

Change in Patient Profiles and Outcomes Before and after Strengthening of the Facilities in NICU of Nepal Medical College Teaching Hospital

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ABSTRACT

Introduction: It is a known fact that neonatal mortality is the major contributor of under five mortality. Many neonatal Intensive care units are being strengthened in low resource countries like Nepal. With addition of more invasive therapeutic approach if we also introduce simple yet cost effective practices and regularly reemphasize them we can help lots of neonates.

Methods: This is a before and after observational study done in NICU of NMCTH. All cases admitted from Sept 2013 to Aug 2014 were studied retrospectively and cases admitted from Sept 2014 to Aug 2015 were studied prospectively. All cases admitted in NICU of NMCTH were included in this study.

Results: Total live birth was 2942 before and 3439 after. NICU admission was 280(9.5%) and 343(9.97%) before and after. Mean duration of NICU stay was 4.76 days and 3.9 days after. We retained more (9times) babies <32weeks of gestation than before. LBW babies and VLBW babies were two times more than before. Admissions from emergency increased two times than before and referrals from other hospital increased three times than before. Admissions of outborn babies also increased. Before outborn consisted of 5% of total NICU admission which increased to 15.55 in after period. Profiles of patient in both the study period are comparable with sepsis related admissions being highest in both the period. There were 57.2% sepsis related admissions with 7.5% culture positive sepsis, 11.4% hyperbilirubinemia, 10.3% prematurity, 9.3% Meconium aspiration syndrome, 4.3% birth asphyxia, 3.6% TTN, 2.5% congenital anomalies before. 44.3% sepsis related admissions with 5.5% culture positive sepsis, 22.4% hyperbilirubinemia, 12% prematurity, 11.1% Meconium aspiration syndrome, 4.7% TTN, 2.6% congenital anomalies, 2.6% birth asphyxia with few cases of birth injuries, neonatal seizures and congenital heart disease after. Outcome was comparable in both the study period. Mortality rates were 4.6% before and 4.7% after. LAMA and DOR cases were 14.3% before and 11.7% before. Cases we referred to other hospitals were more before 5.7% (16) than in after 2.6% (9). **Conclusion:** There was no significant difference in outcome before and after strengthening of services along with re emphasis of better cost effective practices even though there was significant retention of sicker and very low birth weight babies in NICU of Nepal Medical College Teaching Hospital.

Key words: before and after strengthening of NICU, NMCTH.

INTRODUCTION

Every year millions of babies are born and a large proportion of them are admitted to the neonatal ward for various indications. It has been estimated that 3.9 of 126 million neonates born each year die before completing their first 28 days of life.¹ A staggering 99% of these neonatal deaths occur in low-income countries.² The global community has committed itself to a two-thirds reduction in under-5 child mortality between 1990 and 2015 as the fourth Millennium Development Goal (MDG-4).³ As almost 40% of these deaths occur among neonates, a substantial reduction in neonatal mortality rate (NMR) is a prerequisite to attain MDG-4. In

resource poor countries like ours though NICU are established, infrastructure and equipments as per tertiary care NICU are not available. Every year many of neonatal deaths take place because simple yet effective interventions do not reach those who need them the most.⁴

In Nepal Medical College Teaching Hospital newer modalities like ventilator, more monitors, CPAP, invasive techniques like central line placement, newer therapies like surfactant are introduced recently from September 2013.

Similarly better practices like hand washing for 2 minutes before entering NICU, use of sterile towels,

using hand shield in between patients, discarding disposable IV sets in 48 hours, using 5ml distilled water for antibiotics reconstitution and not keeping stock solution in NICU, early discharge, and monthly surveillance of environmental cultures from NICU were emphasized at same time.

This study was conducted to identify the general characteristics, disease spectrum and the commonest causes of morbidity, use of newer modalities of treatment and outcome of babies admitted before and after strengthening of the available facilities in NICU.

MATERIALS AND METHODS

This is a before and after observational study done in NICU of NMCTH. All cases admitted from Sept 2013 to Aug 2014 were studied retrospectively and cases admitted from Sept 2014 to Aug 2015 were studied prospectively. All cases admitted in NICU of NMCTH were included in this study.

Data collected were perinatal and neonatal history, weight, gestational age, diagnosis, complications like nosocomial infection, duration of stay, duration of mechanical ventilation, use of surfactant and outcome.

Outcome is recorded in terms of intact survival, discharged with morbidity, death, LAMA and referred. Indication for referral was also recorded.

Before September 2014, we were giving level II care in 15 bedded NICU. We had 9 warmers, 9 monitors, 6 residents looking after the ICU.

After we upgraded our care to level III with introduction of 4 ventilators, started using CPAP, got more warmers, phototherapy machines and monitors. We also started using more invasive procedures like central line placement, surfactant therapy, and arterial BP monitoring in our NICU. Staffs were also added making 15 nursing staff with 4 consultants looking after NICU along with 7 resident doctors.

