



A STUDY ON STATUS OF NEONATAL TRANSPORT TO A LEVEL III NEONATAL INTENSIVE CARE UNIT

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Abstract : INTRODUCTION In the past decade great advancements in Neonatal care contributed to a fall in IMR. A further fall in IMR can only be achieved by improving the Neonatal Transport Facilities. Hence to assess the current status of Neonatal Transport we undertook this study. STUDY DESIGN This is a cross-sectional study of 75 neonates transported to our NICU. For all the babies data regarding place of birth, mode of delivery and mode of transport were collected. On admission parameters like blood glucose, temperature, CRT, SPO₂, presence of cyanosis and shock were assessed. RESULTS In the present study 64 of neonates came to our NICU on their own conveyance. 67 of referrals from PHCs did not utilise ambulance facility. 30 of neonates had hypothermia on arrival. 35 had hypoglycemia on arrival. 15 had a low oxygen saturation on arrival. 15 had prolonged CRT on arrival. Only 8 of neonates received prior treatment. 11 babies did not have any referral slip. Only a very few had complete and proper referral advice.

CONCLUSION 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 separate fleet of neonatal ambulances that are well equipped and manned by trained personnel is the need of the hour.

Keyword : Neonatal transport, Ambulance, Pre-Hospital stabilisation, Infant Mortality Rate, Neonatal Intensive Care Unit

INTRODUCTION:

The Millennium Developmental Goal -4 aims to lower the IMR from 1990 level of 84 per 1000 Live Births to 28 per 1000 Live births by the year 2015(1). Two- third of IMR is contributed by deaths within the first week of life. The major causes of neonatal mortality are Prematurity, Birth asphyxia and Sepsis. In the past decade we witnessed great advancements in neonatal care under NRHM, IMNCI and CEMONC programmes. This has helped in bringing down the infant mortality rate significantly. However the status of neonatal transport still remains in primitive stage. Hence a further fall in IMR will only be achieved when neonatal transport facilities are improved. Though institutional delivery and in utero transport of newborn is the safest way to transport a sick neonate, unfortunately preterm delivery and perinatal illness cannot be always anticipated. This

results in the continuous need for transport of these babies. These babies are often critically ill and the outcome is also dependant on the effectiveness of transport system. In most of these newborn babies the ineffective transport system results in hypoglycemia, hypothermia, cyanosis and other complications. These complications further increase the mortality among these sick neonates. The introduction of 108 ambulance services in Tamilnadu under the auspices of EMRI (Emergency Medical and Research Institute) has revolutionised the transport of sick patients to the hospitals. Their services to accident and trauma care is commendable. But most of the ambulance services in India are neither equipped to handle sick neonates nor manned by skilled persons to handle neonatal transport. Hence we undertook this study to analyse the profile of newborn babies referred to our level III NICU.

NATURE OF STUDY: Descriptive study.

STUDYPERIOD: One month period from 16.01.2012 TO 15.02.2012.

LIMITATIONS OF THIS STUDY: This is a short study of 75 babies transported to our NICU in one month duration. Many neonatal morbidities like hypoglycemia and shock may occur due to the primary illness per se or due to poor transportation facilities. In this study it was not possible to differentiate between them. Large Randomised Control Studies may be necessary to analyse this (Table-25).

INCLUSION CRITERIA: 1. All babies referred to our NICU are included in the study

Exclusion criteria:

1.Since the aim of the study is to analyse the effectiveness of neonatal transport in emergency situations, Non urgent cases and babies more than 24 hours aged are excluded from the study. 2.babies born intramurally are also excluded from the study

Study Protocol:

After getting consent for the study from the parents, following data were recorded for all the babies in the study group.

1. Time of birth,
2. Place of birth,
3. Birth – Arrival interval,
4. Mode of delivery
5. Birth weight
6. Geststional age
7. Temperature

8. SpO2 by pulse oximeter
9. Blood sugar
10. Capillary Refill Time
11. Cyanosis
12. Mode of Transport
13. Accompanying person
14. Provision of warmth during transport
15. Provision of Kangaroo Mother Care during Transport
16. Availability of referral slip – complete or incomplete
17. Pre-transport stabilisation

Case Definitions:

Case definitions of IMNCI for Hypoglycemia, Hypothermia, Gestational Age, Birth Weight and Shock were used for this study.

