

**Epidemiological Study of Early Neonatal Death at Eastern India****Tarun Kumar Samanta<sup>1</sup>, Subrata Sarkar<sup>2</sup>, Satarupa Mukherjee<sup>3</sup>, Nabendu Chaudhuri<sup>4</sup>, Sukanta Sen<sup>5</sup>**<sup>1</sup>Assistant Professor, Department of Pediatrics, JIS School of Medical Science & Research, 51 South Nayabaz, G.I.P Colony, Domjur, Howrah, West Bengal, India<sup>2</sup>Assistant Professor, Department of Community Medicine, JIS School of Medical Science & Research, 51 South Nayabaz, G.I.P Colony, Domjur, Howrah, West Bengal, India<sup>3</sup>Assistant Professor, Department of Pediatrics, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal, India.<sup>4</sup>Ex-Professor and Head, Department of Pediatrics, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal, India.<sup>5</sup>Professor and Head, Department of Pharmacology, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal, India.

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**Abstract****Background:** Neonatal mortality significantly contributes to the higher incidence of under-five neonatal deaths globally. This study aimed to identify the risk factors of neonatal death at a tertiary care hospital in Eastern India.**Methodology:** Information regarding intrapartum events were sought for regarding place of delivery, person conducting labour, duration of labor, time of rupture of membrane, mode of delivery, single or multiple pregnancy and condition of liquor. In case of instrumental delivery, the indication and anesthesia were noted. Age, sex, date and time of birth, birth order, cry and colour at birth resuscitation done were recorded. Presenting complaints with their duration and age of onset of illness were noted like failure to cry and poor suckling after birth, convulsion, respiratory distress, lethargy, abdominal distension, yellowish discoloration of skin and mucous membrane, fever, vomiting, loose motion, umbilical discharge/bleeding, bleeding manifestation and pallor etc were noted.**Results:** The prospective study was conducted in 100 babies of which 50 babies are hospital delivery and 50 babies are outside born. Male: female ratio was 60%-68%:32%-40%. About 70-72% babies are of low birth weight.**Discussion:** LBW and prematurity are important associated risk factor in birth asphyxia cases and this study showed 43-51% association of LBW with birth asphyxia. Of early neonatal deaths, 20-46% was of septicemia. The Babies born in Dai's conduction have been observed more neonatal death (44%), where as in case of nurse's or trained health care providers it was 36% and if delivery conducted by doctor it was only 10%.**Conclusion:** Prenatal care and hospital deliveries have been shown to significantly lower mortality rates, highlighting their importance for the safety of both mothers and newborns.**Keywords:** Low birth weight (LBW), prematurity, early neonatal death, Eastern India.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Early neonatal death is the death of a newborn within the first 7 days of life, with prematurity and low birth weight, birth asphyxia, and neonatal pneumonia being the primary causes in India. While progress has been made, India still accounts for a significant portion of these deaths, and disparities persist between urban and rural areas and different states. Addressing issues such as access to skilled birth attendants, emergency obstetric care, and socioeconomic factors like

maternal health and poverty are crucial for further reducing these preventable deaths [1,2]. The neonatal period is the most vulnerable phase for the survival of children. In developing countries, neonatal mortality rate (NMR) continues to be a significant problem around the globe. According to World Health Organization (WHO) fact sheet, around 2.4 million neonates died globally during the newborn period in 2020 (World Health Organization, 2022). Neonatal death refers

to any deaths occurring in the first 28 completed days of life. Diverse causes contribute to neonatal deaths during the perinatal period (World Health Organization, 2006). It is essential to put enhanced efforts into improving child survival and achieving the target of sustainable development goal-3 (SDG) of 2030 to end preventable child deaths (Hug et al., 2019) [3, 4].

As per the Sample Registration System (SRS) 2018 report, the neonatal mortality rate (NMR) and under-five mortality rate (U5MR) are 23 and 36 per 1000 live births, respectively, which have sharply declined. Around 65 % of all under-five deaths occurs during the neonatal period (Ministry of Health and Family Welfare, 2022). If improvements in maternal and neonatal care are not made, it is predicted that 27.8 million newborns will die globally between 2018 and 2030 (Hug et al., 2019) [4,5, 6].

