

**ORIGINAL ARTICLE**

**STUDY OF IMMEDIATE OUTCOME OF NEONATES REFERRED TO TERTIARY CARE CENTRE AND ROLE OF TOPS SCORE IN ASSESSING MORTALITY**

**Manuprakash SK<sup>1</sup>, Kumar SR<sup>2</sup>, Srinivasa BS<sup>3</sup>, K S Sriranjini<sup>4\*</sup>, Nivedita Rathod<sup>5</sup>, Sneha G<sup>6</sup>**

<sup>1</sup>Associate Professor, Department of Paediatrics, Hassan Institute of Medical Sciences, Hassan, Karnataka, India

<sup>2</sup>Assistant Professor, Department of Paediatrics, Hassan Institute of Medical Sciences, Hassan, Karnataka, India

<sup>3</sup>Assistant Professor, Department of Paediatrics, Hassan Institute of Medical Sciences, Hassan, Karnataka, India

<sup>4</sup>Post Graduate, Department of Paediatrics, Hassan Institute of Medical Sciences, Hassan, Karnataka, India

<sup>5</sup>Post Graduate, Department of Paediatrics, Hassan Institute of Medical Sciences, Hassan, Karnataka, India

<sup>6</sup>Post Graduate, Department of Paediatrics, Hassan Institute of Medical Sciences, Hassan, Karnataka, India

\*Corresponding author: Dr K S SRIRANJINI

Department of Paediatrics,

Hassan Institute of Medical Sciences, Hassan, Karnataka, India

Phone (or Mobile) No: 9986746013

Email: ranjiniks.ks@gmail.com

**INTRODUCTION:**

The infant mortality rate is a indicator of both health and access to health care in a developing country. Non-institutional births account for a considerable fraction of overall births in developing countries, where many deliveries are still performed at home, particularly in rural areas <sup>1</sup>. In developing nations, the most common causes of neonatal mortality are prematurity, hypoxia, and sepsis.<sup>2</sup>. Many of the neonates carried are chilly, blue, and hypoglycaemic, and these babies have major clinical consequences.

The National Ambulance Service (NAS), which provides free services to mothers and neonates, has also eased patient referral to tertiary care institutions. Although free ambulance service is now provided in virtually every section of the country, the bulk of these vehicles are not equipped to carry neonates. Furthermore, they are frequently not staffed by trained healthcare personnel.

As a result, while the ambulance service has successfully transported a large number of unwell neonates to tertiary care centres in a timely manner, the quality of care prior to and during transport is far from optimal. Furthermore, unlike in developed countries, our country lacks integrated referral and transportation services. Consultation prior to referral, communication, and stabilisation are not routine. As a result, a high proportion of neonates

arrive at tertiary care institutions in poor condition and are either unable to be saved or have a lengthy and complicated hospital stay<sup>3</sup>. Temperature, oxygen saturation, skin perfusion, and blood sugar all have a negative impact on neonatal physiology (TOPS). TOPS score is a straightforward and useful method of assessment that may be used right away, at the time of admission<sup>4,5</sup>.

Hypothermia leads to peripheral vasoconstriction, causing anaerobic metabolism, metabolic acidosis, pulmonary vasoconstriction and hypoglycemia. Hypoxemia further compromises the infants response leading to excess oxygen consumption and caloric loss. Hypoglycemia on the other hand can lead to typical pattern of Central Nervous System injury (parietooccipital cortex and subcortical white matter)<sup>6</sup>

The purpose of this study is to evaluate the impact of epidemiological factors and adverse events associated with neonatal transfer, as well as the role of the TOPS score in predicting the result.

#### **MATERIALS AND METHODS:**

We conducted a cross-sectional study in Hassan Institute Of Medical Sciences. During the three-month study period, neonates referred to SNCU were enrolled, and clinical data were noted upon arrival. The current study included all neonates(0-28days of life) admitted to tertiary care hospitals. The study excluded patients with gross congenital malformations and acute surgical emergencies (TOF, CDH).