Hypoglycemia: Blood glucose < 45mg/dl

Hypothermia: Axillary temperature recorded by thermometer (graded by IMNCI guidelines)

Cyanosis: Cyanosis of soles, perioral region and not just of oral mucosa

CRT: Delayed if more than 3 seconds

LBW: Birth weight <2.5kg

VLBW: Birth weight <1.5kg

Preterm baby: Born <37 week

Extreme preterm: Born <28 week

Sepsis, Birth Asphyxia, MAS were diagnosed as per National Neonatology Forum guidelines.

RESULTS AND ANALYSIS:

1. AGE DISTRIBUTION

AGE IN HOURS	NO. (%)
0-6	88 (88 %)
7-12	8 (10 %)
13-18	1 (1 %)
19-24	0
TOTAL	75 (100 %)

In the present study, most of the babies (88%) were transported within 6 hrs of birth. This finding reassures the promptness with which the neonates are referred to our NICU.

2. PLACE OF BIRTH

PLACE OF BIRTH	NO. (%)
HOME DELIVERY	2 (3%)
PHC/UHP	52 (80%)
CEMONE CENTRE/IGH	14 (18%)
PRIVATE HOSPITAL	7 (9%)
TOTAL	75 (100%)

Among those babies referred to NICU 80% were delivered in PHC.

3. MODE OF TRANSPORT

MODE OF TRANSPORT	NO. (%)
108 AMBULANCE	19 (26 %)
PRIVATE AMBULANCE	3 (4 %)
GOVT. AMBULANCE	5 (7 %)
OWN CONVEYANCE	48 (64 %)

In the present study about 64% of neonates did not have proper transport facilities and arrived at the hospital at their own conveyance. A non-ambulance transport places the neonate at increased risk for mortality and morbidity.

4. DISTANCE TRAVELLED

DISTANCE TRAVELLED	NO OF CASES
WITHIN CITY	11 (15%)
<50 KM	56 (74%)
>50 KM	8 (11%)

Most of the babies referred to our NICU were from a distance of less than 50 kms. 11% of babies were referred from a distance of more than 50kms

5. GESTATIONAL AGE DISTRIBUTION

GESTATIONAL AGE	NO. (%)
EXTREME PRETERM	1 (1 %)
PRETERM	30 (40 %)
TERM	43 (57 %)
POST TERM	1 (1 %)
TOTAL	75 (100 %)

In the present study 40% babies were preterm and 1 % was extreme preterm.

7. DIAGNOSIS

DIAGNOSIS	NO. (%)
RDS	16 (21%)

PRETERM	35 (33%)
BIRTH ASPHYXIA	20 (27%)
MAS	5 (8%)
SEPSIS	4 (5%)
CONGENITAL ANOMALIES	2 (3%)
OTHERS	2 (3%)
TOTAL	75 (100%)

The common reasons for referral in the present study are Preterm(41%), Birth Asphyxia(27%) and RDS(21%). Some of the referred neonates had multiple morbidities and only the dominant illness is considered here for classification.

8. TEMPERATURE ON ARRIVAL

TEMPERATURE	NO. (%)
NORMAL	53 (71 %)
MILD HYPOTHERMIA	20 (27 %)
MODERATE HYPOTHERMIA	2 (2%)
SEVERE HYPOTHERMIA	0
TOTAL	75 (100 %)

In the present study, 27% of babies had mild hypothermia, 3% of babies had moderate hypothermia at the time of admission. These babies were not provided with 'Warm Chain' during transport.

9. BLOOD GLUCOSE ON ARRIVAL

BLOOD GLUCOSE LEVEL	NO. (%)
NORMAL	41 (55 %)
HYPOLYCEMIA	34 (45 %)
TOTAL	75 (100 %)

In the present study hypoglycemia was noted in 45% of babies at the time of admission.

11. CAPILLARY REFILL TIME ON ARRIVAL

CRT	NO. (%)
NORMAL	54 (85 %)
PROLONGED	11 (15 %)
TOTAL	75 (100 %)

In the present study 15% of the babies have prolonged capillary refill time. This finding emphasizes on the importance of pre-transport stabilisation of the neonates.

12. PROVISION OF KANGAROO MOTHER CARE DURING TRANSPORT

KMC	NO. (%)
PROVIDED	0
NOT PROVIDED	75 (100 %)
TOTAL	75 (100 %)

None of the babies were provided with Kangaroo Mother Care (KMC) during transport. KMC could have been provided at least for the stable babies who were transported along with the mother.

13. PRIOR TREATMENT BEFORE TRANSPORT

PRIOR TREATMENT	NO. (%)
PROVIDED	3 (8 %)
NOT PROVIDED	69 (92 %)
TOTAL	75 (100 %)

Only 8% of those babies were given prior treatment before transport. In the rest of the study group no pre-transport stabilisation was given.