The Sustainable Development Goals (SDGs) of the United Nations include reducing mortality in the first 5 years to 25 deaths per 1000 live births and the first 28 days to 12 deaths per 1000 live births by 2030. Nearly 5 million children throughout the world died before their fifth birthday in 2021, with 27% living in South Asia. India, with a rate of 42 children younger than 5 years (under-5) deaths per 1000 live births, accounts for 14% of the global burden of under-5 mortality. Meeting the global child mortality SDG target is therefore intrinsically tied to India's success [6].

Targeting reduction in mortality risk for children younger than 5 years requires a disaggregation by age. However, deaths during the first 7 days (early neonatal) and 8 to 28 days (late neonatal) are usually combined. Similarly, deaths occurring between the ages of 1 to 11 months (postneonatal) and 12 to 59 months (child) are also often conflated. This is problematic as the causes of death during different ages are distinct, necessitating different interventions at each stage of life. During the early-neonatal period, most deaths occur due to preterm birth complications or intrapartum-related events, whereas malnutrition and infections are the major causes of death during late-neonatal, postneonatal, or childhood periods. The mortality risk also varies across ages during early years [7,8].

The present study was conducted at Burdwan Medical College, West Bengal to know the causes of the early neonatal death as ascertained through retrospectively and which has been applied in the prospective study to help to give proper guide to mother's health worker, nursery personnel and to provide better care of the newborn to decline the early neonatal mortality.

## Methodology

In prospective study was done at Baby Nursery of Burdwan Medical College, West Bengal. All the babies admitted in the baby nursery inborn as well as in the special care neonatal unit out born in moribund condition has been followed meticulously starting from maternal history to newborn history and detailed clinical examination up to necessary investigation done. This prospective study has been done in the period of January- December 2006.

Maternal age, parity, details of antenatal history e.g. LMP, EDD. Number and quality of antenatal check-up and tetanus immunization status were noted. Presence of any medical illness in the antenatal period like anemia, hypertension, jaundice, diabetes and fever in last 2 weeks of pregnancy were noted. Past medical records, antenatal cards and investigation reports were consulted when necessary. Information regarding intrapartum events were sought for regarding place of delivery, person conducting labour, duration of labor, time of rupture of membrane, mode of delivery, single or multiple pregnancy and condition of liquor. In case of instrumental delivery, the indication and anesthesia were noted.

Age, sex, date and time of birth, birth order, cry and colour at birth resuscitation done were recorded. Presenting complaints with their duration and age of onset of illness were noted like failure to cry and poor suckling after birth, convulsion, respiratory distress, lethargy, abdominal distension, yellowish discoloration of skin and mucous membrane, fever, vomiting, loose motion, umbilical discharge/bleeding, bleeding manifestation and pallor etc were noted.

A complete physical examination was done in each moribund baby at presentation and daily monitoring was done. It starts from body weight, length, HC, CC, AC, MAC, FL and gestational age determination clinically and through examination. State of alertness, color, temp of trunk and extremities and capillary refill time and cry were noted. CBC, CRP, ESR, blood c/s, capillary blood sugar, serum bilirubin and direct Coomb's test were done and noted. Lumber puncture was done in suspected meningitis cases with proper precaution. Chest X-ray and abdominal X-ray was done when indicated, each of these babies were assessed daily and therapy was given accordingly.

## Results

The prospective study has been carried out in the department of Pediatrics of Burdwan Medical College and Hospital, Bardhaman, West Bengal both inborn and outborn admitted in SNM ward in the year 2006 from January to December. All

babies were examined thoroughly and recorded data accordingly [Tables 1-12].

