e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2023; 13(6); 105-112

Original Research Article

Survival and Factors Affecting Survival of Preterm Neonated at A Tertiary Care Center at Rajasthan

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Received: 13-05-2023 / Revised: 15-05-2023 / Accepted: 10-06-2023
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Conflict of interest: Nil

Abstract

Prematurity is the leading cause of under-five children mortality globally. The WHO estimated around 15 million preterm births every year. India is one of the countries that reported the highest number of preterm births. Asia, along with sub-Saharan Africa, contributes to more than 60% of the world's preterm babies and over 80% of the world's neonatal deaths due to complications associated with preterm deliveries. Low birth weight is one of the associated factors with preterm deliveries which adds to the overall morbidity and mortality of preterm newborns.

Method: This is an observational, retrospective cross-sectional study. Preterm births both inborn and outborn who got admitted in NICU from January 23 to April 23 were taken as cases. All term births that were considered controls were randomly taken.

Results: A total of 268 newborns were admitted in the SNCU out of which 61 (23%) were preterm babies. The median gestational age of the preterm neonates was 31 weeks. On basis of maturity there were 30 (49.2%) late preterm, 29 (47.5%) very preterm and 2 (3.3%) extreme preterm newborns. The most common type of fetal presentation was vertex with 39 (63.93%) of all cases. Out of the total 61 cases studied 36 (59%) were born via normal vaginal deliveries while remaining 25 (41%) were born via caesarean section (CS). The mean birth weight of the neonates was 1.5 ± 0.41 kg. There were 23 (37.70%) deaths out of the total 61 preterm newborns. The most common associated morbidities underlaying preterm neonatal death in the present study were respiratory distress syndrome (29%), neonatal sepsis (25%), hypothermia (21%), perinatal asphyxia (7%), jaundice (4%) and hypoglycaemia (4%). The main causes of deaths in preterm neonates were recorded as respiratory distress syndrome in 10 (43.5%), Perinatal asphyxia 5 (21.7%), neonatal sepsis 4 (17.4%), seizures 2 (8.7%), interactable hypoglycaemia 1 (4.3%) and others 1 (4.3%) where no definitive cause could be diagnosed. On comparing birth weight and grade of prematurity, there was significant correlation between the maturity and birth weight of the newborns. The poor outcome depends on the birth weight, we observed that the chances of neonatal deaths increase significantly. On comparing the outcome with prematurity, we observed that the chances of deaths increase with the grade of prematurity.

Conclusion: Prematurity and low birth weight predispose to neonatal deaths. Low birth weight has a significant association with prematurity. Both prematurity and low birth weight causes multiple complications like RDS, sepsis, etc and are responsible for premature deaths.
Keywords: Preterm, Low birth weight, Perinatal asphyxia.

Introduction

World Health Organization (WHO) defines preterm birth as babies born alive before 37 completed weeks of pregnancy.[1] There are sub-categories of preterm birth, based on gestational age: extremely preterm (less than 28 weeks), very preterm (28 to less than 32 weeks), moderate to late preterm (32 to 37 weeks). Each year, 15 million babies are born preterm in the world. Mortality is higher among preterm neonates than those of term [2,3]. Prematurity is the leading cause of under-five children mortality globally.[1] The WHO estimated around 15 million preterm births every year. [4] India is one of the countries that reported the highest number of preterm births. Asia, along with sub-Saharan Africa, contributes to more than 60% of the world's preterm babies and over 80% of the world's neonatal deaths due to complications associated with preterm deliveries.[5] An estimated 13.4 million babies were born too early in 2020. That is more than 1 in 10 babies. Approximately 900000 children die in 2019 of complications of preterm birth.[1] The chances of mortality and morbidity and risk of lifetime of disability, including learning disabilities and visual and hearing problems are significantly higher in the surviving preterm babies. Compared with term infants, premature babies are more likely to develop long-term neurological and developmental disorders.

