Original Research Article

An evaluation of mortality pattern in the neonatal intensive care unit of a tertiary care centre from western Uttar Pradesh

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Abstract: Neonatal mortality is one of the very important indicators, which reflect country's development. A better understanding of events determining the mortality of neonates could contribute to a more effective approach to saving their lives. The aim is to assess the mortality pattern in the neonatal intensive care unit of a tertiary care centre from western Uttar Pradesh.Retrospective cohort of pediatric patients admitted to Neonatal Intensive Care Unit of FH Medical College during 1st January 2015 to 31st December 2015 formed the study population. Study tools were records of the neonates such as information from Medical Records Department (MRD). Medical records were reviewed for 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 etc. Overall NICU mortality rate was 14.05%. The majority of the causes of neonatal morbidity were low birth weight (LBW) (36.8%), neonatal sepsis (22.2%), neonatal jaundice/hyperbilirubinaemia (17.8%), birth asphyxia with hypoxic ischaemic encephalopathy (HIE) (16.2 %), intra-uterine growth retardation (IUGR) (14.6%) and hyaline membrane disease (10.8%). Neonatal sepsis (24.3%), prematurity with low birth weight (16.2%), and prematurity with respiratory distress syndrome (10.8%) were other common causes for referral for out born neonates. 23.1% of total deaths occurred in neonates weighing >2.5 Kg, while 76.9.9% occurred in <2.5kg birth weight group.Major contributors to the neonatal mortality in our setup are LBW, neonatal sepsis, neonatal jaundice, birth asphyxia with hypoxic ischaemic encephalopathy (HIE), IUGR and hyaline membrane disease. Outcomes of this study can be utilized in planning and modifying existing health care services for improved care of the newborn.
Keywords:NICU, Neonatal Morbidity, Neonatal Mortality, Uttar Pradesh

INTRODUCTION

Each year, about 4 million newborns die before they are 4 weeks old and half of them die in their first 24 hours. It accounts for 40 per cent of under-five mortality. 98 per cent of these deaths occur in developing countries[1].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)[2]. 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[3].

Neonatal mortality is one of the very important indicators, which reflect country's development. The main causes of neonatal mortality are intrinsically linked to the health of the mother and the care she receives before, during and immediately after giving birth. Many neonatal infections, such as tetanus and congenital syphilis can be prevented by care during pregnancy and childbirth. It has been argued that nearly three quarters of all neonatal deaths could be prevented if women were adequately nourished and received appropriate care during pregnancy, childbirth and in the postnatal period. However, neonatal mortality is the most difficult part of infant mortality to alter because of

the endogenous factors, which are not sensitive to improvements in environmental conditions[4,5].

At present there is an evident paucity of literature regarding the neonatal morbidity and mortality patterns in the neonatal intensive care units (NICU)in India. To the best of our knowledge, there is no published study from Uttar Pradesh, which provide the morbidity, and mortality patterns in tertiary care NICUs, which mainly serve the rural population. The present study was therefore conducted with an objective to assess the mortality pattern in the neonatal intensive care unit of a tertiary care centre from western Uttar Pradesh.

MATERIALS AND METHODS

The present retrospective study was planned and executed by the Department of Pediatrics, FH Medical College, Tundla. Retrospective cohort of pediatric patients admitted to Neonatal Intensive Care Unit of this tertiary care teaching institution during 1st January 2015 to 31st December 2015 formed the study population. All the neonates admitted to Neonatal Intensive Care Unit for any reason were included in this study. Neonates who left the hospital against medical advice were excluded.

FH Medical College is a tertiary care teaching hospital equipped with ultra modern multi super specialty facilities and referral unit of western Uttar Pradesh. The hospital receives major chunk of its patients not only from western region of Uttar Pradesh but also from other regions of Uttar Pradesh as well as from neighboring states especially Haryana and Rajasthan. Hospital caters mainly to rural and semi-urban patients, with a significant number of them being below the poverty line (BPL) income group patients. As per past experience, majority of deliveries being conducted here are on unbooked mothers and mothers with complicated obstetric or antenatal histories referred from district/rural hospitals. Thus this tertiary care hospital provided us a perfect base to study such an objective.

Study tools were records of the neonates such as information from Medical Records Department (MRD) and information from NICU. Medical records of all the admitted neonates were reviewed for 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 etc.

The study adhered to the tenets of the Declaration of Helsinki for research in humans. Permission of Institutional ethics committee (IEC) was sought before the commencement of the study. All the proforma were manually checked and edited for completeness and consistency and were then coded for computer entry. After compilation of collected data, analysis was done using Statistical Package for Social Sciences (SPSS), version 20 (IBM, Chicago, USA). The results were expressed using appropriate statistical methods. The birth weight and the gestational age were expressed in mean ± SD. The mean, standard deviation, and odds ratio were calculated. The chi- square (χ^2) test was applied. P value of <0.05 was considered to be statistically significant for any given measures.

