NEONATAL MORTALITY PATTERNS IN AN URBAN HOSPITAL

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ABSTRACT

Neonatal mortality rate is perhaps the most reliable indicator of the perinatal outcome. An assessment of perinatal outcome can be made through knowledge of causes of death. This study was carried out to evaluate the neonatal deaths in our hospital. Live births (n=7309) and deaths (n=328) during a 6 months period were retrospectively analyzed. These were grouped into non-preventable and potentially preventable causes of death. The single most important factor contributing to the mortality was respiratory distress (29.3%) followed by sepsis (24.4%) and birth asphyxia (16.2%). The non-preventable causes of mortality (e.g., lethal congenital malformations, extremely low birth weight) accounted for 10.4% of the total mortality. The idealized neonatal mortality rate was 4.6/1000 live births, while the salvageable death rate was 40.2/1000 live births. The mortality increased significantly if the birth weight fell below 2 kg. The salvageable deaths could perhaps be prevented through better antenatal and intranatal care, ventilatory support and prevention of sepsis.

Key words: *Idealized neonatal mortality, Neonatal mortality rate, Respiratory distress, Sepsis.*

Perinatal outcome is a reliable indicator of the quality of obstetric and neonatal services(1). Perinatal outcome is usually evaluated by analysis of fetal, perinatal, neonatal and infant mortality rates. Of these, fetal and perinatal rates may be imprecise because of uncertainty of obstetric dates and improvement in medical care which has led to increasing number of preterms surviving beyond one week. Infant mortality rate includes deaths during the first year of life, many of these are due to causes other than perinatal factors. Hence, neonatal mortality rate is likely to be the most reliable indicator of perinatal outcome(2).

Although crude neonatal mortality rate (NMR) can be used to evaluate overall progress, birth weight and gestation specific neonatal mortality rates (NMR) help to specify risks to which, the population under surveillance is exposed. Moreover, the knowledge of causes of death may be, helpful in assessing the perinatal outcome(3). We in the present study, have evaluated neonatal deaths in our hospital and hope that this will help in future health planning and suggest proper direction of education and research.

Material and Methods

This study was carried out in the Neonatal Division of Lady Hardinge Medical College. Live births (n=7309) and neonatal deaths (n=328) occurring between July,

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1988 and December, 1988 were analyzed retrospectively.

In this teaching hospital both booked and unbooked mothers as well as high risk cases referred from periphery are admitted. All deliveries are attended to and assessed by a Pediatric resident. Birth weight, gestational age and other examination findings were recorded in inpatient record. High risk uninfected neonates requiring special care were admitted to clean nursery and those with suspected perinatal infection to septic nursery.

All neonatal deaths were certified by the Pediatric senior resident. In this study, all the information was obtained from inpatient records as well as from birth and death registers.

The definition of various categories of causes of deaths is enumerated in *Table I.*

TABLE I—*Categories of Causes of Deaths*

A. *Non-preventable causes*

(*a*) Congenital malformations—All deaths caused by lethal congenital malformations and syndromes incompatible with life.

(*b*) Extremely low birth weight: A weight of < 750 g.

B. *Potentially preventable causes*

(*a*) *Respiratory distress*—Neonatal deaths due to hyaline membrane disease (HMD), meconium aspiration syndromes, bronchopneumonia, pneumothorax. Respiratory distress when severe even though another major pathological diagnosis may have been present, was listed as principal cause, when respiratory distress was mild or recovery from disease was occurring, then accompanying major pathological diagnosis was given as cause of death *e.g.*, recovering HMD with intracranial hemorrhage.

(*b*) *Asphyxia*—If one minute Apgar score was 3 or less, asphyxia was designated as a cause of death.

(*c*) *Sepsis*—When clinical course was consistent with bacterial sepsis and/or was confirmed by cultures.

(*d*) *Other causes*—These included necrotizing enterocolitis, pulmonary hemorrhage, intracranial hemorrhage.

All births and deaths were classified according to weight (500 g intervals) and gestation (2 week intervals). Data was tabulated and neonatal mortality rate, proportional mortality rate and idealized mortality rates were calculated. Inter-group comparison was done using Chi-square test.