One of the very important risks for mortality in preterm newborns is the low birth weight. Low birth weight (LBW) is defined as weight at birth of less than 2500 grams (<2.5 Kilograms) [7], which is usually associated with preterm delivery (typically less than 37 weeks of gestation) or restricted intrauterine development [8]. In India it is estimated that 30% of babies are LBW, with nearly half being born full term and the other half are preterm deliveries.[8]

Low birth weight newborns have a more than 20 times higher risk of death than neonates with birth weight of >2500 g [9]. Low birth weight in newborns is also associated with long term neurological effects due to brain damage, poor speech development [10], poor performance at school, and increased risk of chronic diseases including cardiovascular disease and diabetes. Premature babies are at increased risk of intracranial haemorrhage (ICH), neonatal sepsis, respiratory distress, blindness due to ROP, and GI disorders due to immaturity of multiple organ systems. Prematurity is one of the important cause of under-five child mortality worldwide. [11]

Advances in pregnancy and childbirth have increased the survival of foetuses delivered at a younger age and attempted resuscitation, but these premature babies have a higher mortality rate.

This retrospective observational study was conducted to determine the prevalence of preterm newborns, their survival and association of low birth weight and the factors associated with the mortality of preterm newborns in a tertiary care centre in western Rajasthan.

Material and Method

This is an observational, retrospective cross-sectional study done at Government

Medical College and Bangar Hospital, Pali Rajasthan, India. All necessary approvals were taken from the Research and Ethical committee. Preterm births both inborn and outborn who got admitted in NICU from January 23 to April 23 were taken as cases. All term births that were considered controls were randomly taken.

Gestational age was determined by the last menstrual period (LMP), third trimester scan and by Ballard's Scoring. The babies were grouped in three groups, 1) Extremely preterm (< 28 weeks), very preterm (28 - 32 weeks), late preterm (32 - 37 weeks). Low birth weight (LBW) is defined by the World Health Organization as birth weight of an infant of 2499 g or less, regardless of gestational age.[6]

All newborns admitted during the study period to SNCU meeting the inclusion and exclusion criteria were included in the study. The clinical details like gestational age, birth weight, treatment progress, all investigations and outcomes were recorded in the birth register. Data like child's demographic details, mother's obstetric history, any associated risk factors underlaying preterm delivery like preeclampsia, fetal growth retardation, previous history of preterm births, etc., were noted. Details of onset of labour, mode of delivery, birth weight of the baby, and complications was recorded on designated formats.

Inclusion Criteria

1. All newborns, both inborn and outborn admitted to SNCU having gestational age of 37 weeks or less.
2. The parents consented to be included in study.

Exclusion Criteria

1. Parents who did not consent for the study.
2. IUD and still births deliveries.
3. Incomplete medical records.

Statistical analysis

Data was collected and entered into MS Excel 2019. Frequency and percentage were calculated and analyzed. Taking, 95% confidence interval, and *P* value. *P* Value of <0.05 was considered significant.

Results

In the present study during the study period a total of 268 newborns were admitted in the SNCU out of which 61 (23%) were preterm babies. [Image 1] The median gestational age of the preterm neonates was 31 weeks. On basis of maturity there were 30 (49.2%) late preterm, 29 (47.5%) very preterm and 2 (3.3%) extreme preterm newborns [Image 2]. The most common type of fetal presentation was vertex which accounted for 39 (63.93%) of all cases. Out of the total 61 cases studied 36 (59%) were born via normal vaginal deliveries while remaining 25 (41%) were born via caesarean section (CS). The mean birth weight of the neonates was 1.5 ± 0.41 kg and the distribution of cases is shown in Table 1.

Table 1: Distribution of cases according to birth weight.

Weight Category	No. of Cases	Percent
LBW	44	72.1
VLBW	9	14.8
ELBW	8	13.1
Total	61	100.0

There were 23 (37.70%) deaths out of the total 61 preterm newborns. The most common associated morbidities underlaying preterm neonatal death in the present study were respiratory distress syndrome (29%), neonatal sepsis (25%), hypothermia (21%), perinatal asphyxia (7%), jaundice (4%) and hypoglycaemia (4%).

Table 2: Distribution of cases according to outcome.