**Table 1: Body weight and sex distribution amongst early neonatal death**

| Body weight (gms) | Number of Cases at Baby Nursery | Number of Cases at SNM Ward | Nos of Early Neonatal Death at Baby Nursery | Nos of Early Neonatal Death at SNM Ward | % at Baby Nursery | % At SNM Ward |
|-------------------|---------------------------------|-----------------------------|---------------------------------------------|-----------------------------------------|-------------------|---------------|
| <1000 gm          | 5                               | 4                           | 5                                           | 4                                       | 100               | 100           |
| 1000-1499         | 22                              | 10                          | 13                                          | 5                                       | 60                | 50            |
| 1500-1999         | 28                              | 43                          | 8                                           | 15                                      | 28                | 35            |
| 2000-2499         | 45                              | 60                          | 9                                           | 18                                      | 20                | 30            |
| >2.5 Kg           | 100                             | 40                          | 15                                          | 8                                       | 15                | 20            |
| Sex               |                                 |                             |                                             |                                         |                   |               |
| Male              | 30                              | 34                          | -                                           | -                                       | 60                | 68            |
| Female            | 20                              | 16                          | -                                           | -                                       | 40                | 32            |

**Table 2: Mode of delivery amongst early neonatal death**

| Mode of Delivery | Number of Cases at Baby Nursery | % at Baby Nursery | Number of Cases at SNM Ward | % At SNM Ward |
|------------------|---------------------------------|-------------------|-----------------------------|---------------|
| ND               | 34                              | 68                | 40                          | 80            |
| LUCS             | 10                              | 20                | 5                           | 10            |
| Breech           | 3                               | 6                 | 2                           | 4             |
| Forceps          | 2                               | 4                 | 3                           | 6             |
| Ventose          | 1                               | 2                 | 0                           | 0             |

**Table 3: Antenatal check-up of mother (n=50)**

| ANC      | Number of Cases at Baby Nursery | % at Baby Nursery | Number of Cases at SNM Ward | % At SNM Ward |
|----------|---------------------------------|-------------------|-----------------------------|---------------|
| Booked   | 24                              | 48                | 20                          | 40            |
| Unbooked | 26                              | 52                | 30                          | 60            |

**Table 4: Type of pregnancy (n=50)**

| Type of pregnancy | Number of Cases at Baby Nursery | % at Baby Nursery | Number of Cases at SNM Ward | % At SNM Ward |
|-------------------|---------------------------------|-------------------|-----------------------------|---------------|
| Singleton         | 46                              | 92                | 43                          | 86            |
| Twin              | 4                               | 8                 | 7                           | 14            |

**Table 5: Distribution of cases as per gestational age (n=50)**

| Gestational Age | Number of Cases at Baby Nursery | % at Baby Nursery | Number of Cases at SNM Ward | % At SNM Ward |
|-----------------|---------------------------------|-------------------|-----------------------------|---------------|
| 28-31 wk        | 13                              | 26                | 11                          | 22            |
| 32-36 wk        | 12                              | 24                | 16                          | 32            |
| 37-40 wk        | 25                              | 50                | 23                          | 46            |
| > 40 wk         | 0                               | 0                 | 0                           | 0             |

**Table 6: Age at the time of death (n=50)**

| Age                                   | Number of Cases at Baby Nursery | % at Baby Nursery | Number of Cases at SNM Ward | % At SNM Ward |
|---------------------------------------|---------------------------------|-------------------|-----------------------------|---------------|
| <12 hr                                | 12                              | 24                | 20                          | 40            |
| 12-24 hr                              | 10                              | 20                | 8                           | 16            |
| 2 <sup>nd</sup> - 3 <sup>rd</sup> day | 17                              | 34                | 20                          | 40            |
| 4 <sup>th</sup> - 7 <sup>th</sup> day | 11                              | 22                | 2                           | 4             |

**Table 7: Causes of early neonatal death (n=50)**

| Cause of death       | Number of Cases at Baby Nursery | % at Baby Nursery | Number of Cases at SNM Ward | % At SNM Ward |
|----------------------|---------------------------------|-------------------|-----------------------------|---------------|
| Birth asphyxia       | 30                              | 60                | 29                          | 58            |
| Prematurity          | 16                              | 32                | 19                          | 38            |
| Septicemia           | 10                              | 20                | 23                          | 46            |
| RDS                  | 2                               | 4                 | 0                           | 0             |
| MAS                  | 1                               | 2                 | 2                           | 4             |
| Aspiration pneumonia | 0                               | 0                 | 1                           | 2             |
| Congenital anomaly   | 2                               | 4                 | 1                           | 2             |
| CHD                  | 1                               | 2                 | 1                           | 2             |
| CNS anomaly          | 2                               | 4                 | 1                           | 2             |