RESULTS

A total of 206 neonates were admitted to Neonatal Intensive Care Unit of FH Medical College, Tundla during the study period. Eighteen babies left the hospital against medical advice (LAMA) and 3 were transferred to other hospitals. Thus 21 babies were excluded from this study. Finally data of a total of 185 neonates was included in this study.

Out of total studied neonates, there were 116 boys (62.7%) and 49 girls (37.3%). The ratio of the male and female neonates was 1.68: 1. One hundred and eleven babies (60%) were born in this hospital whereas seventy-four babies (40%) babies were referred from peripheral hospitals and nursing homes.There were 65 (35.1%) premature deliveries with mean gestational age of 33.2 ± 3.5 weeks.68 (36.7%) were LBW neonates with a mean birth weight of 2272 ± 750 gm.

The majority ofthe causes of neonatal morbidity were low birth weight (LBW) (36.8%), neonatal sepsis (22.2%), neonatal jaundice/hyperbilirubinaemia (17.8%), birth asphyxia with hypoxic ischaemic encephalopathy (HIE) (16.2 %), intra-uterine growth retardation (IUGR) (14.6%) and hyaline membrane disease (10.8%). (Table 1)

In this study, 26 neonates succumbed to death against 185 admissions thus the overall NICU mortality rate was 14.05%. Gender wise outcome between the male and female neonates was not statistically significant (p<0.09). (Table 2)

Severe birth asphyxia with HIE was the most common cause of the referral (33.8%) from primary health centres and private nursing homes for the out born neonates. Neonatal sepsis (24.3%), prematurity with low birth weight (16.2%), and prematurity with respiratory distress syndrome (10.8%) were other common causes for referral for out born neonates. (Table 3)

Out of total 26 neonatal deaths, 6 deaths (23.1% of total deaths) occurred in the normal birth weight group i.e. neonates weighing >2.5 Kg, while 20 deaths (76.9.9%) occurred in <2.5kg birth weight group. (Table 3, Figure 1)

Table 1: Common causes of morbidities among studied neonates at admission

Morbidity#	Preterm N = 65	Term N = 120	Total N = 185
Low birth weight (LBW)	41 (63.1%)	27 (22.5%)	68 (36.8%)
Neonatal Sepsis	17 (26.1%)	24 (20.9%)	41 (22.2%)
Neonatal hyperbilirubinaemia	16 (24.6%)	17 (14.2%)	33 (17.8%)
Birth Asphyxia with HIE*	09 (13.8 %)	21 (17.5%)	30 (16.2%)
IUGR**	09 (13.8 %)	18 (15.0 %)	27 (14.6%)
Hyaline Membrane Disease	13 (20.0%)	07 (5.8%)	20 (10.8%)
TTN***	10 (15.4%)	02 (1.7%)	12 (6.5%)
MAS****	02 (3.1%)	09 (7.5%)	11 (5.9%)
Necrotizing Enterocolitis	03 (4.6%)	01 (0.8%)	04 (2.2%)
Congenital Pneumonia	02 (3.1%)	01 (0.8%)	03 (1.6%)
Severe Hypothermia	01 (1.5%)	01 (0.8%)	02 (1.1%)
Multiple Congenital anomalies	01 (1.5%)	01 (0.8%)	02 (1.1%)
#Multiple options permitted; *HIE: Hypoxic Ishaemic Encephalopathy; **IUGR: Intra Uterine Growth Retardation; *** TTN: Transient Tachypnoea of Newborn; ****MAS: Meconium Aspiration Syndrome;Figures in parenthesis indicate percentage			

Table 2: Gender-wise mortality among studied neonates

Variable	Gender		Total	P* value	Odds Ratio
	Male	Female			
Admission	116 (62.7)	49 (37.3)	185 (100)	0.09	2.03 (0.81-5.07)
Death	14 (53.8)	12 (46.2)	26 (100)		
Figures in parenthesis indicate percentage; *Chi-square test					

Table 3: Causes of referral for out born neonates

Causes	Proportion of referral n= 74 (%)
Severe Birth Asphyxia + HIE	25 (33.8)
Neonatal Sepsis	18 (24.3)
Prematurity + LBW	12 (16.2)
Prematurity + RDS	8 (10.8)
Neonatal Jaundice	7 (9.5)
Others	4 (5.4)
Figures in parenthesis indicate percentage	

