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Study of Referral Pattern of Neonates at Tertiary Care Centre and Role of TOPS Score in Assessing Morbidity and Mortality

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ABSTRACT

Objective: This study was aimed to find out characteristics of transport of a sick referred neonate and to measure the risk factors that contribute to mortality.

Methods: In this prospective cross-sectional study, a total of 150 neonates were studied who referred from peripheral hospitals and admitted in the tertiary care hospital. Data collected included referral and transport characteristics and clinical parameters at the time of admission including TOPS score (Temperature, Oxygenation, Pulse and Sugar).

Results: Most of neonatal referrals were self or improperly organized transport and associated with inadequate pre-referral stabilization, incomplete advice regarding care during transport and poor communication. Out of 150 neonates, TOPS score was 0 in 21.7%, 1 in 36%, 2 in 21.3%, 3 in 14% and 4 in 7% of neonates. 100% of neonates with a TOPS score of 4 on admission expired.

Conclusion: This study highlights the fact that a large number of neonatal deaths can be prevented by early identification, appropriate pre-referral stabilisation, improved communication and an effective transport system in place for safe referral of neonates to higher centres for management. The TOPS scoring system can serve as a guide for the paediatrician in initiating appropriate revival and/or treatment measures.

Keywords: Neonate, TOPS score, Morbidity, Mortality

INTRODUCTION

Infant mortality rate is an indicator of health as well as accessibility of health service by the people in a developing country like India. NMR contributes to about two third of all infant deaths.[1] This study aims to assess the impact of epidemiological factors and adverse events related to transfer of neonates, and role of TOPS score in predicting the outcome. Neonatal transport may be defined as the act of moving a neonate from one setting or facility to another to allow the provision of a level of care and/or type of service that is not available at the former.[2-4] Non institutional births constitute a significant proportion of total births in developing country like India and still many deliveries are conducted at home specifically in rural area.[3-5] Prematurity, asphyxia and sepsis are the most common causes of neonatal mortality in developing countries.[6] Many of these are easy to manage and significant decrease in neonatal mortality can be anticipated with regionalization of prenatal care, where many sick newborn can be provided with better care and outcome if they are timely transported in stable condition.[7,8] Many of these newborns thus transported are cold, blue, and hypoglycaemic and 75% of the babies transferred this way have serious clinical implications. Neonatal physiology is adversely affected based on **T**emperature, **O**xygen saturation, skin **P**erfusion, and blood **S**ugar (TOPS).TOPS score is a simple and useful method of assessment that can be performed immediately, at admission.[9,10] This study aims to assess the various factors and adverse events related to transfer of neonates, and role of TOPS score in predicting the outcome system con-

tribute to morbidity and mortality of infants being referred to tertiary care centres for further management.

MATERIAL AND METHODS

This is prospective cross sectional study. Neonates transported to NICU of Tertiary care hospital during the study period of 10 months was enrolled and clinical parameters were documented on arrival. All babies referred to the tertiary care hospitals<= 28 day of life requiring admission were included in present study.

Patient with gross congenital malformation, acute Surgical emergency (TOF, CDH) were excluded from study. A total of 150 patients were selected randomly and enrolled in study. The study was questionnaire based, where the receiving clinician documented the routine clinical physiological TOPS scoring on arrival at NICU within 1 hr of admission. It includes 1) **T**emperature by digital thermometer in axilla; 2) **O**xygenation by Spo2 monitoring by radical 7 pulse oxymeter; 3) **P**erfusion by capillary refilling time (CRT) on midsternum; and 4) **S**ugar by reagent strip with Glucometer parameters as observed on arrival of the baby on a predesigned proforma.

Data collected by complete history and examination. If any parameter was altered, it was assigned a score of 1 and normal values were assigned a score of 0. cut off values of parameter considered abnormal for this study are Temperature <97^{o}F and > 100.4^{o} F, Spo2<85, Capillary refilling time(CRT)<3 seconds, Blood sugar<45 mg/dl.