Outcome	Frequency	Percent
Discharged	35	57.37
Expired	23	37.70
Referred	3	4.9
Total	61	100.0

All the preterm neonates enrolled in the study were followed for 60 days or till the baby was discharged or referred from our facility with a median follow-up period of 6 days. Date and time of birth was recorded from the delivery records, and the event of death refer to as death of any newborn at our facility during the admission. Survival was referred as neonates who were discharged or referred to higher center or discharged against medical advice. In our study, 38 (62.27%) of the neonate survived whereas 23 (37.70%) newborns expired.

The main causes of deaths in preterm neonates were recorded as respiratory distress syndrome in 10 (43.5%), Perinatal asphyxia 5 (21.7%), neonatal sepsis 4 (17.4%), seizures 2 (8.7%), interactable hypoglycaemia 1 (4.3%) and others 1 (4.3%) where no definitive cause could be diagnosed. [Image 3]

In our study, on comparing birth weight and grade of prematurity, there was significant correlation between the maturity and birth weight of the newborns. The birth weight is significantly less as the prematurity increases (p-value < 0.001) [table 3].

The poor outcome in form of newborn deaths, depends on the birth weight in our study. We observed that the chances of neonatal deaths increase significantly as the birth weight decreases with 100% of extremely low birth weight babies expired as compared to only 20.5% of low birth weight babies had poor outcome (p-value < 0.001) [Table 4].

On comparing the outcome with prematurity, we observed that the chances of deaths increase with the grade of prematurity with 100% of fatalities occurred in extreme preterm babies and only 23.3% in late preterm (p-value = 0.026) [table 5]

Table 3: Relation between maturity and birth weight of newborns.

	Weight Category							
Maturity	**LBW**		**VLBW**		**ELBW**		**Total**	
	Count	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**
Late PT	29	96.7%	1	3.3%	0	0.0%	30	100.0%
Very PT	15	51.7%	8	27.6%	6	20.7%	29	100.0%
Extreme PT	0	0.0%	0	0.0%	2	100.0%	2	100.0%
Total	44	72.1%	9	14.8%	8	13.1%	61	100.0%

Chi-square = 28.520, df = 4, p-value = <0.001 (HS)

Table 4: Relation between birth weight and outcome of newborns in the present study

	Outcome					
Weight	**Expired**		**Survived**		**Total**	
	Count	%	Count	%	Count	%
ELBW	8	100.0%	0	0.0%	8	100.0%
LBW	9	20.5%	35	79.5%	44	100.0%
VLBW	6	66.7%	3	33.3%	9	100.0%
Total	23	37.7%	38	62.3%	61	100.0%

Chi-square 22.006, df 2, p-value = < 0.001

Table 5: Relation between maturity and outcome of newborns in the present study

	Outcome					
Maturity	**Expired**		**Survived**		**Total**	
	Count	**Row N %**	**Count**	**Row N %**	**Count**	**Row N %**
Extreme PT	2	100.0%	0	0.0%	2	100.0%
Late PT	7	23.3%	23	76.7%	30	100.0%
Very PT	14	48.3%	15	51.7%	29	100.0%
Total	23	37.7%	38	62.3%	61	100.0%