Table 3: Mortality as per birth weights of studied neonates

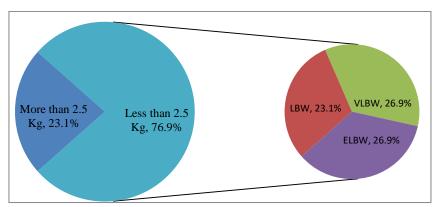| Birth Weight		Number of death		Percentage	
More than 2.5 Kg		6		23.1	
Less than 2.5 Kg	LBW (1500-2499 gm)	6	20	23.1	76.9
	VLBW (1000-1499 gm)	7		26.9	
	ELBW (< 1000 gm)	7		26.9	

Figure 1: Pie of pie chart showing Birth weight and proportion of Mortality

DISCUSSION

The pattern and causes of mortality are often poorly documented in developing countries and our country is not an exception especially in settings dealing with critical care. The Medical Records Department in a teaching hospital has a system of compilation and retention of records, yet the acquisition of meaningful statistics from these records for health care planning and review is lacking. Mortality data from hospitalized patients reflect the causes of major illnesses and care- seeking behaviour of the community as well as the standard of care being provided. Hospital-based death records provide information regarding the causes of deaths, case fatality rates, age and sex distribution, which are of great importance in planning health care services. A better understanding of such events could contribute to a more effective approach to saving these lives[6].

In this study we observed that on admission there were 62.7% boys and 37.3% girls. It could be due to the biological vulnerability of males to infections or discrimination against female offspring. The male preponderance of admission has been documented in various studies[7].Another reason for this may be related to the preference for the male child in the society.

Not surprisingly our study showed that 36.8% of the neonates were low birth weight (LBW) and 35.1% neonates were delivered prematurely. This may be linked to the health of the mother and the care she receives before, during and immediately after giving birth.The result of this study is in agreement with previous study from Bangladesh[8].According to the UNICEF "The State of the World's Children 2010" report, 28% neonates are born with low birth weight in India[9].High burden of low birth weight and premature deliveries in our study could be due to the fact that our hospital predominantly cater to the rural population with very high degree of unemployment and poverty.

Two topmost causes of neonatal morbidity were low birth weight (LBW) (36.8%), neonatal sepsis (22.2%) observed in our study. Our findings confirm the results of another study from Bihar[3]. As per report of National Neonatal Perinatal Database (2002-03), the incidence of neonatal sepsis in India was 30 per 1000 live-births. The database which comprised 18 tertiary care neonatal units across India, found sepsis to be one of the commonest causes of neonatal mortality, which contributed to 19% of all the neonatal deaths[10].

The majority of the causes of neonatal morbidity were low birth weight (LBW) (36.8%), neonatal sepsis (22.2%), neonatal jaundice/hyperbilirubinaemia (17.8%), birth asphyxia with hypoxic ischaemic encephalopathy (HIE) (16.2 %), intra-uterine growth retardation (IUGR) (14.6%) and hyaline membrane disease (10.8%). In a study from Puducherry, systemic infections were found to cause 52.3% of the deaths, followed by birth asphyxia and injuries (29.23%)[11].On the other hand, another report from Delhiobserved prematurity (16.8%), birth asphyxia (22.3%) and infections which included septicaemia, pneumonia, meningitis and other infections (32.8%) were found to be the predominant causes of death[12].

We observed that out of total 26 neonatal deaths, 6 deaths (23.1% of total deaths) occurred in the normal birth weight group i.e. neonates weighing >2.5 Kg, while 20 deaths (76.9.9%) occurred in <2.5kg birth weight group.Another study from Bangladesh is also in concordance with our observations[13].Another study from a sub-district level hospital from India, Kumar et al reported a similar mortality rate[14].There is a strong and significant positive correlation between maternal nutritional status and the length of pregnancy and birth weight. A high percentage of LBW therefore points to deficient health status of pregnant women, inadequate prenatal care and the need for improved care of the newborn.

This study has several strengths. First, we have conducted this study to assess the mortality pattern in the neonatal intensive care unit of a tertiary care centre. Outcomes of this study can be utilized in planning health care services. A better understanding of such events could contribute to a more effective approach to saving lives of neonates. Second, paucity of literature also warranted this study. On the other hand, there have been a few limitations as well. First, retrospective design is an evident limitation of this study. Prospective multicenter studies are warranted. Second, the findings emerging out of the current study cannot be generalized or extrapolated to all the hospitals of India, as this is a hospital-based study.

CONCLUSIONS

The findings of the study highlight that major contributors to the neonatal mortality in our setup are low birth weight (LBW), neonatal sepsis, neonatal jaundice/hyperbilirubinaemia, birth asphyxia with hypoxic ischaemic encephalopathy (HIE), intra-uterine growth retardation (IUGR) and hyaline membrane disease. Outcomes of this study can be utilized in planning and modifying existing health care services for improved care of the newborn.

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