Indications of admission and outcome in a newly established neonatal intensive care unit in a developing Country (Nepal)

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ABSTRACT

Establishing and running a neonatal intensive care unit in a resource poor country is a big challenge. Neonatal Intensive care units (NICU) and Paediatric Intensive care units (PICU) has been started in Patan Hospital from July 2009. The in-born neonates are admitted to NICU and the out-born neonates to PICU. A retrospective hospital based study looking at the common indications for admission and the outcome of the neonates in the intensive care unit was carried out from July 2009 to December 2010. Data was collected from the admission discharge registers at the units and from patient record files. Over the 18 month period there were total 289 neonatal admissions, 214 to NICU and 75 to PICU. More than half of the neonates (53%) admitted to NICU and PICU were preterm. The most common neonatal condition leading to Intensive care unit (ICU) admissions was respiratory distress which accounted for 42%. Of the total neonates admitted to ICUs one third (33.5 %) needed mechanical ventilation. The most common conditions needing mechanical ventilation were hyaline membrane disease (33%) and severe sepsis (24%). The overall mortality rate was 26.6% .The mortality was higher among neonates weighing less than 2.5kg (32%) compared to those weighing >2.5kg (15.5%) (P value – 0.001) and it was higher in babies born before 34 weeks of gestation (P value – 0.009). Neonatal intensive care facilities though is expensive and not readily accessible, establishing a unit can not only save some of the precious lives but also helps in managing critically sick neonates aiming for an intact survival.

Keywords: Neonates, NICU, Nepal.

INTRODUCTION

Of the estimated 130 million infants born each year worldwide, 4 million die in the first 28 days of life. Three-quarters of neonatal deaths occur in the first week, and more than one-quarter occur in the first 24 hours.[1,2] Neonatal deaths account for 40% of deaths under the age of 5 years worldwide. Therefore, efforts to achieve the UN Millennium Development Goal 4 of reducing childhood mortality by two-thirds by 2015 are focused on reducing neonatal deaths in high-mortality countries.

In developing countries like ours where neonatal care services are minimal and availability of intensive care facilities are negligible, reducing neonatal mortality is a great challenge. With this background the services provided at one neonatal intensive care unit may not even come into the big picture but it does matter to the lives those have been saved and the families who got their neonates cured or cared.

Patan hospital is a 460 bedded general hospital with a very busy maternity and paediatric units. Over the past several years Patan hospital neonatology unit was functioning with a level 2 Neonatal nursery. In July 2009 a new Neonatal and Paediatric Intensive care units have opened up at the Hospital. The inborn neonates are admitted to the NICU and the outborn neonates to the PICU. However the inborn neonates if get readmitted after discharge from the hospital and requires ICU care they are then admitted to the PICU.

MATERIALS AND METHODS

This is a retrospective hospital based study done at Patan hospital neonatal unit. The data collection was from the admission discharge registers at the NICU and PICU and from the patient record files at the Hospital record section. Data of all the neonates admitted to the NICU and PICU from 2nd July 2009 to 31st December 2010 were collected and analyzed. Ratio, percentage and p values were calculated using open epi, version 2.3.1.

RESULTS

Over the 18 month period from 2nd July 2009 to 31st December 2010 there were total of 289 neonatal admissions, 214 to the NICU and 75 to the PICU. More than half of the neonates (53%) admitted to NICU and PICU were preterm. We had a few babies (34) below 30 weeks of gestation. Sixty two percent of the neonates weighed < 2.5 kg and out of that 27% were weighing less than 1500 grams.

Table-1: Conditions leading to intensive care unit admission

Diseases/Condition	n. (%)
Respiratory distress Hyaline membrane disease Pneumonia Meconium aspiration syndrome Transient tachypnoea of newborn	93 (32%) 42 (Surfactant recipient-8) 28 15 8
Severe Sepsis/Septic shock	69 (24%)
Prematurity/Very low birth weight	34 (12%)
Birth asphyxia	29 (10%)
Meningitis	18 (6%) culture positive 4
Hyperbilirubinaemia/ Exchange tranfusion	9 (exchange transfusion : 3)
Recurrent hypoglycaemia	8
Necrotising enterocolitis	7
Congenital abnormality	7
Apnoea	6
Others	9

The most common neonatal condition leading to NICU and PICU admissions was respiratory distress followed by severe sepsis/septic shock contributing to 32% and 24% of the total admissions respectively. Out of those with respiratory distress, 45% were hyaline membrane disease, 30% pneumonia, 16% meconium aspiration syndrome and 9% transient tachypnoea of newborn. Among those with severe sepsis, 85.5% were culture positive sepsis and 45% has septic shock. Out of 18 cases of meningitis 4 were culture positive.

