Original Article ISSN (O):2395-2822; ISSN (P):2395-2814

Facility Based Analysis of 100 Neonatal Deaths in Tertiary Care Centre

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Received: March 2020
Accepted: March 2020

ABSTRACT

Background: Child survival is a key determinant of any country's development. Although under five mortality is decreasing globally but the contribution of neonatal mortality to under five mortality is increasing. There are many preventable factors which are responsible for neonatal deaths. The neonatal mortality is directly related to the birth weight and gestation age. The main causes of neonatal mortality are intrinsically linked to the health of the mother and care she receives before, during and immediately after giving birth. Aims and Objectives: To study antenatal and intrapartum factors, socio-economic factors, underlying causesand preventable factors contributing to neonatal mortality. **Methods:** This study was conducted over the period of a year in the department of Pediatrics, Bebe Nanki mother and child Centre of government medical college, Amritsar.The study included 100 neonates who died at less than 28 days of life in the year 2018. Detailed history, clinical examination and investigation as per the facility based newborn death review form under national programme was done. Status of the baby immediately after birth, place and mode of delivery and any resuscitation required was recorded. **Results:** In the study 66% were males and 34% females. 74% of total babies were outborn babies. Majority of the babies were admitted within 6hrs of birth. Those admitted late mainly consist of outborn babies. 54% of all the babies belong to either VLBW or ELBW and 61% were below gestation age of 34 weeks. Unplanned pregnancies, poor preconceptional care and inadequate antenatal visits predisposed neonates to LBW and SGA. The causes of neonatal mortality seen were birth asphyxia (32%), RDS (31%), sepsis (26%) and pulmonary haemorrhage (11%). **Conclusion:** The results of the study suggest that neonatal mortality is mainly due to less no of antenatal visits and delayed referral.

Keywords: Child Survival, Neonatal Deaths.

INTRODUCTION

Child survival is a key determinant of any country's development which is indicated by the number of deaths that occur every year in the terms of less than 5 years of age and infant mortality. In India, we are losing 1.35 million children annually and majority of these deaths occur during the newborn period.1The challenge faced by India is enormous in the fact that the India contributes to 17.5% of the world's population, nearly 20% of the total live births, yet accounts for 26% of global newborn deaths. Even across the country there are wide variations in neonatal health status in different states and within states, populations and communities.[1]

Neonatal mortality is a measure of intensity with which "endogenous factors" (e.g. low birth weight, birth injuries) affect infant life. The neonatal mortality is directly related to the birth weight and gestation age. Intrapartum related complications, low birth weight and preterm birth is a causal factor in 60per cent of neonate deaths.[2]

Of the 6.3 million deaths of under 5 children in 2013 worldwide, 44% (2.8 million) died in neonatal period, namely, first 4 weeks of life.2 Global under-5 mortality burden decreased by 64% since 1970, the decline in neonatal burden has been only 56% in this period.[3] Overall global NMR (per 1000 live births) declined from 48.2 in 1970 to 18.4 in 2013, while early (0-6 days) and late neonatal period (7-28 days) decreased from 31.4 and 16.8 in 1970 to 14 and 4.4 in 2013, respectively. The annual reduction rate (ARR) of global NMR of 1.3% in (1990-2000) has increased to 2.7% in (2000-12). In 2000 53 countries had NMR of 30 or more; in 2012 this number was only 25.4

Prematurity and congenital anomalies account for about 60% of newborn deaths, and these often occur in the first week of life. A further quarter of neonatal deaths are attributable to asphyxia- also mainly in the first week of life. In the late neonate period, that is, after the first week, deaths attributable to infections (including diarrhea and tetanus) predominate.

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Direct causes of newborn death vary from region to region. In general, the proportions of death attributed to prematurity and congenital disorders increase as the neonatal mortality rate decreases, while the proportions caused by infections, asphyxia, diarrhea and tetanus decline as care improves. Babies with a low birth weight are especially vulnerable to the hazards of the first hours and days of life, particularly if they are premature. Majority of low birth weight babies are not actually premature but have suffered from in utero growth restrictions, usually because of mother's poor health. These babies too are at increased risk of death.[5]

Interventions for small and sick newborn babies include kangaroo mother care (KMC) for prevention of hypothermia; management of respiratory distress syndrome, neonatal pneumonia, sepsis, and hyperbilirubinemia; and innovations for skin care including emollient and massage therapy. KMC involves a package of early and continuous skin to skin contact, breastfeeding support, early discharge from hospital, and supportive care in stable neonates. This care package in preterm neonates in hospitals is associated with reduced risk of neonatal mortality (by 51%), nosocomial infection or sepsis (by 58%), hypothermia (by 77%) and shorter length of hospital stay.[6]

The main causes of neonatal mortality are intrinsically linked to the health of the mother and care she receives before during and immediately after giving birth. Asphyxia and birth injuries usually result from poorly managed labor and delivery, and lack of access obstetric services.

