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NICU OUTCOME IN A LOW RESOURCE TEACHING HOSPITAL SETTING

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ABSTRACT: OBJECTIVE: To study the mortality pattern in a level III neonatal intensive care unit (NICU)in a low resource teaching hospital.**METHODS:** A retrospective study was conducted over a period of three years from January 2011 to December 2013. The medical records of all babies who died after being admitted to the NICU were reviewed. Survival was defined as the discharge of a live infant from the hospital. Data regarding birth weight, gestational age, final cause of death and diagnosis was analyzed. Exclusion criteria were to exclude (A) babies who came in the NICU for a few hours observation and were shifted to mother. (B) Any baby who could not be successfully resuscitated in labor room and (C) babies who left the hospital against medical advice and calculation of survival was done after subtracting them from total admission.**RESULTS:** A total of 1031 babies were admitted in this 3 year period in our NICU. Out of these, 95.5% babies survived and 46 babies expired (4.4%). The total number of deliveries in these three years was 5400 and the neonatal mortality rate (NMR) in this study was 8.5% per 1000 live births. In the very low birth weight (VLBW) group the survival was 92% (n=101) and in extremely low birth weight (ELBW) group it was 60% (n=10). In low birth weight (LBW) group 95.1% babies survived (n=502). Total Survival of VLBW & ELBW together was 89%. Out of 46 expired babies 86.9% (n=40) were premature and 45.6% babies (n=21) were below 30 weeks of gestational age. Sepsis was the predominant cause of death (34.7%) followed by hyaline membrane disease (HMD) (19.2%) and Hypoxic Ischemic Encephalopathy (HIE) (15.2%) in these 46 babies.**CONCLUSIONS:** This study identified neonatal sepsis, Hyaline membrane disease or Respiratory distress syndrome (RDS) and HIE as the major contributors to the neonatal mortality. Adequate antenatal care to at risk mothers and advances in the neonatal intensive care with the use of sophisticated technology will improve the neonatal outcome.
KEYWORDS: NICU, Neonatal Mortality, Low resource setting, Cause of death

INTRODUCTION: In India alone, of the 25 million babies who are born every year, one million die, accounting for 25% of the mortality around the world. According to the National Family Health Survey - 3 (NFHS-3) report, the current neonatal mortality rate (NMR) in India of 39 per 1, 000 live births, accounts for nearly 77% of all the infant deaths (57/1000) and nearly half of the under-five child deaths (74/1000) [1]. The rate of the neonatal mortality varies widely among the different states of India, ranging from 11 per 1000 live births in Kerala to 48 per 1000 live births in Uttar Pradesh. The neonatal mortality rate in Karnataka is 38 per 1000 live birth. Preterm birth is one of the major clinical problems in obstetrics and neonatology, as it is associated with increased perinatal mortality and morbidity [2].In a report which was published in The Lancet, the major direct causes of the deaths were pre-term birth Original Article Neonatology Section(27%), infection (26%), asphyxia (23%), congenital anomalies (7%), others (7%), tetanus (7%) and diarrhea (3%) [3].The data from the

tertiary care NICUs in the rural areas which primarily serve the very poor people is scarce. The objective of the study was to study the mortality pattern in a level 3 NICU in a low resource teaching hospital.

MATERIAL AND METHODS: This hospital based retrospective study was carried out in the neonatal intensive care unit (NICU), Department of Pediatrics, at Rajarajeshwari Medical College and Hospital (RRMCH), Bangalore, Karnataka, India, for a period of 3 year from January 2011 to October 2013. The institution ethical committee approved the study protocol.

Our hospital caters mainly to rural and semi-urban patients, with a significant number of them being below the poverty line (BPL) income group patients. Approximately 1800 deliveries are conducted per year. All the admitted neonates were enrolled on a structured protocol, which included the data on antenatal care, maternal morbidity, mode and place of delivery, age, weight at admission, gestational age, diagnosis, relevant investigations, duration of stay and outcome.

Inclusion criteria: All the neonates who were admitted to the NICU of Rajarajeshwari medical college and hospital.

Exclusion Criteria: (A) Babies who came in the NICU for a few hours observation and were shifted to mother. (B) Any baby who could not be successfully resuscitated in labor room and (C) babies who left the hospital against medical advice and calculation of survival was done after subtracting them from total admission as their outcome was not known.

Survival was defined as the discharge of a live infant from the hospital. Data regarding birth weight, gestational age, stay in NICU, final cause of death was analyzed.

RESULTS: A total of 1031 babies were admitted in this 3 year period in our NICU. Of these 1031 babies, 659 were males and 372 were females. The ratio of the male (63.9%) and female (36.1%) neonates was 1.28: 1.Out of 1031 babies, 985 baby's survived (95.5%) and 46 babies expired (4.4%). Total number of babies left the hospital against medical advice (LAMA) was 50 (4.8%). In the very low birth weight (VLBW) group the survival was 92% (n=101) and in extremely low birth weight (ELBW) group it was 60% (n=10). In low birth weight (LBW) group 95.1% babies survived (n= 502). Mortality was highest in ELBW group (40%) with the smallest birth weight recorded 600grams. The mortality rate in other weight category was 7.9% in VLBW and 4.9% in LBW group. (Table 1).Total Survival of VLBW & ELBW together was 89%. Out of 46 expired babies, 86.9% (n=40) were premature and 45.6% babies (n=21) were below 30 weeks of gestational age, 11 babies were in the age group of 30-34 weeks, 6 babies were between 35-37 weeks and 8 babies were more than 37 weeks of gestational age.