All neonates fulfilling the inclusion criteria were examined for tone, cry, anterior fontanelle, colour, grunting, convulsions, cyanosis, and vitals were documented in a preformed proforma. The receiving clinician also noted the routine clinical physiological TOPS grading upon arrival at the NICU within 1 hour of admission. It includes

- 1) Axillary Temperature by digital thermometer (T)
- 2) Oxygenation by Spo2 monitoring by pulse oxymeter; (O)
- 3) Perfusion by capillary refilling time (CRT) on the midsternum; and (P)
- 4) Blood Sugar by reagent strip with Glucometer parameters as observed on a predesigned proforma upon the baby's arrival. (S)

Data gathered through a thorough history and examination. If a parameter was changed, it received a score of 1, while normal values received a score of 0. Temperature <36.5 °C,

Spo<sub>2</sub><90%, Capillary refilling time (CRT)>3 seconds, and blood sugar <45mg/dL are deemed abnormal for this research.

## **RESULTS:**

Among the 100 neonates, 22(22%) were delivered in private hospitals and 78(78%) were referred from government peripheral centres. Out of 100 neonates 78(78%) were transported in the 108 Emergency services ambulance, 22(22%) by private ambulance. Only 10(10%) were accompanied by a doctor/paramedical worker, and remaining 90% were brought only with relatives. Prior to transport, communication with the referral hospital was done in only 5% of patients. 48% of neonates relatives had been given counselling prior to referral while only 78(78%) neonates had appropriate referral documents including birth history, treatment given and reason for referral (TABLE 1). Reason for referral included pre-term (24%), RDS (25%), birth asphyxia (19%), meconium aspiration (10%) and others of 11%(TABLE 1). Out of 100 neonates, 39% were LBW, 10% were VLBW and 6% were ELBW.(TABLE 2)

TOPS score was 0 in 24%, 1 in 39%, 2 in 26%, 3 in 9% and 4 in 2% of neonates. Total 19 (24.7%) neonates expired while the rest were discharged with no immediate complications.(TABLE 3) In the present study 100% of neonates with a TOPS score of 4 on admission expired which includes causes like prematurity (26%),Sepsis (30%), RDS (26%), 2 Birth Asphyxia (10%) and 1Meconium Aspiration (5%). 66% with a score of 3, 15% with a score of 2 and 12% with a score of 1 expired. (TABLE 4).48 neonates had mild hypothermia,20 had moderate hypothermia and 31 did not have hypothermia (GRAPH 1) 43% neonates positive for sepsis and 57% were negative (TABLE 5). Each parameter was assessed separately against death to note that among 19 deaths, 13(68%) neonates had hypothermia, 5(26%) had decreased oxygenation and perfusion, 6(31%) had hypoglycemia, and 7(53%) neonates had more than 1 parameter affected (GRAPH 2)

## **DISCUSSION:**

This study seeks to uncover typical problems with the neonatal transport system for babies. During this analysis, we found that the majority of patients were referred from government hospitals (78%), which is slightly higher than Buch et al., (26.8 percent)<sup>12</sup> and Narang M et al., (29.6 percent),<sup>18</sup>.

The most common reasons for neonatal referrals continue to be respiratory distress, preterm, sepsis, perinatal asphyxia, meconium tainted fluid, and jaundice. Preterm birth, RDS, and

septicemia were the most common causes of mortality among referred neonates, accounting for approximately half of all cases. The neonatal death rate among our babies was 19%.

India has a large network of peripheral health centres in rural areas, where the majority of our people lives. Because a significant proportion of neonates were referred at less than 24 hours of age, perinatal care services at these facilities require improvement. Most of the referred neonates are already quite unwell at the time of referral, with a high fatality rate, and some of them worsen more during travel. Though intrauterine transfer is considered the safest form of transport, the high risk cannot always be predicted during the antenatal period. Reducing referrals will reduce the burden on urban tertiary care centres while also improving their performance. A baby should only be referred when absolutely necessary, and safe neonatal transport would serve as a link between referring and receiving centres. The neonates' journey distance and arrival condition highlight the need for transportation services to be improved further.