The two specific goals of INAP associated with neonatal mortality are; (i) Ending preventable newborn deaths to achieve "single digit NMR" by 2030, with all the states to individually achieve this target by 2035. (ii) Ending preventable still births to achieve "single digit SBR" by 2030, with all the states to individually achieve this target by 2035.

Although cases of neonatal mortality i.e. birth asphyxia, infections, prematurity, and congenital malformations are well known, but there are many underlying preventable factors which contribute to neonatal death like inadequate antenatal and intrapartum care, poor nutrition, late referrals and suboptimal transport of sick neonates, inadequate home-based newborn care, lack of good quality neonatal intensive care, social factors like poverty, ignorance, health seeking behaviors, loss of daily wages of family during hospital stay of neonates, and many others. So the present study is undertaken to review in detail 100 neonatal deaths so that factors contributing to neonatal mortality are identified and based on that knowledge, strategies for better care of neonates are made in future including prevention and optimum management of common neonatal problems contributing to morbidity and mortality.

MATERIALS AND METHODS

This present study was be conducted over the period of a year in the department of Pediatrics, Bebe Nanki mother and child centre of government medical college, Amritsar after approval from institutional thesis and ethical committee.

The study included 100 neonates who died at less than 28 days of life in the year 2018.Cases were enrolled after taking informed consent from parents. Detailed history, clinical examination and investigation details were recorded as per the facility based newborn death review form under national programme. Details of pre-conceptional care and antenatal care were recorded. Status of the baby immediately after birth, place and mode of delivery and any resuscitation required was recorded.

Detailed history was recorded regarding referral of neonate from one or multiple places including care provided during transport of sick neonates. All the clinical details of neonates were recorded as per proforma. It was ascertained whether the sick neonate received the optimum care including nursing care, ventilator, CPAP [if required]. Any component of treatment if required by baby and not available /given was recorded.

Based on history, examination, clinical course, a final cause of death of the neonate was assigned and specific factors both preventable and non preventable leading to mortality was recorded in detail by the principal investigator. Total data was analyzed for cause of mortality and all factors contributing to morbidity and mortality.

Selection Criteria:

This study included 100 neonates admitted in the Bebe Nanki mother and child centre and expired during treatment.

Inclusion Criteria:

1. Age Less than 28 days.
2. Inborn as well as out born neonates admitted in bebe nanki ward.

Exclusion Criteria:

1. Age more than 28 days
2. Congenital malformation not compatible with life
3. Detailed history not available

RESULTS

Out of 100 mortalities 34% were females and 66% were males. 85 (85%) babies were admitted at age <6hrs of life, 12 (12%) babies were admitted between age 6-12hrs of life, 2 (2%) babies were admitted between age 12-24hrs of life and1 (1%) babies were admitted between 24-72hrs of life. 24 (24%) were SGA babies and 76 (76%) were AGA. 28 (28%) cases were having weight ≥2.5kg, 6 (6%) cases were having weight 2.0-2.4 kg, 12 (12%) cases

were having weight between 1.9-1.5 kg, 32 (32%) cases were having weight between 1.4 – 1.0 kg and 22 (22%) cases were having weight <1 kg. 30 (30%) cases were having gestation age ≥37 weeks, 9 (9%) cases were having gestation age between 34-36 weeks, 43 (43%) cases were having gestation age between 30-33 weeks, 17 (17%) cases were having gestation age between 25-29 weeks and 1 (1%) cases were having gestation age between 20 -24 weeks. Thus 70 (70%) were preterm babies. out of 100 cases, 53% babies were referred from government hospitals, 26% were inborn (Bebe Nanki maternal and child health care centre) babies and 21% babies were referred from private hospitals.