Sepsis was the predominant cause of death (34.7%) followed by hyaline membrane disease (HMD) (19.6%) and Hypoxic Ischemic encephalopathy (HIE) (15.2%) in these 46 babies. (Table 2).

The total number of deliveries in these three years was 5400 and out of these 1031 babies got admitted in the NICU which is 19.1% of all deliveries. The total number of death was 46. So, the neonatal mortality rate (NMR) in this study was 8.5 per 1000 live births.

DISCUSSION: Accurate data on the morbidity and mortality are useful for many reasons. It is important for the providers of primary care, investigators, local and national health administrators,

and for decision makers to design interventions for prevention and treatment and to implement and evaluate health care programs. The data from the NICUs of low resource settings is very limited [4]. In our study, the admissions of male babies were more than those of females. These may be related to the preference for the male child in the society and the biological vulnerability of the males to infection. The male preponderance for admissions has been documented in previous studies [5]. There is a great variation in neonatal mortality statistics between NICUs from different parts of the world. This variation probably reflects the difference in the attending population, antenatal care, admission criteria, specific exclusion & inclusion criteria and level of neonatal care. In some studies from Canada, Pakistan & Brazil mortality rates were 4% [6], 9% [7]& 6% [8] respectively. Higher rates have been reported from Saudi Arabia (22.4%) [9], Kenya (24.6%) [10] and Togo (27%) [11].Data from national neonatal perinatal database 02-03 in which 18 centers countrywide have participated reports the neonatal mortality to be 25.4 per 1000 live births [12]. The mortality in our study was 4.4% per 1000 live births. The participating centers in the national database are all tertiary care centers in metropolitan cities; they are likely to have more high risk pregnancies than other centers. The newborns reported in this database are therefore likely to have more problems and so be sicker than others.

The mortality in ELBW babies in our unit is 40% (n=10), which is much lower than that reported in the national perinatal database, probably because of less number of babies. Sehgal et al, [13] have reported a mortality of 43% in a cohort of 52 ELBW babies which is similar to our study. Roy et al, [2] have reported a mortality of 33.3%. Both of these reports are from tertiary care postgraduate institutes.

The mortality of VLBW babies in our unit is 7.9% which is comparable to Roy et al study, reported to have 15.7%&national perinatal databasereportedto be 29.7%. Other study from India showed mortality of 36.9% [4].The mortality in LBW group is 4.9% which is also comparable to the national perinatal database (6.1%).

On analysis of the primary cause of death, it was found that sepsis is the leading cause of death at 34.7% and Hyaline membrane disease following at 19.6%. Birth asphyxia as the cause of death was seen in 15.2% of the babies in our unit as opposed to being the leading cause in the national perinatal database (28.8%). Basu et al [4] in a cohort of 260 cases, out of which 96 died, have reported birth asphyxia as the leading cause of death at 32.2% followed by respiratory distress syndrome at 23.96%. Sepsis as the cause of death in their unit is reported to be 7.29%. Garg et al [14] from a community level NICU have reported birth asphyxia as the leading cause of death followed by sepsis.

A low resource NICU has many inherent problems relating to the population catered by it. Population we cater to are mostly people with financial limitations. With the limited finances and time commitment the compliance of these patients is also suboptimal. Low resource hospitals have to work with these handicaps. For such units to work effectively it is wise to adopt certain policies by which "intensive care" is provided, but not necessarily "invasive care". Some such practices adopted in our unit are mother centered care, minimal invasive investigations, minimal use of central lines and TPN and pro-enteral feeding policy. Fernandez et al [15] have advocated usefulness of similar interventions for low resource NICUs. Agarwal et al [16] have shown the effectiveness of these simple interventions in a low resource teaching hospital and the reduction in mortality in their unit with these measures was statistically significant.

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We conclude that the overall survival of newborns in our unit is comparable to many previously published reports. We advocate that more data be published from centers all over the country. More and more units providing intensive care should report their data and also contribute to the national database to increase the awareness in the variability of neonatal morbidity and mortality countrywide and the reasons behind them. In developing countries and especially in low resource areas more stress should be given to babies more than 1000 grams birth weight as it is in this group that the quality of care will have significant impact on "intact survival".

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	< 1kg	1-1.5kg	1.5-2.5 kg	>2.5 kg	Total
Survived	6	101	502	326	935
Died	4	8	25	9	46
LAMA	2	9	24	15	50

Table 1: NICU outcome in different birth weight groups

Final cause of death	Total	<1 kg	1-1.49	1.5-2.5	>2.5	% of expired babies
Hyaline Membrane disease	9	1	4	5	0	19.6%
Sepsis	16	3	3	9	1	34.7%
Necrotising Enterocolitis	3	0	0	3	0	6.5%
Congenital.Heart.Disease.	1	0	0	0	1	2.1%
Pneumonia	1	0	0	1	0	2.1%
Pneumothorax	2	0	0	2	0	4.2%
Hypoxic Ischemic Encephalopathy	7	0	1	2	4	15.2%
Pulmonary hemorrhage	1	0	0	0	1	2.1%
Congenital anomalies	3	0	0	2	1	6.5%
Severe Pulmonary hypertension	2	0	0	0	2	4.2%
Total	46	4	8	25	9	

Table 2: Final cause of death in expired babies in different weight groups

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