

# Study of Referral Pattern of Sick Neonates To a Tertiary Care Center

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## Abstract

**Objective:** To study the referral pattern of sick neonates to a tertiary care center

**Materials and Methods:** This prospective analytical study was conducted between March 2016 and August 2016 in 488 outborn referrals at a level-3 neonatal intensive care unit (NICU) of a tertiary care center attached to a government medical college (Vanivilas Hospital attached to Bangalore Medical College and Research Institute, Bengaluru, Karnataka, India).

**Results:** This study showed shortcomings in transportation of sick neonates in a stable condition, maintaining all parameters in the required range. There were a lot of setbacks in the referral letters and documentation was inadequate. Birth asphyxia, respiratory distress syndrome, sepsis, and meconium aspiration syndrome were the commonly observed morbidities in neonates soon after birth.

**Discussion:** Improving the survival of low-birth-weight and preterm neonates is a daunting task in developing countries. Appropriate maintenance of thermoambient environment with equal importance being given to metabolic complications must be ensured during the transport of such neonates.

**Conclusion:** Factors such as proper promotion of institutional deliveries, adequate and timely referrals, prior intimation to the referral center, and early identification and prereferral

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stabilization with skilled accompaniment during transport can help reduce the neonatal comorbidities and death.

**Key Words:** Referral pattern, neonatal transportation, documentation, prematurity, thermoambient environment, prereferral stabilization, institutional deliveries

## Introduction

Neonatal period is the duration from birth up to the first 28 days of life. This is the most vulnerable period of human life for diseases and most of these are preventable. A neonate is more prone to death on its first day of life than an infant who is 1-month old.

Among worldwide live births, about 20% occur in India; of 27 million live births that occur each year, about 2 million under-5 children die. One-fourth of global child mortality occurs in India.<sup>1</sup> Although infant mortality rate has reduced over years, there is a wide variation in interstate and intrastate mortality rates and also in rural and urban areas. About 66% of neonatal mortality and > 50% of under-5 mortality occur during neonatal period.<sup>2</sup> Almost two-thirds of neonates die within the first week of life. The objective of the Millennium Development Goal-4 (MDG-4) was to reduce child mortality by two-thirds in India; it has reduced from 84/1000 live births in 1990 to 28/1000 live births by 2015.<sup>3</sup> In developing countries such as India, even now, the number of noninstitutional births is quite high, specifically in rural areas.<sup>4</sup> Although in utero transport and institutional delivery are the safest methods to avoid neonatal morbidities, unexpected preterm deliveries and perinatal complications necessitate the need of transfer of these neonates to a tertiary care center after delivery.<sup>5,6</sup> Neonatal mortality can be controlled if perinatal care is regionalized, that is, sick neonates are stabilized and transported under expert supervision and resuscitation care along with adequate data of their health status to the referral center. But in India, the quality of neonatal transport facility is poor.<sup>6</sup> Most of the neonates are self-transported without proper medical care during transport. Neonates trans-

ported thus become cold, blue, and hypoglycemic, and 75% of them develop serious clinical complications.<sup>7</sup> In India, dedicated neonatal transport service does not exist.

## Aim

This study was conducted to analyze the referral pattern of neonates to a tertiary care center, transportation conditions, and associated morbidities and outcomes.

## Materials and Methods

### Study design

This prospective analytical study was conducted between March 2016 and August 2016 in 488 outborn referrals at a level-3 neonatal intensive care unit (NICU) of a tertiary care center attached to a government medical college (Vanivilas Hospital attached to Bangalore Medical College and Research Institute, Bengaluru, Karnataka, India).

### Inclusion criteria

All extramural neonates referred to NICU were enrolled for the study.

### Exclusion criteria

Neonates with surgical emergencies were excluded from the study.

### Study procedure

The complete history of the study referrals was collected. The body temperature was checked by placing digital thermometer (Hangzhou Universal Electronic Co Ltd, Yangjiatang, Sadun, Hangzhou, Zhejiang, China),

in the axilla; oxygenation was noted by monitoring SpO<sub>2</sub> using pulse oximeter (Philips Multichannel Monitor; Philips Medizin Systeme Böblingen GmbH, Boeblingen, Germany); perfusion was checked with capillary refilling time on midsternum; and blood glucose levels were evaluated using reagent strip (SD Codefree, Lab Care Enterprises, Chennai, Tamil Nadu, India).

## Results

Of the 488 neonates, 335 (68.64%) were referred from government hospitals or special newborn care unit (SNCU) referral hospitals, 95 (19.46%) were referred from private hospitals, and 58 (11.89%) were self-referrals. Of these, 418 (85.6%) neonates had a referral letter while 70 (14.34%) had no referral letters. Among those who had the referral letters, only 92 (22%) had complete letters while 326 (78%) had incomplete letters (Table 1). Table 2 details the age of the neonates referred to our center.

