Original Research Article

Outcome of neonatal transport in newborn with weight less than 1.5 kg and role of TOPS score as mortality predictor

Sucheta S. Munshi, Kajal R. Baldaneeya*, Neha A. Vaghela, Shaishav J. Patel

Department of Pediatrics, BJ Medical College, Ahmedabad, Gujarat, India

*Correspondence:
Dr. Kajal R. Baldaneeya,
E-mail: kajalbaldaniya6@gmail.com

ABSTRACT

Background: Neonatal period is the most vulnerable time for individual survival and newborn with weight <1.5 kg are having more morbidity then newborn with appropriate weight for age. Many of these are easy to manage and neonatal mortality can be decrease with regionalization of perinatal care and transportation in stable condition.
Methods: The study was conducted at B. J. Medical College, Ahmedabad and Civil Hospital, Ahmedabad. A prospective, observational study consisting of total 140 patients, admitted in neonatal intensive care unit during the period from October 2022 to September 2023 with inclusion criteria of newborn <1.5 kg and ≤28 days of life. Study was questionnaire based, TOPS scoring was done on admission (temperature by digital thermometer, SpO2 by pulse oximeter, perfusion by CRT in midsternum, blood sugar by reagent strip). Analysis of outcome done using Chi square.
Results: Out of 140 enrolled patients 134(95.8%) neonates were hospital delivered and 6 (4.3%) home delivered. Most common indication of referral was respiratory distress syndrome (27.8%). 85 (60.7%) of neonates were transferred in ambulance and 44 (31.4%) neonates were transferred in private vehicle. 58 (41.4%) were given intra-transport support in form of O2 prongs, Incubator, bag and tube ventilation and IV fluids. 72 (51.5%) and 68 (48.6%) transferred with untrained and trained personal respectively. 30.7% of the patients were expired and 69.3% of neonates were either discharged or took LAMA.
Conclusions: To reduce neonatal mortality rate, neonatal facility should be upgraded, intra transport stabilization, proper referral notes and specialised neonatal ambulance will be helpful.

Keywords: Neonatal transport, Intra-transport stabilization, Preterm, Neonatal mortality

INTRODUCTION

Neonatal period is the most vulnerable time for individual survival and newborn with weight <1.5 kg is having more morbidity than newborn with appropriate weight for age. Almost two third of the total neonatal deaths are within first week of life.[1] Prematurity and low birth weight, asphyxia and sepsis are the most common cause of neonatal mortality in developing countries. Many of these are easy to manage and significant decrease in neonatal mortality can be anticipated with regionalization of perinatal care, where many sick new-born can be provided with better care and outcome if they transported in stable condition. Though institutional delivery and in utero transport of newborn is safest but unfortunately preterm delivery and perinatal illness cannot be always anticipated resulting in continued need of transfer of these babies after delivery.[2-5] These babies are often critically ill and outcome is also dependent on effectiveness of transport system.[6] Most of neonatal

transport of <1.5 kg are without any pre-treatment stabilization or care during transport. Many of these very low birth weight newborn thus transported are cold, blue and hypoglycaemic and 75% of the babies transferred this way have serious clinical implications.[7]

Quality of transportation to higher centre is one of important factor to decide survival of sick neonates. My study conducted at a tertiary care centre aim at analysing the adverse events related to transfer neonates, impact of epidemiological factor related to transferred neonates and the role of TOPS scoring in predicting mortality especially in newborn with weight <1.5 kg.

METHODS

This is a prospective, observational study of 140 patient enrolled from October 2022 to September 2023, at Civil Hospital, B. J. Medical College, Ahmedabad, Gujrat, India. All extramural babies ≤28 days of life with birth weight <1.5 kg, admitted in neonatal intensive care unit are included in study. Total 140 patients were enrolled by simple randomization technique and every 5th newborn referred to our neonatal intensive care unit were included, who were fulfilling inclusion criteria. Informed consent was obtained from parents and care givers before including them in the study.

Exclusion criteria

Exclusion criterion for current study was lethal congenital malformation and all neonatal surgical emergency.

The study was questionnaire based, where the receiving clinician documented the routine clinical physiological parameters as observed on data capturing sheet. Data collected by complete history and examination, TOPS scoring on arrival at NICU; it includes temperature by digital thermometer in axilla, oxygenation by Spo2 monitoring (pulse oximeter), perfusion by capillary refilling time on mid-sternum and blood sugar by reagent strip. Data recorded in Microsoft excel and analysed using appropriate statistical test (Chi square test, odd ratio). The result was compared with the previous studies and discussed.

