ORIGINAL RESEARCH PAPER

Neonatology

KEY WORDS: Out born neonate, Referrals, transport, Health facilities

REFERRALS OF SICK NEONATES FROM HEALTH FACILITIES TO TERTIARY CARE CENTER: NEWBORN SURVIVAL CHALLENGES: NEED OF GOLDEN TRANSPORT

Chhaya Valvi* Byramjee Jeejeebhoy Government Medical College/Sassoon General Hospital, Jai Prakash Narayan Road, Pune, Maharashtra 411001, India *Corresponding Author

Ravish Kumar Byramjee Jeejeebhoy Government Medical College/Sassoon General Hospital, Jai Prakash Narayan Road, Pune, Maharashtra 411001, India

Sandhya Khadse Rajiv Gandhi Medical College and Chatrapati Shivaji Maharaj Hospital, Kalwa, Thane, Maharashtra 400602, India

AA Kinikar Byramjee Jeejeebhoy Government Medical College/Sassoon General Hospital, Jai Prakash Narayan Road, Pune, Maharashtra 411001, India

Kulkarni R Byramjee Jeejeebhoy Government Medical College/Sassoon General Hospital, Jai Prakash Narayan Road, Pune, Maharashtra 411001, India

ABSTRACT

BACKGROUND: India Newborn Action Plan (2014) aims to achieve a single digit NMR by 2030. To strengthen our National Programs for the there is a dire need of "Golden Transport". The objective of this study was to analyze the referral pattern of the out born sick neonates.

METHODOLOGY: A retrospective cross sectional study was done at a tertiary teaching hospital NICU. All out born neonates over nine months in 2014 were included. Demographic variables, weight, prematurity, transport details, and outcomes were documented.

RESULTS: A total of 259 (35%) neonates of the total 755 admissions were out born. The commonest indication for referral was respiratory distress syndrome 83 (32%). Neonatal transport protocols were very poorly followed in all babies. Thirty eight (14.6 %) sick neonates were referred in very critical condition. Mortality was found in 57 (22%) neonates.

CONCLUSION: The imminent possibilities of life threatening deterioration and death in the sick newborns were noted due to inappropriate transport. Strict adherence of neonatal transport guidelines as simplified by "Golden Transport" checklist by the referring and referral center will definitely avoid numerous preventable deaths.

INTRODUCTION

India Newborn Action Plan (2014) aims to achieve a single digit Neonatal Mortality Rate (NMR) by 2030 [1] To strengthen our National Programs for the newborns and achieve the Millennium Developmental Goals[2] (MDG - 4) there is a dire need of "Golden Transport" for the sick neonates along the lines of Golden Minute [3] and Golden Hour.[4,5]

A significant number of critically sick neonates require emergency transport due to paucity of expertise both in field of manpower and equipment. Neonatal transport is a challenge in developing countries especially due to insufficient distribution of Neonatal Intensive care Units and Specialized Newborn Care Units in rural and urban regions. Further neonatal transport is a neglected phase of the important continuing care of sick neonates that need additional systematic care.[6]There are large numbers of hospital linked private ambulance services, which cater to limited populations in major cities. But transports through these services are poorly managed. Over the years the specialized neonatal transport system in the developing countries has not evolved to its complete optimum functioning state. [7]

In newborns pre-transport stabilization, care during transport models and NNF guidelines are available.[8,9,10,11] Studies have highlighted sick babies transported are hypoglycemic and cyanosed and have serious clinical implications.[12,13,14] There is paucity of data on characteristics of transport of referral neonates to Neonatal Intensive care unit.[15] The referral pattern of neonates and characteristics in Western part of Maharashtra to a tertiary center is lacking. The study was hence planned to analyze the out born babies referrals in relation to transport. The primary objective of this study was to analyze the referral pattern of the sick neonates from the health facilities to tertiary care center. The secondary objective was to evaluate adherence of the guidelines during neonatal transport.

Methodology:

Study Setting:

The study was conducted at the Neonatal Intensive Care Unit (NICU) of Sassoon General Hospital, Pune. Sassoon General Hospitals (SGH) is a large public tertiary care referral center in Pune, a second most populous district in the State of Maharashtra. The Unit is a major urban tertiary referral center for the surrounding districts. The sick neonates coming to SGH come from very resource limited background. The unit caters both to inborn and out born neonates.