RESULTS

Out of 150 neonates, 96(64%) were delivered in private hospitals and 54(36%) were referred from government peripheral centres. Out of 150 neonates 84 (56%) were transported in the 108 Emergency services ambulance, 25(16.6%) by private ambulance, 22(14.6%) by private vehicle and 19(12.6%) by auto-rickshaw. From government peripheral centres, Out of 56 neonates, 31(56%) were transported by 108 Emergency services, 9(16%) by private ambulance, 7(14%) by private vehicles, 7 (14%) by auto-rickshaw. Only 42(28%) were accompanied by a doctor/paramedical worker, and remaining 72% were brought only with relatives. Prior to transport, communication with the referral hospital was done in only 12% of patients. Out of 103(68.7%) neonates who required resuscitative measures, appropriate pre-transport stabilisation was done in only 59 (57.2%) patients. 85% of patients' relatives had been given counselling prior to referral while only 94(63%) neonates had appropriate referral documents including birth history, treatment given and reason for referral. Reason for referral included pre-term (35%), low birth weight (27%), RDS (19%), birth asphyxia (8%), meconium aspiration (7%) and others. Out of 93 LBW neonates, 29(31%) were VLBW and 7(7%) were ELBW.

Table 1: Demographic and Clinical profile of admitted babies

Profile of babies	Cases (n=150) (%)
Referring Hospitals	
private hospitals	96(64)
government	54(36)
Accompanied by doctor/paramedical worker	
Done	42(28)
Not done	108(72)
Mode of transports	
108 Ambulance	84(56)
Private ambulances	25(16.6)
Auto rickshaws	22(14.6)
Private vehicles	19(12.8)
Morbidity of referred newborns	
Pre term/low birth weight	93(62)
RDS	28(18.6)
Birth asphyxia	12(8)
Meconium Aspiration	10(6.6)
others	7(4.6)

Table 2: Transport from Govt. peripheral centres

Transport used	Cases (n=54) (%)
108 Ambulances services	31(57.4%)
Private Ambulance	9(16.6%)
Private Vehicle	7(12.9%)
Auto Rickshaw	7(12.9%)

Table 3: Distribution of LBW neonates

Distribution of LBW babes	Cases (n=129) (%)
LBW(≤2499 gms)	93(72%)
VLBW(≤1499gms)	29(22.5%)
ELBW(≤ 999 gms)	7(5.4%)

Table 4: TOPS Scores and Its Outcome

TOP Scoring	Referred Neonates (n=150)	Expired (n=37)
TOPS 0	33(22%)	0
TOPS 1	54(36%)	8(14.8%)
TOPS 2	32(21.3%)	8(25%)
TOPS 3	21(14%)	11(52.4%)
TOPS 4	10(6.6%)	10(100%)

Table 5: Mortality causes amongst babies with TOPS score=4

Mortality causes	Cases (n=10) (%)
Preterm with Sepsis	5(50%)
RDS	2(20%)
Birth asphyxia	2(20%)
Meconium aspiration	1(10%)

TOPS score was 0 in 21.7%, 1 in 36%, 2 in 21.3%, 3 in 14% and 4 in 7% of neonates. Total 37 (24.7%) neonates expired while the rest were discharged with no immediate complications. In present study 100% of neonates with a TOPS score of 4 on admission expired which includes causes like 5 Sepsis (50%), 2 RDS (20%), 2 Birth Asphyxia (20%) and 1Meconium Aspiration (10%). 52.3% with a score of 3, 25% with a score of 2 and 15% with a score of 1 expired.

DISCUSSION

This study attempts to identify common issues related to the neonatal transport system for newborns. During this study, we observed highest referred from private hospitals. In the present study a large percentage (56%) of referred neonates were transported by ambulance, which is again quiet higher than reported by Buch et al., (26.8%)[12] and Narang M et al., (29.6%),[18] again probably an effect of 108 ambulance service launched in Gujarat.

