered at home, or private nursing home or any health Centre and exclusion criteria were, age more than 28 days, abandoned

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newborns and those delivered in the institution of study. All the included neonates were assessed for place of birth, person conducting delivery, reason for referral, time taken during transport, mode of transport, gestational maturity, weight, referral note, pre-referral treatment, care during transport and deranged physiological state on arrival e.g. hypothermia, prolonged CRT, central cyanosis and respiratory distress. Hypothermia was defined as extremities cold to touch, Central Cyanosis as dusky bluish discoloration in mucous membranes or perioral areas, delayed Capillary Refill Time as 3 seconds or more, and Respiratory Distress as respiratory more than 60 per minute with significant subcostal or lower chest in drawing. Patient outcome was assessed in terms of Death, Discharge and Mode of Transport. A predesigned and tested proforma was used to record information by the paediatric resident on duty at the time of all neonatal admissions. Analysis of data was done by the software STATISTIX and for dichotomous variables the chi-square test was used. Multivariable analysis for predictors of mortality was done by multiple logistic regression.

**RESULTS:** Out of 200 newborns in study cohort, 146 (73%) were male and 54 (27%) were female, 141 (70.5%) were term and 59 (29.5%) were preterm, 140 (70%) were belongs to rural community and 183 (91.5%) were delivered at health facility. Neonatal characteristics were grouped in (Table 1). Out of 200 newborns included in the study 39 (19.5%) were expired. Common mode of transport used to bring the sick neonates by parents was public transport (Table 2) i.e. Taxi 47%, Bus 16%, Auto 16% and ambulance 2.5% on payment. None of the mode of transport had facility to provide care during transport. The deranged physiological status on time of admission was grouped in (Table 3) and neonates grouped according to number of deranged condition present at time of admission and its effect on mortality (Table 4).

Independent predictors of mortality were prematurity, admission weight < 2 kg, spent time more than 2 hours to reach the facility, and poor perfusion, central cyanosis (Table 5). Though hypothermia and respiratory distress were independently did not predicted mortality but it was found that hypothermia ( $p=0.0027$ ) was significantly associated with mortality in full term normal weight newborns, and respiratory distress was significantly associated with mortality in full term normal weight ( $p=0.0067$ ) and low birth weight ( $p=0.04$ ). Other factors have also been studied e.g. place of delivery, person conducting delivery, pre-referral treatment, time of referral and referral note; none of these was found to be statistically significant in contributing to death of newborns.

**DISCUSSION:** The determinants of mortality at arrival of sick newborns in present study were admission weigh less than 2 kg (30%), Prematurity (32.2%), Duration of travel more than 2 hours (56.25%), Cyanosis (19%), Delayed CRT (43.42%). Hypothermia (44.45%) and Respiratory Distress in Full Term Low birth weight neonates. These observations were similar to those of, Pankaj Buch et al<sup>2</sup> Arvind Sehgal et al<sup>3</sup> and Abhay Bang et al<sup>4</sup> i.e. factor contributing to high mortality were LBW, prematurity, hypothermia, delayed CRT, cyanosis and long transport time.<sup>2,3,4</sup>

Common modes of transport in our study were Taxi 47%, Bus 16%, Auto riksha 16%, private vehicle 16% and ambulance 2.5% (Table 2). These observations were similar with Pankaj Buch et al,<sup>2</sup> Deepak Rathod et al<sup>4</sup> and Ekta Dalal et al<sup>5</sup> except use of ambulance 26.8% and 36% respectively. Most of the parents spent money for transporting the sick newborns, none of the convince mode had provision of care during transport, during which irreversible pathophysiology had set in during transport, even best care at facility may not give satisfactory results. Deranged pathophysiology in

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sick neonates earliest recognised by simple clinical parameter which are studied in present study i.e. hypothermia (27%), delayed CRT (38%), cyanosis (19%) and respiratory distress (28.5%). (Table 3) Bhoopalam et al,<sup>7</sup> Mathur et al<sup>8</sup> and Rathod et al in their study found hypothermia as the morbidity in transported neonates.

