

## Original Research Article

# A study on status of neonatal transport to a level III neonatal intensive care unit

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**Received:** 01 March 2018

**Accepted:** 28 March 2018

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### ABSTRACT

**Background:** In the past decade, great advancements in Neonatal care contributed to a fall in IMR. A further fall in IMR can only be achieved by improving the neonatal transport facilities. Hence to assess the current status of neonatal transport we undertook this study.

**Methods:** This is a cross-sectional study of 75 neonates transported to our NICU. For all the babies, data regarding the place of birth, mode of delivery, mode of transport, etc. were collected. On admission parameters like blood glucose, temperature, CRT, SPO<sub>2</sub>, the presence of cyanosis, shock was assessed.

**Results:** In the present study 64% of neonates came to our NICU on their conveyance. 67% of referrals from PHCs did not utilize ambulance facility. 30% of neonates had hypothermia on arrival. 35% had hypoglycemia on arrival. 15% had a low oxygen saturation on arrival. 15% had prolonged CRT on arrival. Only 8% of neonates received prior treatment. 11% babies did not have any referral slip. Only a very few had complete and proper referral advice.

**Conclusions:** To further reduce the neonatal mortality rate, the neonatal transport facilities should be upgraded. A standard protocol should be formulated for interfacility transport. A separate fleet of neonatal ambulances well equipped and manned by trained personnel is the need of the hour.

**Keywords:** Ambulance, Infant mortality rate, Neonatal intensive care unit, Neonatal transport, Pre-hospital stabilization

### INTRODUCTION

The Millennium developmental goal-4 aims to lower the IMR from 1990 level of 84 per 1000 live births to 28 per 1000 live births by the year 2015. Two-thirds of IMR is contributed by deaths within the first week of life.<sup>1</sup> The major causes of neonatal mortality are prematurity, birth asphyxia, and sepsis. In the past decade, we witnessed great advancements in neonatal care under NRHM, IMNCI and CEMONC programmes. This has helped in bringing down the infant mortality rate significantly. However, the status of neonatal transport still remains in primitive stage.<sup>2</sup> Hence a further fall in IMR will only

achieve when neonatal transport facilities are improved. Though institutional delivery and in the utero transport of new-born is the safest way to transport a sick neonate, unfortunately, preterm delivery and perinatal illness cannot be always anticipated. This results in the continuous need for transport of these babies.<sup>3</sup> These babies are often critically ill, and the outcome is also dependant on the effectiveness of transport system.

In most of these new-born babies, the ineffective transport system results in hypoglycemia, hypothermia, cyanosis and other complications. These complications further increase the mortality among these sick neonates.<sup>4</sup>

## METHODS

The cross-sectional study was conducted in the year 2017 at Government Mohan Kumar Mangalam Medical College and Hospital Salem.

### Inclusion criteria

All babies referred to our NICU are included in the study.

### Exclusion criteria

- Since the aim of the study is to analyze the effectiveness of neonatal transport in emergency situations, nonurgent cases and babies more than 24 hours aged are excluded from the study
- Babies born intramurally are also excluded from the study.

### Study protocol

After getting consent for the study from the parents, following data were recorded for all the babies in the study group.

- Time of birth
- Place of birth
- Birth-arrival interval
- Mode of delivery
- Birth weight
- Gestational age,
- Temperature,
- SpO<sub>2</sub> by a pulse oximeter
- Blood sugar
- Capillary refill time
- Cyanosis,
- Mode of transport
- An accompanying person,
- Provision of warmth during transport
- Provision of Kangaroo Mother Care during transport
- Availability of referral slip-complete or incomplete
- Pre-transport stabilization.

### Case definitions

Case definitions of IMNCI for Hypoglycaemia, Hypothermia, gestational age, birth weight and shock were used for this study.

- Hypoglycemia: Blood glucose < 45mg/dl
- Hypothermia: axillary temperature by thermometer (graded by IMNCI guidelines)
- Cyanosis: Cyanosis of soles, perioral region and not just of the oral mucosa
- CRT: Delayed if more than 3 seconds
- LBW: Birth weight <2.5 kg
- VLBW: birth weight <1.5 kg
- Preterm baby: Born <37 weeks.

- Extreme preterm: Born <28 weeks.

Sepsis, birth asphyxia, MAS were diagnosed as per National Neonatology Forum guidelines.

## RESULTS

In the present study, most of the babies (88%) were transported within 6 hours of birth. 10% were transported within 7-12 hours. 1% were transported between 13-18 hours. None were brought to hospital after 19-24 hours of delay This finding reassures the promptness with which the neonates are referred to our NICU.

**Table 1: Age distribution among neonates n = 100.**

Age in hours	No. (%)
0-6	66 (88 %)
7-12	8 (10 %)
13-18	1 (1 %)
19-24	0
Total	75 (100 %)

Among those babies referred to NICU, 75 babies. Home delivery was 3%, primary health care set up delivery were around 69%, government hospital birth was 9%, private hospital sector was 9%. All the babies are admitted in NICU under full medication support.

**Table 2: Place of birth.**

Place of birth	No. (%)
Home delivery	2 (3)
Primary health care centre (PHC)	52 (69)
Government hospitals (GH)	14 (19)
Private hospital	7 (9)
Total	75 (100)

In the present study, about 64% of neonates did not have proper transport facilities and arrived at the hospital at their own conveyance. A non-ambulance transport places the neonate at increased risk for mortality and morbidity. Own conveyance transport has major risk factors which to be faced during treatment hours.