**Table 8: Association of important risk factor with birth asphyxia**

| Risk factor    | Cases at Baby Nursery [n=28] | % at Baby Nursery | Cases at SNM Ward [n=31] | % At SNM Ward |
|----------------|------------------------------|-------------------|--------------------------|---------------|
| LBW            | 13                           | 43                | 14                       | 51.7          |
| Preterm        | 8                            | 26.6              | 9                        | 31            |
| Septicemia     | 4                            | 13.3              | 7                        | 24            |
| Asp. Pneumonia | 0                            | 0                 | 1                        | 3.44          |

**Table 9: Association of important risk factor with septicemia**

| Risk factor | Cases at Baby Nursery [n=10] | % at Baby Nursery | Cases at SNM Ward [n=23] | % At SNM Ward |
|-------------|------------------------------|-------------------|--------------------------|---------------|
| LBW         | 5                            | 50                | 8                        | 34.7          |
| Preterm     | 3                            | 30                | 6                        | 26            |
| Jaundice    | 5                            | 50                | 3                        | 13            |
| Meningitis  | 1                            | 10                | 2                        | 8.7           |
| NEC         | 0                            | 0                 | 2                        | 8.7           |
| Pneumonia   | 1                            | 10                | 1                        | 4.4           |

**Table 10: Association of culture sensitivity with septicemia cases**

| Cases       | Cases at Baby Nursery [n=10] | % at Baby Nursery | Cases at SNM Ward [n=23] | % At SNM Ward |
|-------------|------------------------------|-------------------|--------------------------|---------------|
| Culture +ve | 5                            | 50                | 14                       | 60.8          |
| Culture -ve | 5                            | 50                | 9                        | 39.2          |

**Table 11: Correlation of early neonatal death with conduction of delivery in outborn babies**

| Delivery conducted by                    | Early Neonatal Death | %  |
|------------------------------------------|----------------------|----|
| Dai or traditional birth attendant (TBA) | 22                   | 44 |
| Nursing staff                            | 18                   | 36 |
| Doctor                                   | 10                   | 10 |

**Table 12: Duration of hospital stay on the babies of early neonatal death**

| Hospital stay | Cases at Baby Nursery [n=50] | % at Baby Nursery | Cases at SNM Ward [n=50] | % At SNM Ward |
|---------------|------------------------------|-------------------|--------------------------|---------------|
| < 24 hrs      | 21                           | 42                | 30                       | 60            |
| 24-48 hrs     | 12                           | 24                | 14                       | 28            |
| >48 hrs       | 17                           | 34                | 6                        | 12            |

## Discussion

In retrospective study, the sex distribution in baby nursery was 57.8% were male and 42% were female making a ratio of 100:72. So it was found that male babies suffer more from perinatal and neonatal complications. This is due to the immunological phenomenon of X-chromosome in male babies and they are more prone to be infected.

The body-weight distribution amongst early neonatal death in baby nursery were as follows: ELBW-9.75%, VLBW-19.2%, LBW-70%. In SNM ward it was as follows: ELBW-4.8%, VLBW-21.3%, LBW-68%. Both this observation clearly indicate that low birth weight is the prime factor for early neonatal death.

The ELBW babies are most vulnerable. His is similar to the observation of Gupta S et al, who found poor perinatal outcome on male babies. It also shown that babies with birth weight < 1000 g, severe grade of IVH, hyperglycemia, and RDS requiring surfactant therapy were the significant predictors of mortality among VLBW neonates. Both prediction models developed showed good prediction of mortality [9].

Studies have shown that LBW is the key predictor for neonate and infant mortality [10]. They are more likely to develop congenital heart anomalies and complications such as sepsis, respiratory distress syndrome and metabolic disturbances [11, 12]. Higher the growth impairment, the higher the risk of childhood death. Conditions such as insulin resistance, dyslipidemia, and high blood pressure are intensely related to LBW, resulting in increased rates of cardiovascular, metabolic and renal diseases and henceforth adult chronic diseases. Research says that children with preterm births and LBW have resulted in developmental disabilities such as cerebral palsy, autism spectrum disorder and learning disability [13].