TABLE 7: Comparisons of TOPS Score Vs Mortality

TOPS SCORE	Present study 19/100 expired	<i>Parekh et al</i> <sup>10</sup> 37/150 expired (24.7%)	<i>Suresh et al</i> <sup>11</sup> 81/390 expired (20.76%)	<i>Mathur et al</i> <sup>12</sup> 60/175 expired (34.28%)
0	2/24(8.3%)	-	1/128(0.78%)	4/49(8.16%)
1	5/39(12.8%)	8/54(14.8%)	14/105(13.33%)	7/51(13.72%)
2	4/26(15.3%)	8/32(25%)	35/112(31.25%)	14/34(41.17%)
3	6/9(66.6%)	11/21(52.4%)	23/35(65.72%)	23/29(79.31%)
4	2/2(100%)	10/10(100%)	8/10(80%)	12/12(100%)

Hypothermia was shown to be a prevalent occurrence among transported neonates in the current investigation. Temperature was the most commonly affected parameter of the TOPS score. In our study, nearly 70% of the referred neonates were hypothermic, which is greater than the findings of Dalal E et al., (55.3 percent hypothermic)<sup>9</sup>. Hypoxia was the second most prevalent occurrence. These parameters can be simply managed throughout shipment without the use of any sophisticated technology.

According on Admission TOPS score, significant mortality was seen in neonates when all 4 parameters were compromised. Out of 100 neonates, 2 (100%) died when all parameters were aberrant, which is identical to the study done by Parekh et al<sup>10</sup>. A high TOPS score at admission was associated with a higher mortality rate. The present study showed increase in mortality with increase in TOPS score.

**LIMITATIONS:**

Limitations of our study include; no head to head comparison between out-born and in-born data and lack of long term follow-up. Also, TOPS is a clinical scoring method must be correlated accordingly. To know the quality of transport TOPS score documentation prior to transport is must. But in present study, prior score was not available.

**CONCLUSION:**

Most of the neonates were improperly transferred without pre-referral stabilisation, communication with the referral hospital, proper referral notes & medical or paramedical staffs. Preterm with Low birth weight and/or septic babies are more prone to have high mortality. Hypothermia should be taken care during transport because it is the most commonly affected parameter. It is important to maintain the neonate's blood sugar levels and CFT and oxygenation with help of adequate Intravenous fluids and oxygen if necessary.

**RECOMMENDATIONS:**

The TOPS score was also proven to be a reliable predictor of morbidity and mortality, as evidenced by the findings that the greater the number of altered parameters at the time of admission, the greater the risk of fatality. A considerable number of deaths can be averted by encouraging institutional deliveries, fast and appropriate treatment during transportation, correct regionalization of new born care, pre referral stabilisation, and enough referral facilities.

Neonates requiring special or intense care should preferably be carried by a skilled transport team using a coordinated teamwork and a neonate-specific vehicle. Pre-transport stabilisation is the most critical step in the complete process of transport. During this investigation, we confirmed that TOPS score was simply used because it incorporates data that are part of standard newborn care and can be retrieved rapidly. The TOPS score system predicts neonatal morbidity and death quickly and effectively, and can thus serve as a guidance for the paediatrician in commencing appropriate revival and/or treatment procedures. TOPS is a simple score that can be easily applied in newborn units and hence can be done routinely, in addition to being beneficial for predicting hospital death.

**ACKNOWLEDGEMENTS:**

Authors are thankful for the neonates who participated in the study.