14. PROVISION OF WARMTH DURING TRANSPORT

PROVISION OF WARMTH	NO. (%)
PROVIDED	25 (33 %)
NOT PROVIDED	50 (67 %)
TOTAL	75 (100 %)

In the present study we noted that In about 67% of babies warmth was not provided

15. AVAILABILITY OF REFERRAL SLIP

REFERRAL SLIP	NO. (%)
AVAILABLE	57 (90%)
NOT AVAILABLE	8 (11%)
TOTAL	75 (100%)

Though 90% of the referred babies had referral slip, only 6.6% were complete. Most of the referral slips did not have details like APGAR score, mode of delivery, treatment details, etc.

16. AVAILABILITY OF TRAINED ACCOMPANYING PERSON DURING TRANSPORT

AVAILABILITY OF TRAINED PERSON	NO. (%)
AVAILABLE	17 (23%)
NOT AVAILABLE	58 (77%)
TOTAL	75 (100%)

In the present study only 23% of babies were accompanied by trained persons. The trained persons included Emergency Medical Technicians and Staff Nurses.

17. FEEDING DURING TRANSPORT

FEEDING	NO. (%)
FEEDING GIVEN	7 (9%)
FEEDING NOT GIVEN	58 (91%)
TOTAL	75 (100%)

Feeding was not given to 91% of babies during transport. Feeding could have been given at least for stable preterm/LBW babies who were transferred along with their mothers.

18. OUTCOME

OUTCOME	NO. (%)
DISCHARGED	46 (61%)
EXPIRED	24 (32%)
LEFT AGAINST MEDICAL ADVICE	5 (7%)
TOTAL	75 (100%)

In the present study 61% babies were discharged, 7% left against medical advice and 32% expired.

19. PLACE OF BIRTH AND MODE OF TRANSPORT

	Total No of Neonates	Transported by 108 Ambulance	Transported by Private Ambulance	Transported by Govt Ambulance	Patients own conveyance
Home	2	0	0	2	2 (100%)
PHC	52	17	3	3	35 (67%)
GH	14	0	0	6	8 (57%)
Private Hospital	7	0	4	0	3 (43%)

In the present study, from the above table it can be noted that 67% of neonates born in PHC's came to our NICU by their own conveyance. It can also be noted that 57% neonates born in GH and 43% neonates born in Private Hospital came to NICU in their own conveyance.

20. CORRELATION BETWEEN MODE OF TRANSPORT VS HYPOGLYCEMIA

	Total No.	108	Private Ambulance	Govt Ambulance	Patient's own conveyance
Hypoglycemia	34	9	1	5	19 (56%)
Normal	41	8	3	1	29 (71%)

From the above table it is evident that Hypoglycemia is more common in neonates transported by their own conveyance.

21. CORRELATION BETWEEN MODE OF TRANSPORT VS HYPOTHERMIA

	Total No.	Neonates transported by 108 ambulance	Neonates Transported by Private Ambulance	Neonates Transported by Govt ambulance	Neonates came by own conveyance
Hypothermic	23	4	1	3	15
Normothermic	52	15	2	2	33

From the above table it is evident that 8 babies who were transported by ambulances were hypothermic on arrival.

22. CORRELATION BETWEEN DIAGNOSIS AND PRIOR TREATMENT

	RDS	Preterm	Birth Asphyxia	MAS	Congenital Anomalies	LBW	Sepsis	Others
Treatment received	0	0	4	2	0	0	0	0
Not Received	16	4	16	4	2	21	4	2

From the above table it is evident that none of the babies with RDS, Prematurity, LBW and sepsis received any pre-hospital stabilisation.

23. CORRELATION BETWEEN MODE OF TRANSPORT AND MORTALITY

MODE OF TRANSPORT	MORTALITY
108 AMBULANCE (WITHOUT NEONATAL INCUBATORS)	5(25%)
PRIVATE AMBULANCE	2(8%)
GOVERNMENT AMBULANCE	4(17%)
PATIENT'S OWN CONVEYANCE	12(50%)
TOTAL	24(100%)

As evident from the above table, mortality was more common among babies transported in their own

conveyance.

24. CORRELATION BETWEEN DISTANCE TRAVELLED AND MORTALITY

DISTANCE TRAVELLED	NO OF CASES	MORTALITY	PERCENTAGE
WITHIN CITY	11	1	4%
DISTANCE <50 KM	56	19	79%
DISTANCE >50 KM	8	4	17%
TOTAL	75	24	100%

From the 8 babies transported from a distance of more than 50kms, 4 babies expired. This is due to non-availability of level III NICU within a radius of 50kms.