Study Design:

A retrospective cross sectional study of neonates admitted to Level III NICU of Sassoon General Hospital, Pune was done for a period of 9 months from January 2014 till September 2014. The study populations were neonates admitted to NICU. All out born referrals and out born coming from home directly were included. Neonates readmitted within the neonatal period to NICU after discharges were excluded.

Out born neonates were defined as neonates who were delivered outside of Sassoon General Hospital, either hospital or home. Inborn neonates were defined as newborns delivered at Sassoon General Hospital. Sample size: Convenience sampling method was used and all the out born neonates admitted during the study period were included.

The data was obtained from NICU admission register and indoor case admission paper on a pre-validated case record form sheet. Place of referral, Birth weight, prematurity, age of presentation, transport details, indication of referral, condition and diagnosis on admission, and treatment were the variables documented. Facility based newborn care[16] definitions for birth weight classification, prematurity and clinical diagnoses were used.

Primary outcome was cured, death and discharged against medical advice. Secondary outcome were adherence of neonatal transport guidelines. Statistical analysis: Data was tabulated and percentages were calculated for the categorical variables.

RESULTS :

Of the total 755 admission, 259 (34%) neonates were out born babies. Males were 152 (58.6%), preterm neonates 172 (68%)

and extremely low birth weight neonates (weight less than 1.0 kg) were 31(12%), Very low birth weight neonates (weight less than 1.5 till 1.0 kg) were 40 (15.4%) low birth weight neonates (weight less than 2.5 till 1.5 kg) were 113 (43.6%) were the major referrals. Ninety three (35%) neonate's babies were referred from private hospitals and institutions. The sick neonates referred from primary, rural and civil government hospitals were 75 (29.3 %). Babies admitted at SGH center directly from home were 91(35 %). Maximum neonates were referred on day 1 of life 107 (41%). The commonest indication for referral was Respiratory distress syndrome 83 (32 %), Sepsis 29 (11 %), Hyperbilirubinemia 20 (7.7 %), Convulsions 21(8.1%), Birth asphyxia 19 (7.33 %), Congenital heart disease and malformations 26(10%), Meconium aspiration syndrome 14 (5.4%) and other causes 14(5.4%). Referrals for routine basic care for feeding and temperature regulation of the newborn were observed in 33 (12.7 %) neonates. Nearly three fourth of the neonates 160 (62 %) neonates required second and third line antibiotics. Delay in mother reaching the NICU after 5 days was observed for 139 (54 %) neonates.

Table 1: Demographics and Clinical Characteristics of Out born neonates admitted to NICU, Sassoon General Hospital

Sr. No	Characteristics	Frequency (percentage)
1	Total	n=259
2	Gender	
	Males	152 (58.68 %)
	Females	107 (41.31%)
3	Prematurity	176 (68 %)
4	Weight	
	Low birth weight	113(43.6%)
	Very Low birth weight	40 (15.4 %)
	Extremely low birth weight	31 (12%)
5	Indication of Referral	
	Respiratory Distress Syndrome	83 (32 %)
	Sepsis	29 (11%)
	Hyperbilirubinemia	20 (7.7 %)
	Convulsion	21(8.1%)
	Birth Asphyxia	19 (7%)
	Congenital heart disease and malformations	26(10%),
	Meconium aspiration syndrome	14 (5.4%)
	Other causes	14(5.4%)
6	Referral on Day 1of life	107(41 %)

Neonatal transport protocol was seriously jeopardized in all cases leading to a critical and an unstable neonate at admission. None of the referrals from private and government hospitals confirmed telephonically regarding availability of bed for the critical sick neonates.

Of all the out born admissions, thirty eight (14.6 %) sick neonates were referred in very critical condition from the health facilities. Private hospital referrals constituted 15 (40 %), followed by patient bought from home directly 12 (31.6 %). Sick critical neonates coming from government hospitals were 6 (15.8%). The rural referrals from Primary Health Center (PHC) were 5 (13.1 %) neonate. Ten babies (3.8%) were gasping on arrival to the Neonatal Intensive Care Unit. Six babies (3.5%) were bought in an inappropriate intubated condition. Among the 6 babies bought in intubated condition only 1 referral had an accompanied doctor. The transport protocol of doctor accompaniment, oxygen, intra venous access with supplementation of intravenous fluid, keeping baby warm were seriously lacking in all critically sick neonates referrals from health facilities. Ambulances used for transport with facilities to provide oxygen to the sick neonate were available in 50 (30 %) ambulances only. Complete referral letter with treatment history was available with only 10 (6 %)neonates.