## DECLARATIONS

*Funding:* no funding sources

*Conflict of interest:* none declared

*Ethical approval:* The study was approved by institutional Ethics Committee

## REFERENCES:

1. Kumar PP, Kumar CD, Venkatlakshmi A. Long Distance Neonatal Transport--The Need of the Hour. *Indian pediatrics*. 2008 Nov 1;45(11):920.
2. SRS Bulletin. Available at: [http://www.censusindia.gov.in/vital\\_statistics/Vital\\_Rates/Vital\\_rates.aspx](http://www.censusindia.gov.in/vital_statistics/Vital_Rates/Vital_rates.aspx), Accessed February 13th, 2022
3. Adhisivam B. Transport of sick children: the Indian perspective. *Indian J Emerg Pediatr* 2010; 2: 19-23.
4. Rashid A, Bhutta T, Berry A. A regionalized transport service, the way ahead? *Arch Dis Child* 1999; 80: 488-92
5. Leslie AJ, Stephenson TJ. Audit of neonatal intensive care transport--closing the loop. *Acta paediatrica*. 1997; 86 (11): 1253-6.
6. Eichenwald, Eric C., et al. *Cloherly and Stark's Manual of Neonatal Care*. 8th ed., Wolters Kluwer, 2017, p. 186.
7. Buch PM, Makwana AM, Chudasama RK, Doshi SK. Status of newborn transport in periphery and risk factors of neonatal mortality among referred newborns. *J Phram Biomed Sci*. 2012;16:1-6.
8. Narang M, Kaushik JS, Sharma AK, Faridi MM. Predictors of mortality among the neonates transported to referral centre in Delhi, India.
9. Dalal E, Vishal G, Solanki D. Study on neonatal transport at tertiary care centre. hospital. 2013;84(28):49.
10. Parekh ZR, Bharadwaj R, Parmar G, Shah A. Study of Referral Pattern of Neonates at Tertiary Care Centre and Role of TOPS Score in Assessing Morbidity and Mortality. *National Journal of Community Medicine*. 2018 Mar 31;9(03):157-60.
11. Verma SK, Nagaura CP, Goyal VK, Raheja KK, Singh A, Sharma P, Bishnoi RK, Sachdev K. Status of transported neonates and evaluation of tops as a survival score. *Indian J Neonatal Med Res*. 2017;5(2).
12. Mathur NB, Arora D. Role of TOPS (a simplified assessment of neonatal acute physiology) in predicting mortality in transported neonates. *Acta Paediatrica*. 2007 Feb 1;96(2):172- 5.

## TABLES

TABLE 1: Demographic and Clinical profile of admitted babies

	Frequency	Percent
Government ambulance	78	78
Private Ambulance	2	22
Accompanied by doctor/paramedical worker		
Done	10	10%
Not done	90	90%
Morbidity of referred newborns		
Pre term/low birth weight	24	24%
RDS	25	25%
Birth asphyxia	19	19%
Meconium Aspiration	10	10%
others	11	11%

TABLE 2 : Distribution of LBW neonates

	N	%
ELBW	6	6.1%
LBW	39	39.4%
N	44	44.4%
VLBW	10	10.1%

TABLE 3: TOPS Scores and Its Outcome

TOPS SCORE	Referred neonates (100)	Expired neonates (19)
0	24	2(8%)
1	39	5(12%)
2	26	4(15%)
3	9	6(66%)
4	2	2(100%)

TABLE 4: Mortality causes amongst babies

Cause	Number
Prematurity	5(26%)
Sepsis	6(31%)
MAS	1(5%)
RDS	5(26%)
birth asphyxia	2(10%)