25. CORRELATION BETWEEN MORBIDITY AND MODE OF TRANSPORT

MODE OF TRANSPORT	NO OF CASES	HYPOGLYCEMIA	HYPOTHERMIA	SHOCK	HYPOXIA
108 AMBULANCE	19	5	4	2	1
PVT AMBULANCE	3	1	1	1	1
GOVT AMBULANCE	5	5	3	1	2
PATIENT'S OWN CONVEYANCE	48	19	14	7	7
	75	34	22	11	11

From the above table it is evident that morbidities are significantly higher in babies transported in their own conveyance.

In most of the neonatal illness the above morbidities coexist. Hence much larger studies are needed to definitely ascertain whether morbidities are due to illness per se or due to neonatal transport.

CONCLUSION:

1. Golden Hour Concept

Any insult to the neonatal brain occurring in the first few hours of life will increase their mortality and morbidity. Hence to improve the neonatal survival and to prevent the occurrence of future handicaps, treatment should be initiated immediately after birth, especially in conditions like birth asphyxia.

In trauma care this Golden Hour concept has given very good results. This golden hour concept can be expanded to Newborn Care also, although in a different setting. In contrast to trauma care where the patient is not inside the health care system in the first few hours, the neonates are very much under the health care system immediately after delivery. So stabilisation and treatment can be initiated immediately after birth in the 'Golden Hour'.

2. Establishing satellite level III NICU's - for every 50kms to minimise the morbidity and mortality due to transport.

3. Pre-Hospital stabilisation

As evident from our study only a very few percentage of neonates receive pre transport stabilisation. An improvement in the pre hospital stabilisation will definitely improve the outcome for the neonates.

4. Dedicated fleet of Neonatal ambulances

Most of the available ambulances now are not adequately equipped to handle sick new born babies. So a dedicated fleet of ambulances which are well equipped and manned by trained personnel will improve the quality of neonatal transport. At present this dedicated fleet of ambulances are available in few places in Tamilnadu. This should be expanded to all the Districts in our state. Air lifting of sick new born babies to a nearest NICU like in developed countries still remains a distant dream for a developing country like India.

5. Utilisation of ambulances for Neonatal transport

From the above study it is evident that ambulance services are under utilised for neonatal transport. An improvement in the utilisation of ambulance services for neonatal transport will improve the morbidity and mortality of neonates.

6. Warm chain

The most important aspect in the transport of neonates is the maintenance of warm chain during transport. Adequate equipments like neonatal transport incubators should be available during transport to maintain normothermia in the neonate. In resource limited settings, alternative low cost improvised containers like thermocol box, basket, padded pouch, polythene covering etc., can be provided. Care should also be taken to prevent heat loss by proper wrapping of the baby. Transport crew should be well educated regarding the warm chain.

7. Training of Ambulance Crew

The ambulance crew should be adequately trained to handle neonatal emergencies.

8. Formulation of a standard protocol for Neonatal Transport

As evident from the above study most of the babies are transported without prior stabilisation, without a proper referral slip, without proper maintenance of warm chain and in their own conveyance. Hence an availability of standard protocol for inter facility transport will go a long way in improving the outcome of transported babies. The following factors should be considered in formulating a standard protocol(2,3,4,5) . Separate protocols should be formulated for Primary Health Centres and Government Hospitals, as facilities available will differ

Pre transport stabilisation	
1.	Maintain normothermia
2.	Maintain airway/breathing – consider intubation if preterm < 30 weeks , recurrent apnea , etc
3.	Maintain circulation – IV access and shock correction as indicated
4.	Blood glucose – measure and stabilize blood glucose as indicated
5.	Prevention of sepsis during transport -
6.	Counselling the parents
7.	Write a complete referral slip
Basic equipments needed for ideal neonatal transport	
1.	Transport incubator or low cost alternatives
2.	Suction device
3.	Oxygen cylinders
4.	Airway equipments like ET tube , mask , laryngoscope , etc
5.	Pulse-oximeter , ECG monitors , glucometer , thermometer.
6.	Essential drugs like adrenaline, dopamine, phenobarbitone, vit k, calcium gluconate, etc.
7.	Consumables like IV fluids , IV set, stethoscope , gloves, etc.
Care during transport	
1.	Watch for hypothermia (a simple way to assess – ensure warm feet)
2.	Ensure open airway/ breathing
3.	Provide KMC / feeds as indicated
4.	Monitor vitals – Heart Rate, Respiratory Rate, CRT.

8. Periodical review of Neonatal Transport Facilities

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