Birth asphyxia moderate to severe with hypoxic ischemic encephalopathy (HIE) contributed to 10% of admission. Nine neonates were admitted for severe hyperbilirubinaemia and 3 needed exchange transfusion.

Some of the babies with a different initial diagnosis later during the ICU stay developed culture positive sepsis. The table below (Table-1) is not inclusive of the new infection in the ICUs.

Among the preterm neonates admitted to the units only 28% (42/150) had features suggestive of HMD. Out of those with HMD 78.5% (33/42) required mechanical ventilation and the rest were managed with bubble CPAP. Only 8 neonates received surfactant. The frequency of HMD in the gestational age groups of <30 weeks, 30-34 weeks and 34 - <37 weeks (36 weeks +7days) were 61%, 23% and 9% respectively. (Table-2)

Table-2: Gestational age wise distribution of the Preterm and HMD

Gestational age	No of neonates	HMD	Mechanical ventilation
< 28 weeks	12	7	4
28-30 wks	19	12	10
30-32 wks	40	7	6
32-34 wks	47	13	11
34- 36 wks + 6 days	32	3	2

Of the total neonates admitted to NICU and PICU 33.6% needed mechanical ventilation. The most common conditions leading to the need of mechanical ventilation were HMD (33%) and severe sepsis (24%). Among the ventilated neonate with HMD survival was 53% while in the ventilated sepsis group the survival was only 9%. Out of 21 deaths among mechanically ventilated babies with sepsis, 20 were culture positive bacterial sepsis (Table-3).

During the study period there were total 59 positive blood cultures in the NICU and PICU neonates. Six neonates had more than one positive blood culture with different organisms during their ICU stay. The most common organisms isolated were Klebsiella (39%) followed by Salmonella species (17%) and Acinetobacter (15%). A few (4) blood cultures grew methicillin resistant staphylococcus (MRSA). There were 4 positive cerebrospinal fluid cultures: 3 grew Salmonella species and 1 grew Klebsiella. Twenty-three of 59 neonates (39%) with Blood culture positive sepsis died. The case fatality rate was highest in the Salmonella and Klebsiella group. Two neonates with Salmonella meningitis died (Table-4).

Out of the total 289 neonatal admissions, 193 improved and were transferred to the neonatal nursery or to the children ward. Seven left against medical advice and 77

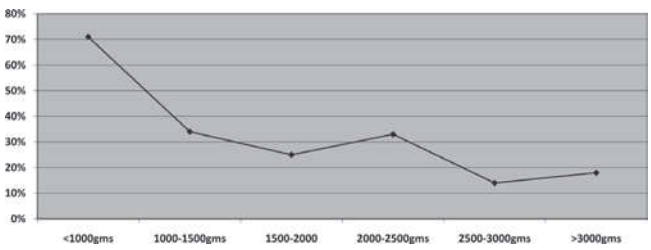

Fig. 1. Birth weight and mortality

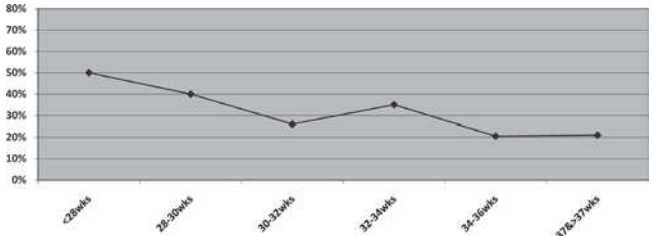

Fig. 2. Gestational age and mortality

Table-3: Outcome of ventilated neonates

Disease/ Conditions	Neonates on mechanical ventilation	Survived	Expired
RDS / HMD	32	17 (53%)	15(47%)
Sepsis	23	2 (9%)	21 (91%)
Pneumonia	13	11	2
MAS	9	7	2
Severe birth asphyxia	16	7	9
Cong Diaph hernia	3	1	2
OP poisoning	1		1

(27%) died. Twelve neonates were referred to other centers for neonatal surgical, neurosurgical or cardiac consultations and/or interventions.

The mortality was higher (32%) among neonates weighing less than 2.5 kgs compared to those weighing >2.5kg (15%) [p value: 0.001]. It was higher in babies born before 34 weeks of gestation (35%) than in babies born after 34 weeks of gestation (21%) [p value:0.009] (Fig. 1,2).