RESULTS

Out of 140 enrolled patients 134 (95.8%) neonates were hospital delivered and 6 (4.3%) home delivered. In present study, 81 (57.2%) were referred from urban area of these 80 (57.1%) were institutional delivered and only 1 (0.7%) was home delivered. 59 (42.8%) were referred from rural area of these too, the majority 54 (38.7%) were institutional delivered and only 5 (3.5%) were home delivered. In present study, 109 (77.9%) of the referred neonates had been referred with referral note, of these 109 notes only 70 (50%) were having adequate details.

Total 85 (60.7%) of neonates were transferred in ambulance and 44 (31.4%) neonates were transferred in private vehicle. Only 5 (3.6%) and 6 (4.3%) were transferred with bus and rickshaw respectively. 75 (51.4%) were advised about transfer in utero but only 47 (33.6%) were transported to higher center in utero.

Table 1: Place of referral: area.

Place of delivery: Area	Home, N (%)	Institutional, N (%)	Total, N (%)
Rural	5 (3.5)	54 (38.7)	59 (42.8)
Urban	1 (0.7)	80 (57.1)	81 (57.2)
Total	6 (4.2)	134 (95.8)	140 (100)

Table 2: Referral note (n=140).

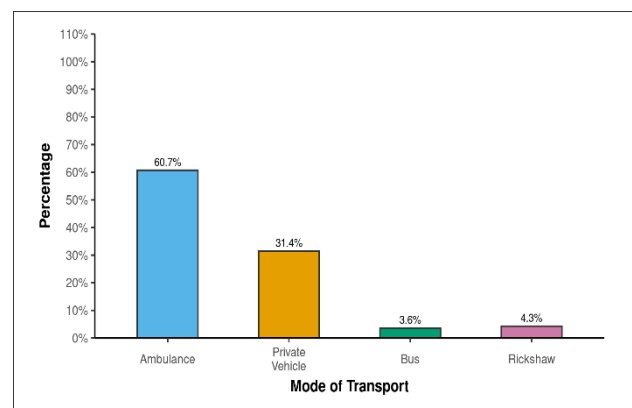| Referral note	N	%
Available	109	77.9
Acurate/adequate	70	50
Not available	31	22.1

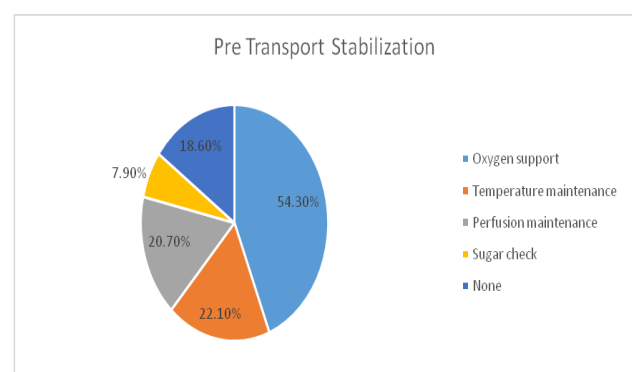**Figure 1: Mode of transport.**

Figure 2: Pre-transport stabilization.

In present study, 114 patients were given some attention and stabilized pre transport. Among pre transport stabilization maximum were given o2 support (54.3%) followed by temperature and perfusion maintenance (22.1%) and (20.7%) respectively.

Table 3: Accompanying person (n=140).

Accompanying person	N	%
Untrained: relative/other	72	51.5
Trained: doctor/nurse	68	48.6

Table 4: Morbidity profile of referred newborns (n=140).

Morbidity	Total, frequency (%)	Survived (N=97), frequency (%)	Expired (N=40), frequency (%)
Septicaemia	12 (8.5)	5 (3.5)	7 (5)
Respiratory distress syndrome	39 (27.8)	27 (19.2)	12 (8.5)
Perinatal asphyxia	6 (4.3)	4 (2.8)	2 (1.4)
Prematurity <34 weeks	34 (24.3)	27 (19.2)	7 (5)
Meconium aspiration	4 (2.9)	2 (1.4)	2 (1.4)
Congenital heart disease	10 (7.1)	6 (4.2)	4 (2.8)
Low birth weight	32 (22.8)	26 (18.5)	6 (4.2)
Neonatal jaundice	3 (2.1)	3 (2.1)	0

Table 5: A altered parameter of transported newborn on admission.