Respiratory distress, prematurity, sepsis, perinatal asphyxia, meconium stained liquor and jaundice continue to be the most common causes for neonatal referrals across the country.Commonest cause of death amongst referred neonates were preterm and septicemia(50%). Study done by Buch Pankaj M et al. / JPBMS, 2012, 16(09) and INAP September 2014 reported preterm and septicemia as major cause of neonatal death in India.[11,12,13]

Neonatal mortality rate among our neonates was 24.7% which is in line with the findings of a recent study done by Begum et al., in Telangana (22.8%) but is lower than older studies done.[14]

Table 5: Comparisons of TOPS Score Vs Mortality

TOPS Score	Present Study Expired 37/150(24.7%)	Suresh et al[15] Expired 81/390 (20.76%)	Mathur et al[16] Expired 60/175 (34.28%)	Dalal et al[17] Expired 71/300 (23.66%)
0	--	1/128(0.78%)	4/49(8.16%)	--
1	8/54(14.8%)	14/105(13.33%)	7/51(13.72%)	12/121(9.91%)
2	8/32(25%)	35/112(31.25%)	14/34(41.17%)	17/48(35.41%)
3	11/21(52.4%)	23/35(65.72%)	23/29(79.31%)	29/37(78.37%)
4	10/10(100%)	8/10(80%)	12/12(100%)	13/13(100%)

India has got a wide network of peripheral health centres in rural areas where most of our population resides. As a sizeable proportion of neonates were referred at less than 24 hours of age, perinatal care facilities at these set ups need up gradation. Most of the referred neonates are already very sick at the time of referral, carrying the high mortality and some of them deteriorate during transport also. Though, intrauterine transfer is considered the safest mode of transport, but every time it is not possible to predict the high risk during antenatal period. Reduction in referrals will decrease the loads on tertiary care centres located in urban areas and will improve their functioning also. A neonate should be referred only when it is absolutely necessary, and here safe neonatal transport would act as a bridge between referring and receiving centres. Distance travelled by the neonates and condition at arrival emphasize the need of further improvement of transport services.

In present study, Hypothermia is a common event among transported neonates. Commonest affected parameter of the TOPS score was Temperature. In our study also almost half (36%) of the referred neonates were hypothermic, which is commensurate with the findings of Dalal E et al.,(55.3% hypothermic) followed by Hypoxia was the next most common event.[17] In contrast Narang M et al., reported delayed CFT to be the most common event followed by hypothermia (69.3% and 47% respectively).[18] These parameters can be managed easily during transport without requiring any sophisticated equipments. Even if no facility is available then at least kangaroo parental care can be practiced during transport to prevent hypothermia.

According on Admission TOPS score, high mortality was observed in neonates where all 4 parameters were affected. Out of 150 neonates in 10 neonates where all parameters were abnormal, 10(100%) expired. High TOPS score on admission was positively correlate with high mortality.The present study showed increase in mortality with increase in TOPS score, these findings are in concordance with the previous studies [Table 5].

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. 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-referal 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 morbidity and mortality. Hypothermia should be taken care during transport because it is a most commonly affected parameter and risk factor that contributing to morbidity.

RECOMMENDATIONS

The TOPS score was also found to be a reliable indicator of morbidity and mortality, as evidenced by the results where we inferred that the higher the number of altered parameters at the time of admission, the higher the risk of mortality to the baby whenever feasible, *In utero* transfer needs to be strengthened in peripheral parts of the country. Risk factor which causes significant number of deaths can be avoided by promotion of institutional deliveries, prompt and appropriate care during transport, proper regionalization of new born care, pre referral stabilization and adequate referral facilities.Neonate needing special or intensive care should preferably be transported by a skilled transport team through an organized teamwork with equipped vehicle customized for neonate transport. Pre-transport stabilization is the most vital step in the whole process of transport.