Idealized neonatal mortality rate (INMR): INMR was calculated by multiplying neonatal mortality rate (NMR) by the fraction of neonatal deaths due to congenital malformations and babies of birth weight below 750 g. For example if NMR is 20 per 1000 live births and proportion of deaths due to the above 2 factors is 30% then the INMR would be $20 \times 0.3 = 6$ per thousand. The salvageable rate is then the net difference between the actual and the ideal rates(4).

Results

Classification of births and deaths according to weight and gestation are given in *Tables II & III,* respectively. Low birth weight (<2500 g) contributed to 35.8% of births and 84.5% of all deaths. Babies less than 1000 g accounted for 11.0% of all deaths (*Table II*). A total of 11.5% of all births were preterms while they contributed to 76.5% of deaths (*Table III*). The NMR was 44.87/1000 live births. There was no significant difference in mortality of weight groups 2-2.499 kg and ≥2.5 kg

TABLE II— *Weight -wise Distribution of Births and Deaths*

Weight category (kg)	Births		Deaths		Proportional mortality rate (%)
	No.	%	No.	%	
<1.000	37	(0.5)	36	(11.0)	97.3
1.000–1.499	174	(2.4)	119	(36.3)	68.4
1.500–1.999	497	(6.8)	92	(28.1)	18.6
2.000–2.499	1910	(26.1)	30	(9.1)	1.6
≥ 2.500	4691	(64.2)	51	(15.5)	1.1
Total	7309	(100.0)	328	(100.0)	

TABLE III—*Gestation-wise Distribution of Births and Deaths*

Gestation	Births		Deaths		Proportional mortality rate (%)
	No.	%	No.	%	
≤ 28	50	(0.7)	50	(15.2)	100.0
29–30	41	(0.6)	39	(11.9)	95.1
31–32	105	(1.4)	65	(19.8)	61.9
33–34	216	(2.9)	59	(18.0)	27.3
35–36	422	(5.8)	38	(11.6)	9.0
≥ 37	6475	(88.6)	77	(23.5)	1.2
Total	7309	(100.0)	328	(100.0)	

($p>0.05$) while mortality increased significantly if birth weight fell below 2 kg ($p<0.001$).

On the other hand, the mortality increased significantly if gestation was <37 weeks as compared to term births ($p<0.05$). Respiratory distress was a leading cause of death (29.3%) followed by sepsis (24.4%) and asphyxia (16.2%). Extreme low birth weight and lethal congenital anomalies accounted for 10.4% of all deaths. Hence, the idealized NMR was $(44.87 \times 0.1036) = 4.6$ and salvageable death rate was $(44.87 - 4.6) = 40.27/1000$ live births. Classification of causes of deaths according to weight and gestation are given in *Tables IV & V.*

In neonates with gestation less than 32 weeks the main cause of respiratory distress was hyaline membrane disease whereas bronchopneumonia was a major cause above this gestation (*Table VI*). Miscellaneous causes included intracranial hemorrhage, pulmonary hemorrhage, necrotising enterocolitis and metabolic problems.

Discussion

The high level of pregnancy wastage due to neonatal deaths has aroused considerable concern among health professionals.

TABLE IV—*Birth Weight and Neonatal Mortality Causes*

Causes	1 kg	1-1.499	1.5-1.999	2-2.499	≥2.5 kg
Birth asphyxia	8 (22.2)	13 (10.9)	12 (13.0)	4 (13.3)	16 (31.4)
Respiratory distress	12 (33.3)	31 (26.1)	27 (29.4)	12 (40.0)	14 (27.4)
Sepsis	2 (5.6)	38 (31.9)	24 (26.1)	10 (33.4)	6 (11.8)
Extreme low birth weight	12 (33.3)	–	–	–	–
Congenital anomalies	–	6 (5.01)	6 (6.5)	3 (10.0)	7 (13.7)
Miscellaneous	2 (5.6)	31 (26.1)	23 (25.0)	1 (3.3)	8 (15.7)
Total	36 (100.0)	119 (100.0)	92 (100.0)	30 (100.0)	51 (100.0)

Figures in parentheses are percentages.