Chi-square 7.322, df 2, p-value = 0.026

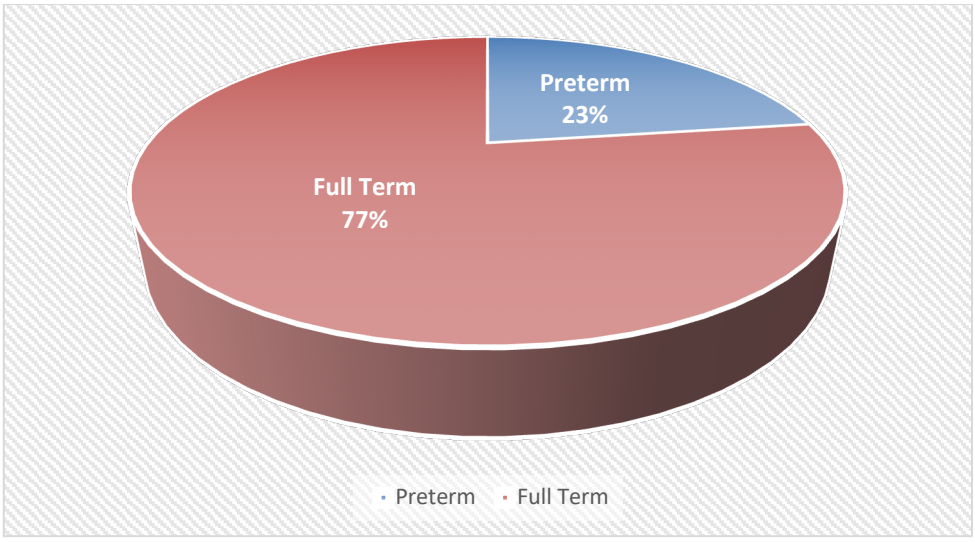

Figure 1: Ratio of full term and preterm deliveries during the study period

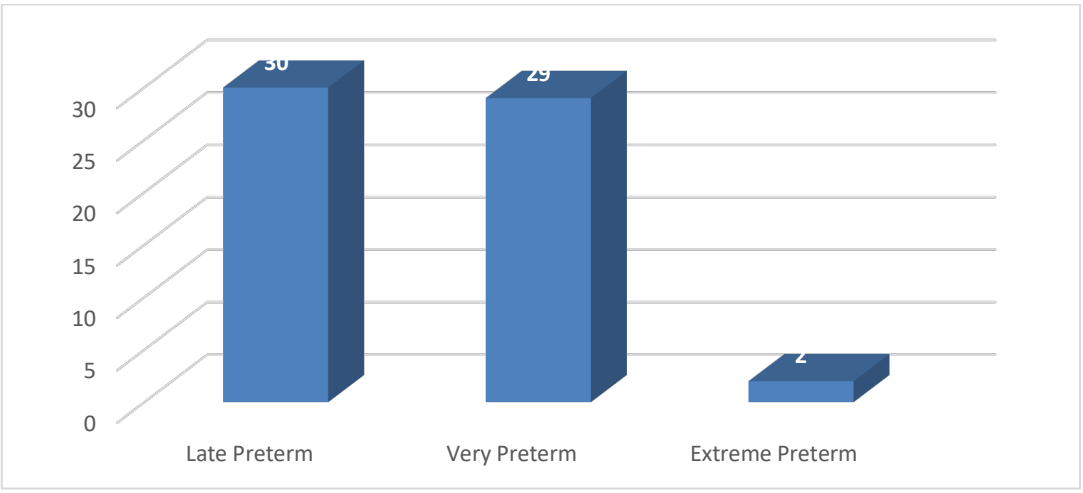

Figure 2: Distribution of cases according to maturity

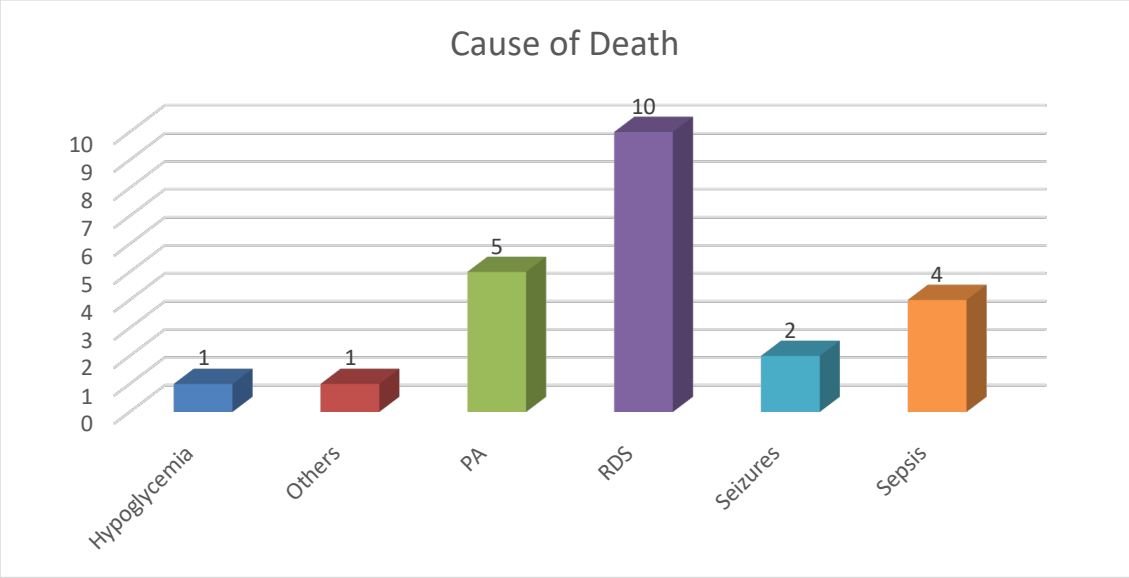

Figure 3: Cause of Death in preterm neonates in our study.

Discussion

Preterm birth is one of the most challenging problems in neonatal care and it is closely related to neonatal mortality and morbidity. Although in the past few decades, neonatal intensive care has made continuous progress and neonatal mortality has declined significantly, the morbidity and mortality among preterm neonates still have a lot of room for improvement. The objective of the present study was to investigate the prevalence of poor outcome in preterm neonates, complications, mortality in a tertiary care centre in Rajasthan. The present study shows that rate of survival of babies with gestational age less than 28 weeks was still very low. There is scope in improvement of maternal and infant care practices in the very preterm births.

In the present study, there were 23 (37.7%) death among preterm neonates which is in concordance with the study conducted at Ethopia where the percent of preterm death ranged from 22.7 to 28.8% [12-14] In the study done by Kajal Jain et. al.[15] which included the pooled data from 3 cohorts in India, reported a total of 33.53% mortality in preterm neonates which is in agreement with our study. On the other hand, the percentage of newborn deaths in our study is far from two studies done in China where the overall mortality among premature births was 1.9% and 5.0%. [3,16] The difference between studies may have resulted from the study area and the country's health status. Some studies have been done in all fetuses where the risk of infant death may not be the same as hospitalization in the neonatal intensive care unit alone.

In this study nearly 3/4th of the deaths was recorded in the first week of life. Our results were in agreement with a previous study done at Iran where, 39% and 84.3% of deaths were recorded in the first 24 h and the first week of the neonatal life, respectively.[17]