During this study, we verified that TOPS score was easily applied since it uses variables that are part of the routine care of newborns, and also because they are quickly obtained. It is an objective method of interpretation so subjective interpretation errors can be avoided. TOPS score again proves to be accurate in predicting the mortality among out-born neonates. Also, TOPS scoring system provides a quick and effective method of predicting neonatal morbidity and mortality and hence can serve as a guide for the paediatrician in initiating appropriate revival and/or treatment measures. Besides being useful to predict hospital death, TOPS is a simple score that can be easily applied in neonatal units. Based on these results, we recommend TOPS score to be done routinely for all the babies at admission.

REFFERENCES

1. Sehgal A, Roy MS, Dubey NK, Jyothi MC. Factors contributing to outcome in newborns delivered out of hospital and referred to a teaching institution. Indian pediatrics. 2001; 38: 1289-94.
2. Britto J, Nadel S, Maconochie I, Levin M, Habibi P. Morbidity and severity of illness during interhospital transfer: impact of a specialised paediatric retrieval team. BMJ. 1995 Sep 30;311(7009):836-9.
3. Kumar PP, Kumar CD, Venkatlakshmi A. Long Distance Neonatal Transport--The Need of the Hour. Indian pediatrics. 2008 Nov 1;45(11):920.
4. Hood JL, Cross A, Hulka B, Lawson EE. Effectiveness of the neonatal transport tea. Critical care medicine. 1983 ;11(6): 419-23.
5. Mathew JL, Mohan P, Panda R. Siddhartha Gogia,* Siddarth Ramji, $ Piyush Gupta, Tarun Gera, $ Dheeraj Shah. Indian Pediatr. 2011;48:537-46.
6. SRS Bulletin. Available at: http://www.censusindia.gov.in/vital_statistics/Vital_Rates/Vital_rates.aspx, Accessed February 13th,2012.
7. Wardhani DM, Haksari SW. Risk factors of neonatal mortality of referred babies with birthweight of 1000-< 2500 grams. Journal of the Medical Sciences (Berkala ilmu Kedokteran). 2009 Sep;41(03).
8. Ojha S, Sand L, Ratnavel N, Kempley ST, Sinha AK, Mohinuddin S, Budge H, Leslie A. Newborn infants with bilious vomiting: a national audit of neonatal transport services. Archives of Disease in Childhood-Fetal and Neonatal Edition. 2017 May 8:fetalneonatal-2016.
9. Rashid A, Bhutta T, Berry A. A regionalized transport service, the way ahead? Arch Dis Child 1999; 80; 488-92
10. Leslie AJ, Stephenson TJ. Audit of neonatal intensive care transport–closing the loop. Acta paediatrica. 1997; 86 (11): 1253-6.
11. Manual T. Navjaat Shishu Suraksha Karyakram New Delhi, Government of India, 2009.
12. Buch Pankaj M, Makwana Aarti M, Chudasama Rajesh K, Doshi Smita K. Status of newborn transport in periphery and risk factors of neonatal mortality among referred newborns. Journal of Pharmaceutical and Biomedical Sciences. 2012;16(09):3.
13. World health organization; managing newborn Problems; 2003
14. Begum A, Ashwani N, Kumar CS. "TOPS: a reliable and simplified tool for predicting mortality in transported neonates".
15. SureSh Kumar Verma, Chandra PraKaSh nagaura, ViShnu Kumar goyal, KaPil Kumar raheja, anurag Singh, Verma et al., Status of Transported Neonates and Evaluation of TOPS as a Survival Score www.ijnmr.net. Indian Journal of Neonatal Medicine and Research. 2017;5(2): PO01-PO05. 2.
16. 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.
17. Dalal E, Vishal G, Solanki D. Study on neonatal transport at tertiary care centre. hospital. 2013;84(28):49.
18. Narang M, Kaushik JS, Sharma AK, Faridi MM. Predictors of mortality among the neonates transported to referral centre in Delhi, India. Indian journal of public health. 2013 Apr 1;57(2):100.