Table 1: Characteristics of Study Population

Characteristics		Frequency	Percentage
Sex of baby	Female	34	34.0
	Male	66	66.0
Age at admission	<6 hours	85	85.0
	6-12 hours	12	12.0
	12 – 24hours	2	2.0
	24 hours to 72 hours	1	1.0
Weight for gestation age	Small for gestation age (SGA)	24	24.0
	Appropriate for gestation age (AGA)	76	76.0
	Large for gestation age (LGA)	0	0
Birth weight (in kg)	≥2.5	28	28.0
	2.0-2.5	6	6.0
	2.0-1.5	12	12.0
	1.5-1.0	32	32.0
	<1	22	22.0
Gestational Age	≥37	30	30.0
	34-36	9	9.0
	30-33	43	43.0
	25-29	17	17.0
	20-24	1	1.0
Place of birth	Government Hospitals	53	53.0
	Tertiary Care Hospital (Inborn)	26	26.0
	Private Hospital	21	21.0

Table 2: Clinical Examination and Investigations and Diagnosis

Clinical Examination and Investigations and Diagnosis			Frequency	Percent
Deranged renal function tests			77	77.0
Direct cause of death	Birth asphyxia		32	32.0
	Respiratory distress syndrome		31	31.0
	Sepsis	Positive septic screen	4	4.0
		Blood culture positivity	2	2.0
		CSF positivity for Meningitis	5	5.0
		Sclerema	5	5.0
		Clinical features suggestive of sepsis	10	10.0
		Total cases of sepsis (26)	26	26.0
		Inborn	5/26	19.2
		Outborn	21/26	80.7
	Pulmonary hemorrhage		11	11.0
	Inborn		3/11	27.2
	Outborn		8/11	72.7

Direct causes of deaths assigned were birth asphyxia in 32 (32%), respiratory distress syndrome in 31 (31%), sepsis in 26 (26%), pulmonary hemorrhage in 11 (11%) of the cases.

45.2% babies with RDS were inborn. 70.9% babies were ≤3 hrs of life and 96.7% were ≤34 weeks of gestation. Ante-natal steroids were given to 38.7% mothers. 64.5% cases had adequate transportation. 38.7% cases received ICU care, surfactant therapy and ventilatory support. In 100% cases chest X - ray was suggestive of RDS.

[Table 3] shows that cases among partograph was used 21, mortality due to birth asphyxia was significantly less i.e.2 than among rest of causes of mortality that was 19. Among no use of partograph deaths due to birth asphyxia was 30 compared to other causes which was 49. P-value was 0.013 i.e significant, hence a significant relation was seen in the study among partograph not used and death due to birth asphyxia. So, it can be concluded that partograph must be used in all deliveries for early detection of birth asphyxia.

[Table 4] shows that among 26 cases in whom antenatal steroids were given, 5 mortalities were seen due to RDS and 21 were due to other causes. And among 44 cases in whom antenatal steroids were not given, 26 mortalities were seen due to RDS and 18 were due to other causes.

X2 value was 0.001 hence significant. So there was significant correlation seen between antenatal steroid not given and RDS.

Table 3: Correlation between Partograph Used and Direct Cause of Death

Partograph used		Cause of death as Birth asphyxia	Other causes
Yes	21	2	19
No	79	30	49

$X^2 = 0.013$; P - Significant

Table 4: Correlation between Antenatal Steroids and RDS

Antenatal steroids		RDS as cause of death	Other causes of death
Yes	26	5	21
No	44	26	18

$X^2 = 0.001$, P - Significant

DISCUSSION

Out of 100 neonatal mortalities 30 (30%) cases had gestation age ≥37 weeks and rest 70% were <37weeks with 9 (9%), 43%, 17% and 1% respectively between 34-36 weeks, 30-33 weeks, 25-29 weeks and 20 -24 weeks. Thus more number of deaths were in case of preterm babies accounting for 70 (70%) cases in our study. In 43% of babies were born at gestation age of 30-33 weeks, RDS (39.5%) was main cause followed by sepsis (34.9%) and pulmonary bleed (20.9%). Among term babies major cause was birth asphyxia (96.4%) followed by sepsis (3.6%). An updated systematic analysis for 2010 with time trends since 2000 on Global, regional and national causes of child mortality by Liu L et all also concluded that the major causes of neonatal deaths globally were direct complications from preterm birth (35%), intrapartum-related events (23%), with infections, including sepsis, pneumonia, diarrhea and meningitis responsible for a combined 27% of neonatal deaths.7 The role of preterm birth is even greater than suggested by this figure because preterm birth is not only a direct cause of death, but also an important contributory factor to deaths due to other causes such that over half of all neonatal deaths globally occur in preterm babies.[8]

28 (28%) cases had weight 2500gm, 18 (18%) cases were LBW having weight 1500-2500 gm, 32 (32%) cases were VLBW having weight between 1000 – 1500 g and 22 (22%) cases were ELBW having weight <1000 gm. Thus mortality is higher in those with weight <2500gm. Thus neonatal deaths in LBW babies are 2.5 times more than those with normal weight. Among preterm who died of RDS, 54.8% were outborn delivered at different peripheral government and private hospitals. Pre term delivery is high risk category and should be delivered at hospital where pediatricians and ICU is available. A study for international comparison conducted by Kramer MS based on epidemiological observations also concluded that infants weighing less than 2500 g are approximately 20 times more likely to die than their heavier counterparts.[9]

Also there were babies with delayed referral from peripheral centres that too under suboptimal transportation. Neonatal transportation remains a neglected topic so far, especially in the context of developing countries. Evidence suggests that mortality in transported newborns is much higher than inborn babies.[10] Thus indicating that transport of sick babies from their place of birth to referral centre under optimal conditions is of utmost importance.