Table 2: Transport Characteristics of Out born Sick Neonates

Sr.No	Characteristics	Frequency (percentage)
1	Referrals	n=259
	Private Hospital and Institutions	93 (36 %)
	Government Hospitals	75 (29 %)
	Home	91 (35 %)
2	Rural	132 (51 %)
	Urban	127 (49 %)
3	Critically Sick Neonates	38 (14.6 %)
	Private Hospitals	15 (40%)
	Government Hospitals	06 (15.7%)
	Primary Health Center (PHC)	05 (13.1%)
	Home	12 (31.5 %)
4	Intubated	06 (3.5%)
5	Neonates gasping on admission	10 (3.8%)
6	Referral letter (complete details)	10 (6%)
7	Ambulance with oxygen	50 (30 %)

Among the out born neonates enrolled in the study mortality was found in 57 (22%) neonates. Nearly half of the of the deaths 26 (45 %) occurred within first 24 hours of admission, 14 (24 %) within 2-3 days and 17 (29.8 %) after 3 days of life. The distribution of mortality as per the weight was as follows Extremely low birth weight neonates constituted 13 (22.8%), Very low birth weight neonates 6 (10.5%) and Low birth weight neonates 19 (33%).

Table 3: Outcome of the Out born Sick neonates admitted to NICU, SGH

Sr. No	Outcome	Frequency (percentage)
1	Discharged	165 (63 %)
	Discharged against Medical Advise	37(14 %)
	Mortality	57 (22 %)
2	Mortality as per day of admission	
	Day 1 of admission	26 (45%)
	Day 2 -3 of admission	14 (24 %)
	Beyond day 3 of admission	17 (29.8 %)
3	Mortality as per weight	
	Extremely low birth weight	13 (22.8 %)
	Very Low birth weight	06(10.5 %)
	Low birth weight	19 (33 %)
	Normal birth weight	19 (33%)

DISCUSSION:

This study attempts to highlight the challenges faced by sick neonates for survival during transport. Prematurity and low birth weight were the major burden of the referrals. Further transporting these critical sick babies in compromised condition leads to poor outcome. In addition prematurity and low birth weight importantly constitute as major public health problems in the developing countries.[17,18,19] Study by Buch et.al[20] highlighted poor outcomes of transported sick out born neonates. Neonatal co morbid conditions observed in our study are similar to studies across India and many developing countries.[21] Respiratory distress sepsis, asphyxia, hypothermia are the common cause of neonatal mortality in India.[17] Transporting neonates in poor conditions further leads to adverse outcomes which is preventable. Appropriate simple steps taken during transport to maintain the vitals may prevent poor outcomes.

Private hospitals and institution constituted more than one third of the referrals followed by home referrals and primary health center and government hospitals. The prerequisite of transport for critical sick neonate is to confirm the vacancy and inform the time of arrival. The government has initiated 108 ambulance services for free transport of sick mother and newborn. Coordination of

referring to referral center along with the ambulance services is necessary for effective services for neonatal transport. Private hospitals transported babies in more critical conditions compared to government hospital. Continuous medical education of the medical officers in neonatal national programs may be the underlying reason.

Our study found complete lack of telephonic communication of the referral centers. Prior communication is vitals for ensuring optimal management of the critically sick referred newborns.[22]A study in Delhi by Babinard J. et.al[23] found less than 8% of babies were sent to referred hospital after prior communication. Telephonic confirmation and availability of bed in NICU and SNCU is vital for the referred baby and also for the referred unit to avoid unnecessary overcrowding and morbidities. Among the referred out born, our study found 12.7% newborn were referred for routine newborn care of feeding and temperature regulation. This further indicates continued skill building is required in health workers to avoid unnecessary transport to higher centers.

Efficient ambulance services for sick neonatal transport have been lacking in addition to unavailability of trained expertise and equipped machinery in neonatal transport. Study in India showed a trend of less than 30 % for utilizing ambulance services.[20,22] Mortality is lower compared to other studies [8,25], this may be the reflection at the tertiary health care teaching center, whereas data from literature vary from developing countries to rural areas where facilities are scare.