DISCUSSION

Advances in perinatal and neonatal care have significantly reduced neonatal mortality rates globally. However the picture still remains gloomy in the resource poor developing countries like Nepal.

A high proportion of neonatal deaths occur in babies with low birth weight many of whom are born prematurely. Most of these deaths could be avoided with simple preventive care such as warmth and breastfeeding plus early treatment of infections. Only a small minority require costly intensive care.[3]

International data suggests that 60-80% of all neonatal mortality and morbidity is due to preterm birth.[4] Very low birth weight infants, i.e. those weighing < 1500 grams, account for a very small percentage of all live births but make a disproportionately large contribution to neonatal mortality and morbidity. [5]

The most common condition leading to NICU admission in our series was respiratory distress and almost half of them had Hyaline membrane disease (HMD). In our study HMD was the most common condition leading to mechanical ventilation. We do not practice prophylactic surfactant therapy but use surfactant as a rescue therapy for those requiring mechanical ventilation. Prophylactic surfactant administered within 15 minutes of delivery is associated with a significantly greater reduction in respiratory distress syndrome than rescue therapy [6] and prophylaxis is also associated with a reduction in mortality.[7] Due to the problem with the supply and financial constraint only 9 babies with HMD received surfactant during the study period.

Severe sepsis in our series is one of the important conditions leading to NICU admission (24%) and is the most common cause leading to need for mechanical ventilation (22%) and also the most common cause of mortality (27%) among the neonates admitted to NICU. In a low resource Teaching Hospital, India, sepsis was the predominant cause of death (31.9%) followed by hyaline membrane disease (25.5%) and neonatal enterocolitis (9%)[8] Another community level NICU in India has reported sepsis as the second most common cause of death, birth asphyxia being the first.[9]

Severe sepsis due to Klebsiella (mostly extended spectrum beta lactamase (ESBL) producing) and salmonella species were the most common causes of sepsis related deaths in our series We had only a few cases of MRSA. ESBL producing Klebsiella and MRSA has emerged as a problem in some NICU.[10] Klebsiella pneumoniae producing extended-spectrum beta lactamases (ESBLs) has been increasingly implicated in nosocomial outbreaks in neonatal intensive care units. Klebsiella species and E. coli were reported as the most common gram negative bacterial causes of neonatal sepsis in India, and over one-third were ESBL producers in both community and hospital settings.[11] A multiclonal ESBL producing Klebsiella pneumoniae outbreak was repoted in a NICU in São Paulo Brazil. [12] Salmonella was observed as the second most common isolates in neonates with septicaemia at College of Medicine, Blantyre, Malawi (1996-2001) and at Dhaka Medical College, Bangladesh (2004) accounting for 14% and 22.3% respectively.[13,14] Septic shock in the neonatal period has a very poor outcome and is one of the most common causes of mortality in this age group, more so in very low birth weight babies with gram negative sepsis.[15]

Table-4: Bacterial isolates in Blood culture

Organisms in Blood culture	n.	Deaths
Klebsiella	23	12 (52%)
Salmonella	10	8 (80%)
Acinetobacter	9	1 (11%)
Coagulase –ve staphylococcus	7	2 (28.5%)
MRSA	4	
Enterobacter	4	
Pseudomonas	1	
E coli	1	

Mortality rates among premature infants correlate with birth weight and gestational age with decreases in both associated with poorer survival.[1] We in our study found that the mortality was higher among neonates weighing less than 2.5 kgs and in babies born before 34 weeks of gestation. A study done at Bangladesh reports that the risk of death was several-fold higher in preterm infants than in full-term infants whose growth had been restricted in utero.[16]

The overall mortality rate of the neonatal intensive care facility in our series was 27 % which is very high comparing to other series. In a resource poor country like Nepal only the very sick babies get admitted to the NICUs and hence the outcome of the babies admitted to these units look disappointing and way high compared to figures from affluent countries. Besides, during the study period we had an epidemic due to ESBL klebsiella and an epidemic of Salmonella species. The overall mortality of the unit significantly increased due to these infection epidemics.

Sever sepsis and HMD are the common causes of admission to NICU and the leading cause of death in these units. Growing antibiotic resistance against gram negative organism and epidemics of ESBL producing organism has posed a great challenge. Prophylactic surfactant therapy has financial constraints and admission to Intensive care unit itself poses a great economic burden to the families.

Whether the new intensive care units will have any impact on decreasing the perinatal and early neonatal mortality rates is a question. However the new facility has helped and will help a lot in managing very sick neonates aiming for their intact survival.

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