TABLE V—*Gestation and Mortality Factors*

Factors	<28 wk	29-30 wk	31-32 wk	33-34 wk	35-36 wk	≥37 wk
Birth asphyxia	8 (16.0)	5 (12.8)	6 (9.2)	7 (11.8)	7 (18.4)	20 (26.0)
Respiratory distress	17 (34.0)	15 (38.5)	19 (29.2)	10 (17.0)	11 (29.0)	24 (31.2)
Sepsis	7 (14.0)	6 (15.4)	21 (32.3)	24 (40.7)	10 (26.3)	12 (15.6)
Extreme low birth weight	12 (24.0)	–	–	–	–	–
Congenital anomaly	3 (6.0)	1 (2.6)	–	5 (8.5)	3 (7.9)	10 (13.0)
Miscellaneous	3 (6.0)	12 (30.7)	19 (29.3)	13 (22.0)	7 (18.4)	11 (14.2)
Total	50 (100.0)	39 (100.0)	65 (100.0)	59 (100.0)	38 (100.0)	77 (100.0)

TABLE VI—*Causes of Respiratory Distress and Gestation*

Causes	< 28 wk	29-30 wk	31-32 wk	33-34 wk	35-36 wk	≥37 wk
HMD*	15 (88.2)	11 (73.3)	13 (68.4)	2 (20.0)	–	–
Pneumonia	2 (11.0)	4 (26.7)	6 (31.6)	6 (60.0)	10 (90.9)	11 (45.8)
MAS**	–	–	–	2 (20.0)	1 (9.1)	11 (45.8)
Pneumothorax	–	–	–	–	–	2 (8.4)
Total	17 (100.0)	15 (100.0)	19 (100.0)	10 (100.0)	11 (100.0)	24 (100.0)

*HMD – Hyaline Membrane Disease
**MAS – Meconium Aspiration Syndrome.

The main source of information regarding neonatal mortality is from hospital with its inherent bias as many institutions attend to only referred high risk and antenatally booked cases(1,5). But we, in this study, have dealt with births and deaths of both booked and unbooked hospital borns. Though there are some limitations of hospital based data but it is more reliable.

The neonatal mortality rate is directly related to birth weight and gestation (*Tables II & III*). In this study, with NMR of 44.87, low birth weight neonates accounted for about one third of births and more than 80% of deaths. This is in accordance with an earlier study(1). Deaths rates in most of weight groups are comparable with earlier studies(6-9). *Table III* represents improved neonatal survival with increasing gestational age. Singh reported similar results in his study from the All India Institute of Medical Sciences(1). Mortality in other gestational groups, in our study, is higher as compared to earlier data(1).

Our findings are similar to other workers who showed respiratory distress, sepsis and birth asphyxia as major causes of deaths(7,11). This is in contrast with the study by Bhakoo *et al.*(10) where lower mortality rates were seen. Other workers(3,5,12) showed increasing number of deaths due to congenital malformations and extremely low birth weights, but the incidence of sepsis is low. Further analysis of causes of deaths (*Tables V & VI*) showed higher incidence of HMD in lower gestational age groups whereas sepsis and bronchopneumonia accounted for more deaths in higher gestational groups. This can be attributed to longer duration of hospital stay in these groups with the attendant risk of infection.

In this study, the idealized NMR was 4.6/1000 live births and salvageable death rate was 40.2/1000 live births. This is in contrast to the findings of Hein(3) where the idealized and salvageable NMR was 3.7 and 4.6, respectively. Idealized NMR is comparable in the two studies but it contributes to half of deaths in West as compared to only 10% of deaths in our study. The use of idealized NMR to project potential for neonatal salvage may not accurately predict the true number of preventable deaths but this approach does give health planners the magnitude and source of salvage available(3).

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NOTES AND NEWS

CME ON PLATELET AND COAGULATION DISORDERS

A CME on "Platelet and coagulation disorders" is being organized by the Department of Hematology, L.T.M.G. Hospital and L.T.M. Medical College, Sion, Bombay 400 022 from *Friday 6th, September to Tuesday, 10th September, 1991.* Apart from lectures by outstanding hematologists in the area, demonstrations of techniques, case discussions, slide shows and scientific exhibits on products are also planned. The programme would be oriented towards practising consultants (hematologists, pediatricians, physicians, pathologists and technicians) as well as postgraduate students.

Registration for the CME is open to first 50 candidates on first-come-first-served basis.

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