A scoring system TOPS was developed by Mathur NB et al<sup>8</sup> to assess acute neonatal physiology of transported neonates and validity of score was study by author Ekta Dalal et al<sup>5</sup> to predict the mortality. The parameter studied were temperature, oxygen saturation, skin perfusion and blood glucose level. 100% mortality was found when all the four parameter of TOPS were deranged. Similarly in present study derangement in all four clinical parameters i.e. hypothermia, respiratory distress, poor perfusion and central cyanosis was associated with 100% mortality, and 2 or more deranged conditions predict the mortality (Table 4). Early recognition of these clinical parameters before and during transport can arrest progression of morbidity and help in recovery. Neonatal Transport Facility are not encouraging in India and study by P. Kumar et al<sup>9</sup> show that skilled organized transport for sick neonates reduces mortality and morbidity.

**CONCLUSION:** This study concludes that neonatal transport in our country is self-supported and ideal element of neonatal transport is major gap in holistic care of newborns. The acute neonatal physiology is affected during the transport and adversely affects the outcome. Early recognition of acute physiology of newborns to assess need of referral, care during transport and initiation of management at NICU without delay will arrest progression of morbidity, help recovery and decrease mortality.

We suggest RUSH-IN Facility approach i.e. R-Recognition of acute neonatal physiology, U-Urgent referral, S-Stabilization before referral, H-Hospital care during transport, I-prompt Initiation of management at NICU. And neonatal transport system equipped with Bag and Mask, oxygen, warm source, IV drip and paramedic skill in basic neonatal resuscitation

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Characteristics		Number	%
Preterm		59	29.50
Term		141	70.50
Male		146	73.00
Female		54	27.00
Rural		140	70.00
Urban		60	30.00
Home delivery		17	8.50
Hospital delivery		183	91.50
Routine hour		109	54.50
Emergency hour		91	45.50
Admission weight (n=200)	≥2.5 kg	73	36.50
	≥1.5 kg	102	51.00
	<1.5 kg	25	12.50
Duration of travel (n=200)	<2 hour	168	84.00
	>2 hour	32	16.00

**Table 1: Neonatal characteristics of study cohort**

Mode of Transport	Number	%
Autoriksha	32	16.00
Riksha	4	2.00
Bus	32	16.00
Motorcycle	21	10.50
Private vehicle	12	6.00
Taxi	94	47.00
Ambulance	5	2.50
<b>Total</b>	<b>200</b>	<b>100.0%</b>

**Table 2: Mode of transport used by subject in study cohort**

Physiological status	Number	%
Hypothermia	54	27.00
Respiratory distress	57	28.50
Shock	76	38.00
Cyanosis	38	19.00

**Table 3: Deranged physiological status of neonates on time of admission**

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Outcome	Number			
	One (n=84)	Two (n=63)	Three (n=45)	Four (n=8)
Survival (n=161)	81 (86.43%)	55 (87.30%)	25 (55.56%)	0 (0.00%)
Expired (n=39)	3 (3.57%)	8 (12.70%)	20 (44.44%)	8 (100.0%)
P value		0.037	< 0.0001	

**Table 4: No. of Deranged physiological status of neonates on time of admission**

Variable	Unstandardized co-efficient		Std. co-efficient beta	t	P
	Beta	Std. Error			
Preterm	0.122	0.053	0.140	2.297	0.023
Admission wt. < 2 kg	0.001	0.000	0.153	2.498	0.013
Duration of travel > 2hrs	0.133	0.064	0.123	2.095	0.038
Shock (Delayed CRT)	0.224	0.059	0.271	3.778	0.000
Cyanosis	0.239	0.072	0.290	4.067	0.000
Hypothermia	0.051	0.005	0.056	0.782	0.435
Respiratory distress	0.119	0.066	0.147	1.882	0.073

**Table 5: Multiple logistic regression for independent predictors of mortality**

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Date of Submission: 16/01/2015.  
Date of Peer Review: 17/01/2015.  
Date of Acceptance: 30/01/2015.  
Date of Publishing: 07/02/2015.