**Table 1.** Profile of Referral Centers

Referral Characteristics	Number	Percentage
Type of Referral		
Government hospitals	335	68.64
Private hospitals	95	19.46
Self-referrals	58	11.89
Referral Documentation		
Yes	418	85.6
No	70	14.34
Referral Documentation Status		
Complete	92	22
Incomplete	326	78

**Table 2.** Age of the Neonates Referred to Our Center

Age	Number	Percentage
< 1 h	10	2.04
1–6 h	94	19.26
6–12 h	107	22
12–24 h	67	13.7
24–48 h	53	10.8
48–72 h	43	9
72 h to 7 d	24	5
7–14 d	23	4.8
14–28 d	67	13.7

## Discussion

The present study evaluated issues related to neonatal health before, during, and after transportation to referral centers. It aims to understand the referral patterns and the adequacy of information provided during referral. As observed during this study, although

**Table 3.** Transportation Profile of Referred Neonates

Mode of Transport	Number	Percentage
108 Ambulance	384	79.68
Private Ambulance	67	13.73
Private Open Vehicle	17	3.5
Auto	12	2.45
Bus	8	1.64

**Table 4.** Altered Parameters of Referred Neonates

Parameters	Number	Percentage
Body Temperature		
Euthermic	299	61.3
Hypothermic	189	38.8
Glucose Levels		
Euglycemic	270	55.32
Hypoglycemic	218	44.68

**Table 5.** Morbidity Profile of Referred Neonates

Morbidity	Number	Percentage
Hypoxic–Ischemic Encephalopathy		
Stage 1	40	8.2
Stage 2	45	9.2
Stage 3	34	7
Preterm Care	80	16.4
RDS	35	7.2
Meconium Aspiration Syndrome	39	8
Transient Tachypnea of Newborn	30	6
Sepsis	58	11.7
Pneumonia	48	10
Congenital Anomalies	9	1.8
Neonatal Hyperbilirubinemia	48	10
Neonatal Convulsions	22	4.5
Survivals	392	80.32
Deaths	96	19.7
Referred Back	68	14
Discharge Against Advice	41	8.4

RDS, respiratory distress syndrome.

85.6% of neonates were referred with referral documentation, only 22% of them were adequate (Table 1).

Most of the neonates were transported in a government-provided free ambulance service. However, a majority of the neonates did not receive adequate care during transport (Tables 3 and 4). Of the cases referred to our unit, majority were neonates with perinatal asphyxia (23.8%) and neonates for preterm care (16.4%) (Table 5).

Institutional deliveries supervised by expert personnel should be encouraged and promoted to reduce the neonatal mortality rate. Preterm birth and low birth weight (LBW) remain major public health problems in developing countries.

In India, the rural population and ASHA and Anganwadi workers should be educated about the significance of in utero transport. In this study, most of the neonates were referred without proper prereferral stabilization, documentation, or communication. Referrals were neither preinformed about the condition nor accompanied by trained health personnel. Also, neonates were not fed during transport. A study conducted in Nigeria<sup>8,9</sup> showed that neonates transported in suboptimal conditions of neonatal resuscitation and thermoregulation did not respond to the treatment immediately.<sup>7</sup> This necessitates the requirement of perinatal regionalization with SCNUs in smaller regions. A neonatal transport system must comprise a well-equipped vehicle, trained medical staff, proper communication to family members and their support, documentation, and feedback from the referring unit.

Birth asphyxia, respiratory distress syndrome (RDS), sepsis, and meconium aspiration syndrome are commonly observed morbidities in neonates soon after the birth. Several studies conducted in developing countries such as Asia and Africa show that major causes of adverse outcomes in preterm and LBW neonates are sepsis and RDS.

In this study, majority of the neonates were referred for preterm or LBW management and some were referred for managing RDS. Improving the survival of LBW and preterm neonates is a daunting task in developing countries. However, neonatal and perinatal care must

be prioritized in case of anticipated deliveries and no mother should be denied antenatal steroids. Appropriate maintenance of thermoambient environment and monitoring of metabolic complications must be ensured during transport of such neonates. An organized and medically supported transportation should be preferred to self-transportation. When a neonate has to be referred to another healthcare center for further care, the neonate should be examined and stabilized prior to transport so as to improve survival. In resource-limited settings, because of the unavailability of transport incubator facility, kangaroo mother care should be followed by attendants or mothers to maintain the required temperature. Other local alternative methods such as thermocol boxes and plastic wrap can also be used.<sup>5</sup> In developing countries, community-based interventions, prereferral stabilization, and appropriate care during transport by a trained personnel (eg, ASHA or Anganwadi worker) might help improve survival of referred neonates.<sup>5</sup>

## Conclusion

This study has demonstrated the prevailing demographic pattern of neonatal referrals, the level of care in the peripheral centers, and the need for regionalization of peripheral care for better outcomes. A significant proportion of these deaths could have been avoided with proper promotion of institutional deliveries, adequate and timely referrals, and prior intimation to the referral center, and early identification and prereferral stabilization with skilled accompaniment during transport.

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