Similarly better practices like hand washing for 2 minutes before entering NICU, using hand shield in between patients, discarding disposable IV sets in 48 hours, using 5ml distilled water for antibiotics reconstitution and not keeping stock solution in NICU, monthly surveillance of environmental cultures from NICU were re-emphasized and we also started taking regular classes for working staffs and doctors at same time.

RESULTS

Percentage of NICU admission out of total live births was comparable in both study periods.

Total live birth was 2942 before and 3439 after. NICU

admission was 280(9.5%) and 343(9.97%) before and after. Mean duration of NICU stay was 4.76 days and 3.9 days after.

We retained more babies <32weeks of gestation than before. (9 times more)

Table 1: Gestational age profile before and after

	BEFORE	AFTER
28-30 weeks	1	4
30-32 weeks	2	25
32-34 weeks	10	15
34-36 weeks	10	8
36-37 weeks	39	14
37-40 weeks	218	277
TOTAL	280	343

LBW babies and VLBW babies were two times more than before.

Table 2: Birth weight profiles before and after

BIRTH WEIGHT	BEFORE	AFTER
1000-1499 GRAMS	4	8
1500-2499 GRAMS	27	54
2500-3999 GRAMS	239	273
>4000 GRAMS	10	9
TOTAL	280	343

There was no significant difference in male and female ratio in both the study period.

Admissions from emergency increased two times than before and referrals from other hospital increased three times than before.

Table 3: Admission and referral pattern before and after

ADMITTED FROM	BEFORE	AFTER
Emergency	6	17
OPD	32	40
Labour room	109	89
Operation Theatre	58	46
Post Natal Ward	70	136
Other Hospital	5	15
TOTAL	280	343

Admissions of outborn babies also increased. Before outborn consisted of 5% of total NICU admission which increased to 15.55 in after period.

Profiles of patient in both the study period are comparable with sepsis related admissions being highest in both the period. There were 57.2% sepsis related

admissions with 7.5% culture positive sepsis, 11.4% hyperbilirubinemia, 10.3% prematurity, 9.3% Meconium aspiration syndrome, 4.3% birth asphyxia, 3.6% TTN, 2.5% congenital anomalies before.

44.3% sepsis related admissions with 5.5% culture positive sepsis, 22.4% hyperbilirubinemia, 12% prematurity, 11.1% Meconium aspiration syndrome, 4.7% TTN, 2.6% congenital anomalies, 2.6% birth asphyxia with few cases of birth injuries, neonatal seizures and congenital heart disease after.

Table 4: Disease profile before and after.

DISEASE SPECTRUM	BEFORE	AFTER
SEPSIS RELATED ADMISSIONS	159 (57.2%)	142 (44.3%)
SEPSIS WITH MODS	1 (0.4%)	10 (2.9%)
HYPERBILIRUBINEMIA	32 (11.4%)	77 (22.44%)
BIRTH ASPHYXIA	12 (4.3%)	9 (2.6%)
PREMATURITY FOR SUPPORTIVE CARE	9 (3.2%)	15 (4.4%)
RDS OF PREMATURITY	13 (4.6%)	25 (7.3%)
IUGR	7 (2.5%)	1 (0.3%)
CONGENITAL ANOMALY	7 (2.5%)	9 (2.6%)
TTN	10 (3.6%)	16 (4.7%)
MAS	26 (9.3%)	38 (11.1%)
NEONATAL SEIZURE	2 (0.7%)	0
CONGENITAL HEART DISEASE	1 (0.4%)	1 (0.3%)
BIRTH INJURIES	1 (0.4%)	0
Total	280	343

There was significant retention of sepsis with MODS than before. 1 case before and 10 cases after. Incidence of nosocomial infection was 10% (28) of total NICU admission before and 8.2% (28) after.

After strengthening NICU we ventilated 4.4% (15) of total NICU admissions, used surfactant in 2% (7) of cases, central line placement in 2.9% (10). Outcome was comparable in both the study period. Mortality rates were 4.6% before and 4.7% after. LAMA and DOR cases were 14.3% before and 11.7% before. Cases we referred to other hospitals were more before 5.7% (16) than in after 2.6% (9).

Table 5: Outcome before and after.

OUTCOME	BEFORE	AFTER
INTACT SURVIVAL	211 (75.4%)	278 (81%)
DEATH	13 (4.6%)	16 (4.7%)
LAMA	32 (11.4%)	29 (8.5%)
REFERRED	16 (5.7%)	9 (2.6%)
DISCHARGE ON REQUEST	8 (2.9%)	11 (3.2%)

DISCUSSION

This study is valuable in showing that after upgrading the NICU services to level III and retaining more of the sick and low birth weight babies if we practice

and reemphasize simple and cost effective methods of aseptic techniques in our NICU we can save life of lots of neonate from sepsis related deaths.