GRAPH 1: Hypothermia in referred neonates

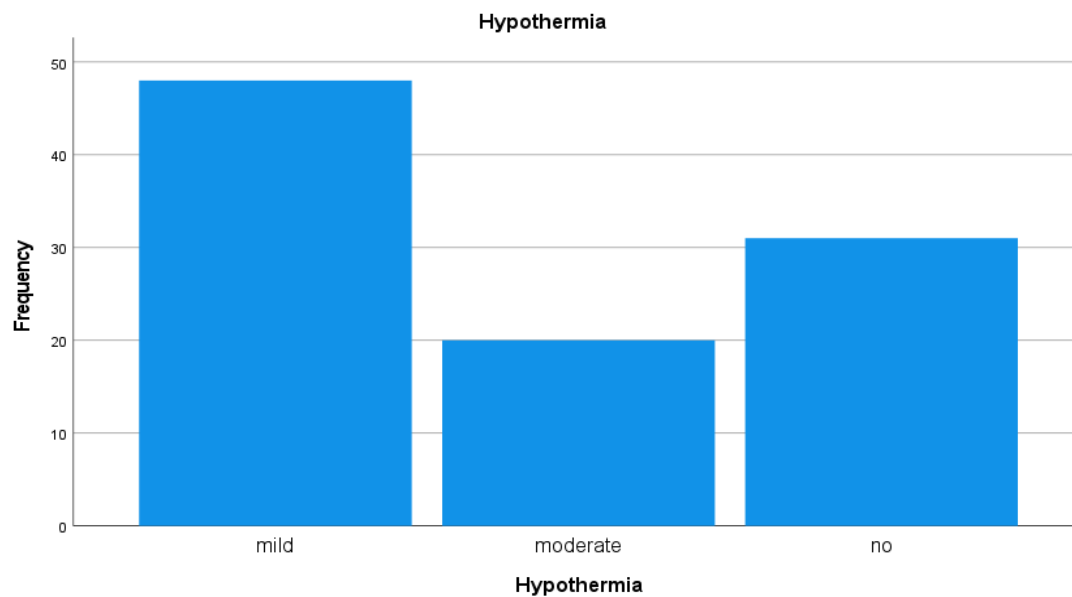


TABLE 5: Relation with sepsis

Negative	57	57%
positive	43	43%

GRAPH 2: T O P S vs Death



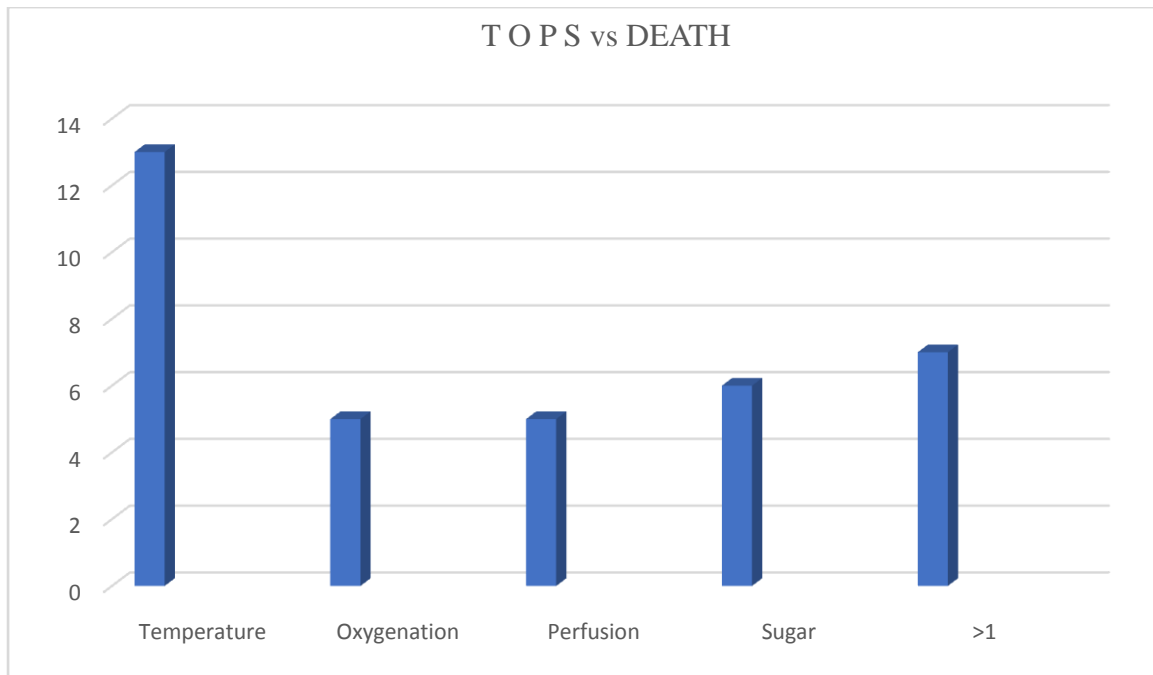


TABLE 6: Comparisons of TOPS Score Vs Mortality

TOPS SCORE	Present study 19/100 expired	<i>Parekh et al</i> <sup>9</sup> 37/150 expired (24.7%)	<i>Suresh et al</i> <sup>10</sup> 81/390 expired (20.76%)	<i>Mathur et al</i> <sup>11</sup> 60/175 expired (34.28%)
0	2/24(8.3%)	-	1/128(0.78%)	4/49(8.16%)
1	5/39(12.8%)	8/54(14.8%)	14/105(13.33%)	7/51(13.72%)
2	4/26(15.3%)	8/32(25%)	35/112(31.25%)	14/34(41.17%)
3	6/9(66.6%)	11/21(52.4%)	23/35(65.72%)	23/29(79.31%)
4	2/2(100%)	10/10(100%)	8/10(80%)	12/12(100%)