Preterm deliveries are often linked to various fetal and maternal problems. Due to these problems many times it becomes essential to conduct the delivery either by induction or cesarean section.[1] In the present study, we found around half (41%) of the preterm neonates were delivered by cesarean section. This is consistent with a recent multi-country survey, which reported that the prevalence of women with preterm CS delivery was 36.7%.[18] whereas the study conducted by O. Gluck et al.[19] has shown slightly higher values, where the percentage of preterm cesarean delivery was 53.1%.

In this study, we observed that the most common factors associated with mortality in preterm neonates were respiratory distress syndrome, perinatal asphyxia, birth weight, and gestational age. Our finding showed that neonatal mortality and gestation age have an inverse relationship to each other that is chances of mortality in newborns increases with decreasing gestational age. This finding has been consistent with other studies conducted in India [15], Ethiopia [3], and China. Therefore, infants with low birth weight and various comorbidities are likely to be at higher risk of death.

Additionally, this study also found that respiratory distress syndrome was an independent indicator of preterm deaths. Death may be due to adverse pulmonary outcomes and other obstetric causes. Additionally, inadequate medical facilities, limited respiratory equipment, and other shortages in hospitals can increase the number of deaths associated with respiratory distress.

Limitation of the study. This study has limitations due to its retrospective nature and possible incomplete clinical data. First, it has less maternal data to add value to the existing findings. Second, there may be selection bias, as premature death often leads to missing data and subsequent exclusion from studies. Third, information about the place of birth, home and hospital is lacking. Finally it lacks the ability to check for false medical records and diagnoses.

Conclusion

Prematurity and low birth weight predispose to neonatal deaths. Low birth weight has a significant association with prematurity. Both prematurity and low birth weight causes multiple complications like RDS, sepsis, etc and are responsible for premature deaths.

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