Total 100 early neonatal deaths consisting of 50 in Baby Nursery and 50 in SNM ward died within 0-7 days after birth have been studied. Male babies were 60% and 68% in Baby Nursery and SNM ward respectively. This is similar as in retrospective study. The birth weight distributions in the above study amongst neonatal death were low birth weight babies are more than 70%. Early neonatal death in babies born of abnormal labour (LUCS, forceps, and breech delivery) 32% in Baby Nursery and 20% in SNM ward. This study shows there is 44% early neonatal death occurred within 24 hrs of birth in baby nursery and 56% in SNM ward. Baseline survey of the five-site ICMR study on "Home based management of newborn and young infants" provides timeline of neonatal death- 39.5% neonates died within 24 hrs of birth and 56.4% within first 3 days of birth [14].

A report published by UNICEF-WHO on LBW stated the prevalence as 26.4% in Southern Asia which was five times higher than Eastern Asia 5.1% in 2015. Member States of the World Health Assembly (WHA) 65th session employed the goal of a 30% worldwide decline in low birthweight between 2012 and 2025. Reporting on progress continues to be challenging, though. Since 2000, there has been no significant improvement in the rate of LBW babies, especially from 2010 to 2015. Without accelerated preventative measures, we will not be able to reduce LBW by 30% by 2025. Due to unavailability of data, the regional prevalence for India has not been evaluated in that report [15].

The Gupta P et al study (2024) had revealed that the gender analysis revealed a notable male

predominance, with 52.7% males compared to 47.3% females. The mean birth weight was  $1.23 \pm 0.13$  kg for males and  $1.28 \pm 0.12$  kg for females, leading to an overall mean weight of  $1.25 \pm 0.13$  kg for all neonates included in the study [16]. Kabilan et al. found similar results to our study, with 98.7% of deliveries being inborn and only 1.2% outborn [17]. Guran's study also indicated a low rate of outborn deliveries, with only 10.7% in 2002–2006 and 5.3% in 2007–2011 [18].

In this prospective study, the causes of early neonatal death were detected as birth asphyxia 30%, prematurity 16%, septicemia 10%, and others as MAS, RDS, congenital anomaly few percentage observed in baby nursery. In paediatric baby ward the causes of death were as follows: birth asphyxia 58%, prematurity 38%, septicemia 46% and other like RDS, MAs, aspiration pneumonia, congenital anomaly. This is similar to observation of Bang et al in the field trial of home-based neonatal care in rural Gadchiroli district in India where neonatal, infant, and perinatal mortality rates in the intervention area (net percentage reduction) compared with the control area, were 25.5 (62.2%), 38.8 (45.7%), and 47.8 (71.0%), respectively ( $p < 0.001$ ). Case fatality in neonatal sepsis declined from 16.6% (163 cases) before treatment, to 2.8% (71 cases) after treatment by village health workers ( $p < 0.01$ ). Home-based neonatal care cost US\$5.3 per neonate, and in 1997-98 such care averted one death (fetal or neonatal) per 18 neonates cared for [19].

Bang AT et al study had also revealed that the cause-specific NMR (1995 to 1996 vs 2001 to 2003) for sepsis decreased by 90%, for asphyxia by 53% and for prematurity by 38%. The total reduction in neonatal mortality during intervention (1996 to 2003) was ascribed to sepsis management, 36%; supportive care of low birth weight (LBW) neonates, 34%; asphyxia management, 19%; primary prevention, 7% and management of other illnesses or unexplained, 4% [20].

Among the various factors contributing to VLBW babies, key elements include intrauterine growth restriction (IUGR), preterm delivery, and a combination of both pathological and physiological conditions. Infants with IUGR experience significantly higher rates of morbidity and mortality compared to appropriately grown, gestation- matched peers. Malnutrition in infancy is a major contributor to VLBW, with over 40% of such babies identified as malnourished during their first year [21].