Our study shows that out of 100 cases, 70 mothers required antenatal steroids. Out of these 70 mothers, only 26 (37.1%) mothers received antenatal steroids during their pregnancy and among mothers who received antenatal steroids, 5 (19.2%) mortalities were due to RDS. Among 44 mothers who required antenatal steroids but didn't receive the same, 26 (59.09%) neonatal mortalities were due to RDS. Among all 31 babies with RDS, 14 (45.2%) were inborn babies and Antenatal steroid was given in 12 (38.7%) cases and optimal care was received by 12 (38.7%) of cases, rest receive no ICU care due to non-availability of ventilator or ICU and 1 (3.2%) refused for the ICU care. Out of 100 mothers, 70 required antenatal steroids. Among these 70, only 26 received antenatal steroid whereas 44 didn't receive.

Thus to decrease premature mortalities one factor that can be of great significance is coverage of antenatal steroids in antepartum period. A similar Cochrane systematic review of 26 trials,[11] compared corticosteroid treatment with placebo or no treatment in women expected to deliver between 24 and 37 weeks of gestation as a result of either spontaneous preterm labour, preterm prelabour rupture of membranes (PPROM) or elective preterm birth. Compared with placebo, corticosteroid therapy was associated with significantly fewer fetal and neonatal deaths. Amongst the cases in which partograph was not used, 30 (37.9%) deaths were due to birth asphyxia and 40 (62.2%) deaths were due to other causes. Out. There were inadequate antenatal visits in 46.8% of the asphyxiated babies and in 9 (28.12%) cases no partograph was used. 28 babies (87.5%) received resuscitation. A study to access the relationship between partograph used and birth outcomes conducted in teaching hospital of Korle-bu also concluded that partograph use was associated with less maternal blood loss and neonatal injuries and also associated with less assisted deliveries and a fewer low APGAR scores and NICU admissions. Thus when properly used and timely interventions taken, partograph proves to be an effective tool.[12]

CONCLUSION

This cross-sectional study was conducted on 100 neonates who were admitted and died at BebeNanki Mother and Child Care Centre, Amritsar. In the study 66% were males and 34% females. 74% of total babies were outborn babies. Majority of the babies were admitted within 6hrs of birth. Those admitted late mainly consist of outborn babies.

54% of all the babies belong to either VLBW or ELBW and 61% were below gestation age of 34 weeks. In this study, RDS was the most common cause of mortality seen under this group.

Unplanned pregnancies, poor preconceptional care and inadequate antenatal visits predisposed neonates to LBW and SGA culminating in increased neonatal deaths due to RDS, sepsis and pulmonary haemorrhage. No antenatal steroids to mothers when indicated lead to motalities due to RDS. Thus the antenatal factors contributing to neonatal mortality were unplanned pregnancies, poor preconceptional care, inadequate antenatal visits, no antenatal steroids when indicated.

In asphyxiated babies (32%) Partograph use was seen in very less cases. Thus deaths due to asphyxia can be prevented by working upon factors like adequate training of nurses and medical officers and early referrals of mothers and babies to hospitals where adequate care can be provided.

Amongst sepsis most of the early onset of sepsis cases can be prevented by early detection and treatment of chorioamnionitis and reproductive tract infections. Late onset of sepsis can be prevented by proper care of newborn and aseptic measures during feeding and handling of babies.

Pulmonary haemorrhage was seen mostly in premature and SGA babies. Thus we can prevent this cause also by prevention of preterm deliveries as far as possible via proper antenatal care.

It can be concluded that neonatal survival can be improved by providing routine antenatal care, vigilance and monitoring for early detection of sick babies during intranatal periods as well as improving transportation and referral facilities in 1st golden hrs of life.

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How to cite this article: Singh S, Kumar A, Mahajan S, Kaur S, Singh N, Kaur A, Neki NS. Facility Based Analysis of 100 Neonatal Deaths in Tertiary Care Centre. Ann. Int. Med. Den. Res. 2020; 6(3):PE01-PE05.

Source of Support: Nil, **Conflict of Interest:** None declared