Parameters	At admission, frequency (%)	Mortality (N=40), frequency (%)
Temperature (<36.5°C)	60 (42.9)	18 (30)
Oxygen (SpO2 <90%)	85 (61.6)	29 (34.1)
Perfusion (>3sec)	48 (34.3)	21 (43.7)
Sugar (RBS <45 mg/dl)	29 (20.7)	9 (31)

Least importance was given to sugar testing (7.9%). 58 (41.4%) were given intra-transport support in form of O2 prongs, transported in incubator, bag and tube ventilation and IV fluids. 72 (51.5%) transferred with untrained person and 68 (48.6%) were transferred with trained medical/ paramedical personal. Most common indication of referral was respiratory distress syndrome 39 (27.8%). Maternal risk factors were present in 74 (52.8%) of neonates admitted and 24 (32.4%) of these expired, while out of 66 (47.1%) of neonates without maternal risk factors 16 (24.2%) expired. Highest altered parameter at admission was hypoxia. The area under the ROC curve (AUROC) for TOPS total predicting mortality was 0.827(95% CI; 0.726-0.894), thus demonstrating good diagnostic performance, it was statistically significant

(p≤0.001). At a cut off of TOPS total ≥2, it predicts mortality with a sensitivity of 93% and a specificity of 57%. TOPS ≥2 indicate poor outcome.

Table 6: TOPS score as mortality predictor.

Number of altered parameters	At admission, frequency (%)	Mortality (N=40), frequency (%)
Zero	18 (12.8)	0
One	40 (28.6)	5 (3.5)
Two	40 (28.6)	13 (9.2)
Three	29 (20.7)	15 (10.7)
Four	13 (9.2)	7 (5)

DISCUSSION

This study attempts to identify common issues related to neonatal transport and role of TOPS score as mortality predictor, especially in newborn with weight less than 1.5 kg, because low birth weight and prematurity are at higher risk for hypothermia, hypoxia and sepsis. Hypothermia, hypoxia and poor perfusion at time of admission were strongly observed among expired newborns compared to survive. As mentioned below Similar finding has been shown by others, so these findings reaffirm that safe neonatal transport system and in utero transfer needs to be promoted. In present study, 72(51.4%) of the low-birth-weight neonates relatives had been advised regarding high-risk pregnancy of mother and transfer of mother to higher centre. Among them 47 (33.6%) were referred to higher center in-utero and delivered at higher centre. Still, they required transport to tertiary care hospital for further management, so it is advisable to strengthen all the level of referral centers with man power and equipment's. In utero transport is the best way of transport of high-risk mother at appropriate referral centre to prevent multiple transports of mother and neonates. In Nadia et al study was 23% transported with trained personnel and 66.5% with pre-transport stabilization, which was 48.6% and 81.4% respectively in present study; showing improvement but still on lower side.[8]

In Sachan et al study newborn transported in <1 hour duration was 76.3% and mortality is 18.36%, while this data in present study 38.6% and 30.7% respectively.[9] That indicate the mortality significantly less when time for transport (total duration) is less (<1 hour). In study by Dalal et al were only 47.3% transported via ambulance, 18.3% via open vehicle and 59.4% hospital delivered; in compared to present study which is 60.7%, 3.6% and 95.8% respectively.[10] Which is showing improvement in neonatal transport over the time. In study by Dalal highest altered parameter was hypothermia while in present study is hypoxia, which depicts that due to awareness regarding maintaining temperature hypothermia decreased over time, but there is need of maintaining adequate oxygenation of baby during transport. In present study, 30.7% of the patients were

expired and 69.3% of neonates were either discharged or took LAMA. Being one of the major referral points in Gujarat and surrounding states, this hospital caters to high-risk neonates referred from its wide catchment area. This could be the reason for witnessing higher mortality. However, mortality rate of 25-35% have also been reported in previous Indian studies among neonates transported to tertiary care center.[11-15] Neonates who were transported in ambulance, with medical/paramedical attendant, with adequate referral note had huge impact on their outcome. There is dire and urgent need to improve neonatal transport systems with judicious referrals with better equipped ambulances and trained medical personnel.

Limitations

Limitations of current study were; It was prospective analytic study, after discharge follow up was not done. Sample size of the study was small, so further study with large sample size required to support the conclusion. In present study very low birth weight neonates were included so neonates with birth weight of >1.5 kg were not studied. Transfer analysis was done on base of referral note and neonates without referral note were analysed by relatives information so chances of bias can possible.

CONCLUSION

It was concluded that to further reduce the neonatal mortality rate, the neonatal transport facilities should be upgraded. A standard protocol should be formulated for inter facility transport. A specialized neonatal ambulance that are well quipped and manned trained personnel will be helpful. Mortality was found to be statistically significant in those newborns who were presented with 2 or more than 2 altered TOPS parameter.

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