Tyagi NK et al study revealed that during 1981-1991 at a rural teaching hospital (Kasturba Hospital) of Mahatma Gandhi Institute of Medical Sciences in Sevagram, Wardha, India, 454 of 13,939 newborns died during the early neonatal

period for an early neonatal mortality rate (ENMR) of 33.7/1000 live births. The ENMR for boys was not significantly different from that for girls (36.1 vs. 28.6). They calculated average percent deaths (APD) per hour to examine the dynamics in early neonatal mortality. The mean age at death was lower among newborns of birth order greater than 2 than those of birth order less than 2 (23.47 vs. 26.85 hours;  $p$  0.001). ENMR was higher for newborns of birth order greater than 2 than those of birth order less than 2 (41.74% vs. 27.35%;  $P$  0.001). The mean age at death increased as gestation increased (10.34 for 28 weeks; 24.27 for 28-33 weeks, 31.53 for 33-37 weeks, and 34.43 for 37 weeks;  $p$  0.001). ENMR decreased as gestation increased (850 for 28 weeks; 375 for 28-33 weeks, 147.02 for 33-37 weeks, and 8.77 for 37 weeks;  $p$  0.001). The mean age at death increased as birth weight increased for newborns weighing less than 1500 gms through 2000-2500 gms (23.36-37.13 hours;  $p$  0.001). Knowledge of time of likely death can help providers know where they need to focus their attention to prevent early neonatal deaths [22].

In prospective study we found that it is difficult to ascertain the contribution of individual causes of death in neonatal mortality because 2 or 3 basic causes of death were found to be present in death of a single baby. It was found that birth asphyxia and LBW contributed in most cases as predisposing causes of death where the immediate cause of death was septicemia or pneumonia. However, in a smaller number of cases severe prematurity or birth asphyxia caused death within a short period.

In the prospective study also, there is more than 2/3 of (70%) of early neonatal death occurred in LBW babies (<2.5 kg body weight) in baby nursery and it is nearly 80% in SNM ward and of these LBW babies, there is significant number of VLBW babies (<1.5 kg) and also ELBW (<1 kg) measuring 27%. Over 80% of all neonatal death, in both developed and developing countries occur among the LBW babies.

Pabbati J et study (2019) revealed that the incidence of LBW babies was 25.07% with almost an equal contribution from preterm (50.46%) and term intra-uterine growth restricted (IUGR) (49.53%) babies. The most common morbidity found in LBW babies was Jaundice (40.09%) followed by respiratory distress (18.16%), sepsis (8.72%) and apnea (4.48%). preterm-LBW babies had more morbidities in terms of apnea (100%), birth asphyxia (88.88%), respiratory distress (87.01%), sepsis (80.55%) and jaundice (67.64%).

Early neonatal mortality was 21.22 per 1000 live births. Mortality was 100% for babies <1 kg in birth weight, 16% in 1-1.499 kg group and 0.75% in 1.5-2.499 kg group in early neonatal period.

According to gestational age, mortality in preterm-LBW babies was 88.88% and 11.11% in term IUGR-LBW babies. The most common cause of death in LBW babies was birth asphyxia (44.44%) followed by hyaline membrane disease (HMD) (33.33%). The study revealed that preterm babies contributed 50% to incidence of LBW babies. Morbidity and mortality in LBW babies were inversely related to birth weight and gestational age [23].

Proper ANC is very much important in neonatal outcome. In our study of 100 neonatal deaths. It was observed that 48% and 40% of mother had antenatal check-up. And this is much lower than our projected goal of RCH programme. In this prospective study, there are 30 cases of birth asphyxia in baby nursery and 29 cases of birth asphyxia in SNM ward. And of this birth asphyxia, 40 and 34.5% cases were booked in baby nursery and SNM ward. This clearly indicates poor ANC contributes to neonatal morbidity and mortality. The causes of early neonatal death in this study is birth asphyxia in Baby nursery and septicemia in SNM ward.

Low ANC rates mean missed opportunities for essential health interventions, which increases the risk of adverse outcomes for newborns, demonstrating a clear need to improve maternal health access and the delivery of ANC services. The prevailing antenatal care services are ineffective in preparing mothers for newborn care. Place and frequency of ANC have positive associations with umbilical cord care.