Various models for pre transport stabilization have been developed STABLE (Sugar, Temperature, Airway, Blood pressure, Laboratory work up and Emotional support), SAFER (Sugar, Arterial circulatory support, Family support, Environment and Respiratory support), TOPS (Temperature, oxygenation (Airway & Breathing), Perfusion, Sugar.[8,9,10]

The government of India has launched various neonatal health programs to improve neonatal health and decrease neonatal morbidity and mortality. Health program like Navjat Shishu Swasthya Karyakram[21] emphasize on neonatal resuscitation and importance of the Golden minute the first minute of life. JSSK and F IMNCI health programs have simplified the protocol management for detection of danger sign and pre referral treatment and care during transport.[26,27]

The use of Golden Hour approach in adult emergency medicine showed a decrease in patient mortality with better transport and patient outcome.[4] In addition effective stabilization of the neonate in the first 60 minutes after birth the Golden Hour has helped in minimizing the complications with improved outcome.[5]

The prerequisites for a neonatal transport can be followed in a simpler manner.

GOLDEN TRANPORT

GOLDEN -
G - Give Feeds (when required appropriately in sick neonates),
O - Oxygen,
L - Letter,
D - Drugs,
E - Enquiry of NICU Bed,
N - Nurse or Doctors accompany.

TRANSPORT

T- Temperature maintenance,
R - Resuscitation kit / respiration,
A - Airway / intravenous Access,
N - NICU,
S - Sugar – prevent hypoglycemia / Safety roads approach,
P- Parents counseling / prevent infections,
O - Oxygen (recheck),
T- Telephone.

The tool is simple and is easy to remember as the heath worker are aware of the importance of Golden minute and Golden hour. The same can be applied for Golden Transport. All high risk newborn babies should be delivered in a centre having NICU facilities to avoid the hazard of transport after delivery. The best mode of transport is intrauterine and delivery at the designated referral center. Thus a premature neonate requires the utmost same care post natal when transferred from one center to other. We have to provide the best appropriate route for transporting the sick premature babies who are seriously compromised for functioning of every organ of the body. Use of the above simple tool by transport health care workers and nursing staff will make marked improvement in the health condition of the sick neonates during transport. The tool is a simple checklist to be followed.

The success of neonatal transportation depends on early identification of need of transport, pre referral stabilization, appropriate referral and care during stabilization(28). Process of neonatal transport study for all stages of transfer with continuous quality assessments to improve upon the existing protocols is the need of the hour.

Our study focused on how neonates are referred to a tertiary care center from the community depicting both the referrals from government and private hospitals. The data demonstrates the situation in urban region. The situation of sick neonatal transport may be grimmer in rural regions. The details of various clinical conditions and course of the out born neonates has not been studied. Further being a retrospective study the data has not been able to analyze the statistical significant test and predictors of mortality on regression analyses. Also time required traveling, detailed clinical characteristics on admission could not been documented. The attempt in this study is to highlight the need of following the protocol of neonatal transport. The use of Golden transport as a tool can be studied in future research.

CONCLUSION:

The imminent possibilities of life threatening deterioration and death in the sick newborns were noted due to inappropriate transport. Inflated cost of the treatment and difficulties experienced by families can be minimized if strict adherence of neonatal transport guidelines are followed which is "Golden Transport" will definitely avoid numerous preventable deaths. Strict adherence of neonatal transport guidelines as simplified by "Golden Transport" checklist by the referring and referral center will definitely avoid numerous preventable deaths.

Acknowledgment: The authors acknowledge the staff nurses of NICU, SGH, Pune.

Conflict of Interest: None

REFERENCES:

1. Ministry of Health and Family Welfare. Government of India. India Newborn Action Plan (INAP) September 2014. http://www.newbornwhocc.org/INAP_Final.pdf. (Last accessed on 2018 September 20)
2. Social Statistics Division Ministry of Statistics and Program Implementation. Government of India. Millennium Developmental Goals India Country Report 2015. mospi.nic.in/Mospi_New/upload/mdg_26feb15.pdf (Last accessed on 2018 September 20)
3. Wyckoff MH, Aziz K, Escobedo MB, Kapadia VS, Kattwinkel J, Perlman JM, Simon WM, Weiner GM, Zaichkin, JG. Part 13: neonatal resuscitation: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2015;132(suppl 2):S543–S560.
4. Lerner EB, Moscati RM. The golden hour: scientific fact or medical "urban legend"? Acad Emerg Med Off J Soc Acad Emerg Med. 2001 Jul;8(7):758–60.
5. Doyle K, Bradshaw W. Sixty golden minutes: Neonatal Network 2012; 31(5):289-94. http://dx.doi.org/10.1891/07300832.31.5.2 89 PMid: 22908049
6. Hosseini M-B, Jannati A, Gholipour K, et al. Perception and Expectation of Iran Neonatal Transport Expert Regard to Developing Neonatal Transport System in Iran: A Qualitative Research. Journal of Clinical Neonatology. 2014;3(1):25-34. doi:10.4103/2249-4847.128726.
7. Poddutoor Preetham Kumar, Chirla Dinesh Kumar, Farhan A.R. Shaik et. al. Prolonged Neonatal Interhospital transport on Road: Relevance for developing countries. Indian J Pediatr 2010; 77 (2):151-154
8. Mathur NB, Arora D. Role of TOPS (a simplified assessment of neonatal acute physiology) in predicting mortality in transported neonates. Acta Paediatr. 2007 Feb;96(2):172-5
9. Karlsen K. The STABLE Program. STABLE Program, Utah. 2001.
10. Transporting newborn the SAFER way National Neonatology Forum of India, PENN India Health Group, university of Pennsylvania WHO Perinatal collaborating centre Illinois 1999
11. Satish Saluja, Manoj Malviya, Pankaj Garg, Girish Gupta, Naveen Jain. Transport of sick neonate. NNF clinical practice guidelines . Evidence Based Clinical Practice Guidelines. 2011: 303-327.

12. 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):836839.
13. Agostino R, Fenton AC, Kollée LAA, et al. Organization of neonatal transport in Europe. Prenat Neonatal Med 1999;4:20.
14. Leslie AJ, Stephenson TJ. Audit of neonatal intensive care transportclosing the loop. Acta Paediatr. 1997 Nov; 86(11):12531256
15. 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.
16. Ministry of Health and family Welfare. Government of India. Facility based Newborn care Operational Guidelines. Guidelines for planning and Implementation. 2011. (Last accessed on 2018 September 20)
17. For the Million Death Study Collaborators. Causes of neonatal and child mortality in India: nationally representative mortality survey. Lancet. 2010;376(9755):1853-1860. doi:10.1016/S0140-6736(10)61461-4.
18. M Hoque, S Haaq, R Islam. Causes of neonatal admissions and death at rural hospital in Kwazulu-natal, South Africa. South Afr J Epidemiol infect 2011; 26(1):27-29
19. Njokanma OF, Olanrewaju DM. A study of neonatal deaths at the Ogun State University Teaching Hospital, Sagamu, Nigeria. J Trop Med Hyg. 1995; 98: 155 – 60.
20. Buch P, Makwana A 2, Chudasama R , Doshi S et.al Status of Newborn Transport in Periphery and Risk Factors of Neonatal Mortality among Referred Newborns. Journal of Pharmaceutical and Biomedical Sciences (JPBMS), 2012 Vol. 16, Issue 16
21. Ministry of Health and family Welfare. Participant Module Navjat Shishu Suraksha Karyakram. New Delhi, Government of India, 2009
22. Narang M, Kaushik JS, Sharma AK, Faridi MM. Predictors of mortality among the neonates transported to referral centre in Delhi, India. Indian J Public Health 2013;57:100-4
23. Babinard J, Roberts P. Maternal and Child Developmental Goals: What Can Transport Sector Do? The World Bank Group. Transport Paper. Available from: http://www.siteresources.worldbank.org/INTTRANSPORT/Resources/336291-1227561426235/5611053-1229359963828/tp12_maternal_health.pdf. [Last accessed on 2018 September 20].
24. EMRI/Patient Transport Service. National Ambulance Service (NAS). Available from: http://www.nrhm.gov.in/nrhm-components/health-systems-strengthening/emri-patient- transport-service.html [Last accessed on 2018 September 20]
25. Sehgal Arvind, M.S.Roy, N.K.Dubey, M.C.Jyothi. Factors contributing to outcome in newborns delivered out of Hospital and referred to a teaching Institution. Indian pediatr 2001; 38: 1289-94.
26. Government of India. Guidelines for Janani Shishu Suraksha Karyakram. New Delhi: National Rural Health Mission, MoHFW; 2011.
27. Ministry of Health and family Welfare. Participant Module of Facility based IMNCI. New Delhi, Government of India, 2009.
28. Jaydeep Ray. Neonatal transport is a challenge in our country. JKIMSU July- Dec; 2012(1) 2