Our study showed sepsis, hyperbilirubinemia, birth asphyxia, prematurity as major cause of NICU admission. Similar findings of admission was seen in study done in level III NICU of Eastern Nepal which showed Sepsis, prematurity and birth asphyxia were major causes for admission in NICU.⁵ Similar study done in Bangladesh showed The top five causes for neonatal admission were perinatal asphyxia (38.7%), low birth weight (25.7%), septicemia (19.2%), neonatal jaundice (5.9%), meconium aspiration syndrome (2.9%).⁶

In study done in Pakistan, low birth weight accounted for 55.4% admissions. Neonatal infection was the major cause of admission (45.21%) comprising 30.64% cases of septicemia, 9.82% of pneumonia and 4.73% of meningitis. Other causes of admission were birth asphyxia (18.85%), neonatal jaundice (13.15%), pre-term (6.87%), meconium aspiration syndrome (3.67%), hemorrhagic disease of newborn (2.21%), diarrhea (2.11%) and hyaline membrane disease (1.05%).⁷

In our study though we retained more cases of sepsis with MODS, neonates <32weeks of gestation and low birth weight babies, mortality rates became almost similar in both the study periods. This is mainly due to aseptic techniques we reemphasized regularly to our working doctor as well as nursing staffs.

Immediate outcome of reduction of sepsis related deaths with the package of simple interventions like rational admissions, early discharge, enforcing asepsis routines, aggressive enteral feedings, and protocol based management, involving mothers in care of babies and training and empowerment of nurses and working doctors have showed significant reduction in sepsis related deaths in India.¹⁸

Similar study from Bangladesh also showed that simple low cost infection control programme resulted in substantial reduction in sepsis deaths in preterm babies.⁹

As sepsis is the major cause of death in NICU in our as well as other countries. A study done in India showed sepsis as a major cause for admission in NICU.¹⁰ another study done in eastern Nepal showed 32.6% cases diagnosed as sepsis.¹¹

Another study done in hospital of Kathmandu showed prematurity as a major contributor of early neonatal death followed by birth asphyxia, congenital anomalies and septicemia.¹²

If we incorporate these simple yet cost effective aseptic practices in routine NICU care we can observe a

significant immediate gain in neonatal survival due to significant reduction in sepsis related deaths.

In most of our NICUs mothers are not involved in care of their sick and preterm neonates. When our NICU is full most of our staffs are overworked and quality of care can therefore be compromised. If we could involve mother in their care we can significantly reduce work load of health care workers and therefore improve survival of preterm neonates.

This is also shown in study done in Pakistan and India.^{13,14}

Our study showed that 9 to 10 % of total live births needed admission in NICU which is slightly less than reported from our neighboring hospitals and countries.

Mean duration of stay in our study decreased significantly in after period. This may be due to the construction of separate neonate cabin in pediatric ward and early transfer of babies even with low flow oxygen to the ward from NICU.

Higher NICU admissions due to hyperbilirubinemia are seen in our study in both the study periods is due to the fact that phototherapy is only given in NICU. In a study done in Nepal also hyperbilirubinemia is major cause for neonatal admissions with sepsis following it.¹⁵

Our study also showed significant rates of LAMA and DOR cases. Most of them went on their own because of financial constraints. We receive neonates with poor socioeconomic background and poor literacy level of most of the parents. NICU cost can be made free by hospital management in few cases but cost of their medicines, cost of outside stay by parents have to be beared on their own. In our study 25% of LAMA and DOR cases were terminal. Parents will only wait for certain days for their newborn to get better otherwise they would discontinue treatment as well as hospital stay on their own. There were very few cases where they went on LAMA because parents wanted to shift their neonates to some other tertiary care hospital.

In studies done to find NICU outcomes deaths rates reported are higher than our study and also showed similar LAMA rates 7 out of 25 leaving against medical advice.¹⁶

After strengthening our NICU, we not only practiced strict aseptic techniques but also revised admission and discharge protocols so as to reduce NICU stay of neonates, practiced early enteral feeding, started more invasive management, routine surveillance of environmental cultures in NICU, regular classes for nursing staffs regarding care of sick newborns. There may have been various factors playing role in

maintaining same mortality rates even after retaining more sick and preterm babies in our NICU like improved skill of nursing staffs and doctors after repeated training, availability of more physiological monitoring equipments, ventilators, invasive procedures like central line placement, arterial BP monitoring.

In our study better neonatal outcome may be due to the regular classes that we are conducting to the nursing as well as working doctors in our NICU. A study conducted in eastern India demonstrated a decline in NMR of the served district by creating a facility-based care and extensive training of referring doctors at primary and secondary levels.¹⁷

One study in INDIA suggested that countries investing in facility based newborn care should give impetus to establishing regionalized systems of perinatal care. Strengthening of lower level units with high case loads, can yield optimal reduction in NMR.¹⁸

Another study done in teaching hospital in Ghana concluded that improved facilities significantly improved survival of newborns <2500 g, but was of no benefit for newborns >2500 g. A scaling-up approach with investments that improve emergency obstetric services, referral systems, human resources and neonatal resuscitation practices will save more newborn lives.¹⁹

Strict aseptic practices may have changed our nosocomial infection rates from 10% before to 8.2% after.

CONCLUSION

There was no significant difference in outcome before and after strengthening of services along with re emphasisation of better cost effective practices even though there was significant retention of sicker and very low birth weight babies in NICU of Nepal Medical College Teaching Hospital.

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