There is a need to implement quality ANC that will enhance maternal and neonatal outcomes and implement innovative interventions to enhance ANC attendance. The WHO positive pregnancy experience model should be implemented [24].

## Conclusion

LBW and prematurity are important associated risk factor in birth asphyxia cases and this study showed 43-51% association of LBW with birth asphyxia. Of early neonatal deaths, 20-46% was of septicemia. The Babies born in Dai's conduction have been observed more neonatal death (44%), where as in case of nurse's or trained health care providers it was 36% and if delivery conducted by doctor it was only 10%.

It is desirable that all pregnant mothers attend proper antenatal check-up for the interest of both mother and the baby. High risk mothers should be sent to better facility centers for better and favorable outcome.

## References

1. Subramanian SV, Kumar A, Pullum TW, Ambade M, Rajpal S, Kim R. Early-Neonatal,

- Late-Neonatal, Postneonatal, and Child Mortality Rates Across India, 1993-2021. *JAMA Netw Open*. 2024 May 1;7(5):e2410046. doi: 10.1001/jamanetworkopen.2024.10046. Erratum in: *JAMA Netw Open*. 2025 May 1;8(5):e2516129. doi: 10.1001/jamanetworkopen.2025.16129. PMID: 38728034; PMCID: PMC11087840.
2. Tyagi NK, Bharambe MS, Garg BS, Mathur JS, Goswami K. Epidemiology of early neonatal mortality. *Indian J Matern Child Health*. 1994 Oct-Dec;5(4):99-102. PMID: 12290543.
  3. Ritu Kumari, Binu Margaret, Sheela Shetty. Risk factors for neonatal death in India: A retrospective case control study. *Journal of Neonatal Nursing* 2024; 30(6):803-807. World Health Organization Fact Sheet: Neonatal Mortality (2022). Available at <https://www.who.int/news-room/fact-sheets/detail/levels-and-trends-in-child-mortality-report-2021>, Accessed 20th August 2025.
  4. Hug L, Alexander M, You D, Alkema L; UN Inter-agency Group for Child Mortality Estimation. National, regional, and global levels and trends in neonatal mortality between 1990 and 2017, with scenario-based projections to 2030: a systematic analysis. *Lancet Glob Health*. 2019 Jun;7(6):e710-e720.
  5. Levels & Trends in Child Mortality. Report 2022, Estimates developed by the United Nations Inter-agency Group for Child Mortality Estimation. 2023. Accessed February 2024. <https://childmortality.org/wp-content/uploads/2023/01/UN-IGME-Child-Mortality-Report-2022.pdf>
  6. World Population Prospects. 2022. United Nations, Department of Economic and Social Affairs, Population Division. Accessed February 2024. <https://population.un.org/wpp/Download/Standard/Mortality/>
  7. Subramanian SV, Kumar A, Pullum TW, Ambade M, Rajpal S, Kim R. Early-Neonatal, Late-Neonatal, Postneonatal, and Child Mortality Rates Across India, 1993-2021. *JAMA Netw Open*. 2024 May 1;7(5):e2410046. doi: 10.1001/jamanetworkopen.2024.10046. Erratum in: *JAMA Netw Open*. 2025 May 1;8(5):e2516129.
  8. Karlsson O, Kim R, Hasman A, Subramanian SV. Age distribution of all-cause mortality among children younger than 5 years in low- and middle-income countries. *JAMA Netw Open*. 2022;5(5):e2212692-e2212692.
  9. Gupta S, Adhisivam B, Bhat BV, Plakkal N, Amala R. Short Term Outcome and Predictors of Mortality Among Very Low Birth Weight Infants - A Descriptive Study. *Indian J Pediatr*. 2021 Apr;88(4):351-357. doi: 10.1007/s12098-020-03456-z. Epub 2020 Aug 19. PMID: 32813195.
  10. Alexander GR, Wingate MS, Bader D, Kogan MD. The increasing racial disparity in infant mortality rates: composition and contributors to recent US trends. *Am J Obstet Gynecol*. 2008; 198:51.e1-51.e9.
  11. Apoorva MS, Thomas V, Kiranmai B. A cross sectional study on socio-demographic and maternal factors associated with low birth weight babies among institutional deliveries in a tertiary care hospital, Hyderabad, Telangana. *Int J Commun Med Public Heal*. 2018; 5:4901-4904.
  12. Tellapragada C, Eshwara VK, Bhat P, Acharya S, Kamath A, Bhat S, Rao C, Nayak S, Mukhopadhyay C. Risk factors for preterm birth and low birth weight among pregnant Indian women: A hospital-based prospective study. *J Prev Med Public Heal*. 2016; 49:165-175.
  13. Singh D, Manna S, Barik M, Rehman T, Kanungo S, Pati S. Prevalence and correlates of low birth weight in India: findings from national family health survey 5. *BMC Pregnancy Childbirth*. 2023 Jun 20;23(1):456. doi: 10.1186/s12884-023-05726-y. PMID: 37340388; PMCID: PMC10283257.
  14. Sankar MJ, Natarajan CK, Das RR, Agarwal R, Chandrasekaran A, Paul VK. When do newborns die? A systematic review of timing of overall and cause-specific neonatal deaths in developing countries. *J Perinatol*. 2016 May;36 Suppl 1(Suppl 1):S1-S11. doi: 10.1038/jp.2016.27. PMID: 27109087; PMCID: PMC4848744.
  15. UNICEF-WHO Low birthweight estimates: Levels and trends 2000-2015 | UNICEF. <https://www.unicef.org/reports/UNICEF-WHO-low-birthweight-estimates-2019>. Accessed 9 September 2025.
  16. Gupta P, Ingale S, Parab G, Pol P. Study of Neonatal Morbidity and Mortality in Very Low Birth Weight Neonates Admitted in Neonatal Intensive Care Unit in a Tertiary Care Centre: An Observational Study. *SSR Inst Int J Life Sci*. 2024; 10(5): 6304-6312.
  17. Kabilan S, Kumar MS. Morbidity and mortality pattern of very low birth weight infants admitted in SNCU in a South Asian tertiary care centre. *Int J Contemp Pediatr*. 2018; 5: 720-25.
  18. Guran O, Bulbul A, Uslu S, Dursun M, Zubarioglu U, et al. The change of morbidity and mortality rates in very low birth weight infants over time. *Turk Pediatr Arsivi*. 2013; 48: 102-09.
  19. Bang AT, Bang RA, Baitule SB, Reddy MH, Deshmukh MD. Effect of home-based neonatal care and management of sepsis on neonatal