**Table 3: Mode of transport.**

Mode of transpo	No. (%)
108 ambulance	19 (2)
Private ambulance	3 (4)
Government ambulance	5 (7)
Own conveyance	48 (64)
Total	75

The common reasons for referral in the present study are preterm (41%), birth asphyxia (27%) and respiratory distress syndrome (21%). Preterm was around 41%, meconium asphyxia were 20%, sepsis were 5%,

congenital anomalies were 3%. Some of the referred neonates had multiple morbidities and only the dominant illness is considered here for classification.

**Table 4: Diagnosis arrival.**

Diagnosis	No. (%)
Respiratory distress syndrome	16 (21)
Preterm	31 (41)
Birth asphyxia	20 (27)
Meconium aspiration syndrome	6 (8)
Sepsis	4 (5)
Congenital anomalies	2 (3)
Others	2 (3)
Total	75 (100)

In the present study, 27% of babies had mild hypothermia, 3% of babies had moderate hypothermia at the time of admission.

Normal body temperature was observed is around 53%, none of the cases had severe hypothermia. These babies were not provided with 'warm chain' during transport.

**Table 5: Body temperature on arrival.**

Temperature	No. (%)
Normal	53 (71)
Mild hypothermia	20 (27)
Moderate hypothermia	2 (3)
Severe hypothermia	0
Total	75 (100)

In the present study, hypoglycemia was noted in 45% of babies at the time of admission. Hypoglycemia was around 34%.

**Table 6: Blood glucose level on arrival.**

Blood glucose level	No. (%)
Normal	41 (55)
Hypoglycemia	34 (45)
Total	75 (100)

Out of those babies transferred to our NICU normal SPO<sub>2</sub> was seen in 85% of babies, low SPO<sub>2</sub> was observed in 15% of babies at the time of admission.

**Table 7: Oxygen saturation on arrival.**

SPO <sub>2</sub> level	No. (%)
Normal	64 (85)
Low	11 (15)
Total	75 (100)

In the present study, 15% of the babies have prolonged capillary refill time. Normal capillary refilling was observed in 85% of babies.

**Table 8: Capillary refill time on arrival.**

Capillary refill time	No. (%)
Normal	64 (85)
Prolonged	11 (15)
Total	75 (100)

This finding emphasizes on the importance of pre-transport stabilization of the neonates.

## DISCUSSION

A source of confusion has been that designations for levels of care are variably applied to units caring for newborn infants and to the hospitals themselves.<sup>5</sup> Facilities are usually designated by the highest level of care they provide, although they may provide less complex care as well. One exception may be freestanding children's hospitals, which may provide specialty and subspecialty care but transfer newborn infants to other facilities (often the hospital of birth) for lower levels of care as their medical conditions improve.<sup>6</sup>

Some hospitals have single units that integrate specialty and subspecialty care, and others have separate units for each level. Regional centres are hospitals that include the highest level of NICU care and serve regional needs through education, data collection, and transport services. Some perinatal centers with large delivery services have NICUs but depend on agreements with neighbouring institutions for paediatric subspecialty services including advanced imaging and operating rooms.<sup>7</sup> In some regions, perinatal centers may be great distances from pediatric subspecialty care. Golden hour concept any insult to the neonatal brain occurring in the first few hours of life will increase their mortality and morbidity.<sup>8</sup> Hence to improve the neonatal survival and to prevent the occurrence of future handicaps, treatment should be initiated immediately after birth, especially in conditions like birth asphyxia. In trauma care, this golden hour concept has given very good results.<sup>9</sup> This golden hour concept can be expanded to newborn care also, although in a different setting.

In contrast to trauma care where the patient is not inside the health care system in the first few hours, the neonates are very much under the health care system immediately after delivery. So, stabilization and treatment can be initiated immediately after birth in the 'golden hour'. As evident from our study, only a very few percentage of neonates receive pre-transport stabilization.<sup>10</sup> An improvement in the pre-hospital stabilization will definitely improve the outcome for the neonates. Most of the available ambulances now are not adequately equipped to handle sick newborn babies.

So, a dedicated fleet of ambulances which are well equipped and manned by trained personnel will improve the quality of neonatal transport.<sup>11</sup> At present this dedicated fleet of ambulances is available in few places in

Tamil Nadu. This should be expanded to all the Districts in our state. Airlifting of sick newborn babies to the nearest NICU like in developed countries still remains a distant dream for a developing country like India.<sup>12</sup> The most important aspect in the transport of neonates is the maintenance of warm chain during transport. Adequate equipment like neonatal transport incubators should be available during transport to maintain normothermia in the neonate.<sup>13</sup> In resource-limited settings, alternative low-cost improvised containers like a thermocol box, basket, padded pouch, polythene covering etc., can be provided. Care should also be taken to prevent heat loss by the proper wrapping of the baby. Transport crew should be well educated regarding the warm chain.<sup>14,15</sup>

## CONCLUSION

From the above study, it is evident that ambulance services are underutilized for neonatal transport. An improvement in the utilization of ambulance services for neonatal transport will improve the morbidity and mortality of neonates. The following factors should be considered in formulating a standard protocol. Separate protocols should be formulated for primary health centres and government hospitals, as facilities available will differ.

## ACKNOWLEDGEMENTS

Authors would like to thank the Pediatric Department Faculty of Mohan Kumaramanglam Medical College and Hospital.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Sampathkumar P, Gobinathan S. A study on status of neonatal transport to a level III neonatal intensive care unit. *Int J Contemp Pediatr* 2018;5:1040-3.