- mortality: field trial in rural India. *Lancet*. 1999 Dec 4;354(9194):1955-61. doi: 10.1016/S0140-6736(99)03046-9. PMID: 10622298.
20. Bang AT, Reddy HM, Deshmukh MD, Baitule SB, Bang RA. Neonatal and infant mortality in the ten years (1993 to 2003) of the Gadchiroli field trial: effect of home-based neonatal care. *J Perinatol*. 2005 Mar;25 Suppl 1:S92-107. doi: 10.1038/sj.jp.7211277. PMID: 15791283.
21. Kader M, Perera NK. Socio-economic and nutritional determinants of low birth weight in India. *North Am J Med Sci*. 2014; 6(7): 302-13.
22. Tyagi NK, Bharambe MS, Garg BS, Mathur JS, Goswami K. Epidemiology of early neonatal mortality. *Indian J Matern Child Health*. 1994 Oct-Dec;5(4):99-102. PMID: 12290543.
23. Pabbati J, Subramanian P, Renikuntla M. Morbidity and mortality of low birth weight babies in early neonatal period in a rural area teaching hospital, Telangana, India. *Int J Contemp Pediatr* 2019;6:1582-7.
24. Omotosho A, Sodeinde K, Abolurin O, Adekoya A, Abiodun O. How effective is antenatal care in preparing mothers for newborn care? An exploratory survey of lactating women in a rural Nigerian district. *Heliyon*. 2022 Nov 14;8(11):e11650. doi: 10.1016/j.heliyon.2022.e11650. PMID: 36406692; PMCID: PMC9668566.