Morbidities and mortalities in very low birth weight newborn a cohort study at tertiary care center of Central India

Virendra Mehar¹, Swati Muley², Saksham Agrawal³, Anuj Malhotra³

From ¹Associate Professor, ²Professor, ³Resident, Department of Pediatrics, Sri Aurobindo Institute of Medical Science, Indore, Madhya Pradesh, India

ABSTRACT

Background: The survival in neonates is associated with their birth weights, gestation, and severity of illness. Despite all the efforts, the early neonatal mortality represents quite a high percentage. Objectives: The objectives of the study were to study the various short-term outcomes in with very low birth weight (VLBW) neonates. Materials and Methods: An observational hospital-based prospective cohort study was performed on live VLBW neonates admitted over a period of 1 year at the NICU of a tertiary hospital of Central India. Neonates with birth weight outside the study range or with major congenital anomalies and those with clinically identified chromosomal syndromes were excluded from the study. The hospital records of all neonates enrolled in the study were followed daily until the time of discharge for any morbidity. Results: A total of 116 neonates were recruited according to inclusion and exclusion criteria. There were 63 (54.3%) male and 53 (45.7%) female neonates considered in the study. The mean birth weight of VLBW neonates was 1282±136 g. Birth asphyxia was observed in 21% of the patients. Neonatal hyperbilirubinemia was the most common (36%) morbidity in these neonates. Conclusion: Almost half of the newborns had sepsis. Due to many factors such as optimization of neonatal care, better knowledge of the pathophysiology of the premature infant, the advent of exogenous surfactant therapy, and neonatal intensive care unit to handle sick infants, the survival rate in VLBW babies was higher in our study.

Key words: Birth asphyxia, Extremely Low birth weight, Morbidity, Mortality

Very low birth weight (VLBW) neonates represent a vulnerable group of newborns with a high mortality rate. The survival in neonates is associated with their birth weights, gestation, and illness severity. The survival rate of VLBW infants varies globally with 40% in developing countries to more than 90% in developed countries [1]. VLBW neonates who survived tend to have a higher risk for neurodevelopmental disabilities causing significant changes to the lives of their families [2]. Varied morbidities have been associated during initial hospitalization of VLBW infants, including respiratory distress syndrome (RDS), bloodstream and central nervous system infections, necrotizing enterocolitis (NEC), chronic lung disease (CLD), intraventricular hemorrhage, periventricular leukomalacia, and retinopathy of prematurity, leading to exposure to additional diagnostic, therapeutic, and surgical interventions. These cause psychological distress to families with an increase in the length of hospital stay, the risk of recurrent hospitalization, and costs of treatment [3].

The morbidities in infants are proved to be associated with neurodevelopmental disabilities developing later including cerebral palsy, cognitive delay, hearing loss, and visual impairment [4,5]. According to several studies performed about morbidity and mortality and morbidity of neonates in the past two decades, no additional improvements have been seen [6]. Data are scarce on the incidence of short-term morbidities in preterm neonates from India. Bhat and Adhisivam concluded that early weaning from mechanical ventilator support in VLBW infants reduced morbidities such as CLD and infections [7]. The present study was designed and executed to assess the short-term outcomes of neonates with birth weights between 1000 g and 1500 g treated at the tertiary hospital of Central India.

MATERIALS AND METHODS

This prospective cohort study was conducted in the NICU, conducted at the tertiary hospital of Central India from April 2014 to March 2015. It was a level 3 NICU with 20 intensive care beds and 6 bedded kangaroo mother care (KMC) ward with an annual admission of more than 1000 cases. All live VLBW neonates (1000–1500 g), admitted between the study period, were enrolled for the study. Extremely low weight (<1000 g), low birth weight (1500–2500 g), and normal birth weight (>2500 g) neonates

Access this article online

Received - 02 August 2020
Initial Review - 11 August 2020
Accepted - 15 August 2020

DOI: 10.32677/IJCH.2020.v07.i08.005

Correspondence to: Virendra Mehar, J-234, SS Infinitus, MR 11, Lausudiya Moris, Dewas Naka, Indore - 452 010, Madhya Pradesh, India. E-mail: dr.veerendramehar@gmail.com

© 2020 Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC-ND 4.0).
Mehar et al. Short-term outcomes among very low birth weight neonates

were excluded from the study. Neonates with major congenital anomalies and those with clinically identified chromosomal syndromes were also excluded from the study. The study was approved by the Institutional Ethical Committee.

All neonates enrolled in the study whose parents gave consent for the study were followed daily until the time of discharge for any morbidity by clinical evaluation and reviewing hospital records. Mode of delivery, parity, and gestation period was noted their percentages were calculated. All the morbidities resulting in admission or readmission of patients after the 1st day of delivery were considered in the study (Table 1).

Blood sugar level was monitored as per the NICU protocol in all the neonates under study. The statistical analysis was done using SPSS version 25.0. p<0.05 was considered statistically significant.

RESULTS

A total of 116 neonates were recruited according to the inclusion-exclusion criteria. Of 116 VLBW neonates, 63 (54.3%) were male and 53 (45.7%) were female. A total of 71 (61.2%) neonates were appropriate for gestational age. Out of a total of 116 mothers of infants, 58 each were primi and multiparous. Maximum births (28.4%) took place at 34 weeks of gestation, whereas only 1 (0.9%) birth took place at the 38th week of gestation. A total of 66 mothers (56.9%) gave birth by lower segment cesarean section and 50 mothers (43.1%) gave birth by vaginal delivery.

PIH was observed in 16% of mothers of VLBH neonates. About 22% of mothers of VLBW neonates were anemic. About 19% of mothers did not receive any supplementation in the form of calcium, iron, and folic acid. No significant difference in mean birth weight was observed with different parity of mothers (p=0.149). However, we observed significantly lower birth weight of infants born to anemic women as compared to non-anemic women (p=0.039) (Table 2).

| Parameters | Birth weight (g) | p-value |
|------------|----------------|---------|
| Gender     |                |         |
| Male       | 1273±147       | 0.412   |
| Female     | 1294±122       |         |
| Parity     |                |         |
| Primi      | 1292±124       | 0.419   |
| Multi      | 1272±148       |         |
| Supplement received | |         |
| Yes        | 1286±135       | 0.519   |
| No         | 1265±144       |         |
| Maternal anemia | |         |
| Present    | 1234±125       | 0.039   |
| Absent     | 126±137        |         |

DISCUSSION

The rise in the survival of the VLBW preterm is due to advances in both perinatal and neonatal care over the past two decades [8]. The survival of VLBW babies depends on several factors such as optimization of neonatal care, better knowledge of the pathophysiology of the premature infant, the advent of exogenous surfactant therapy, and the NICU handling sick infants. Rate of overall survival for VLBW newborns has been widely different in studies from different parts of the world; 63% and 84.2% from India [9,10], 35.6% from a study in Iran [11], 74.5% from Turkey [12], 87.5 and 85% from the USA [13], and 90% from New Zealand [14]. Differences among the patient population,
antenatal care, intranatal care, aggressive neonatal care, and availability of NICU facilities are a few reasons responsible for these varied results. The survival rate in VLBW babies in our study was 81.0% which is quite similar to the previous studies.

RDS occurred in 34% of neonates in this study which is contrast to a previous study which reported RDS in 90% of cases [15]. We followed recommended guidelines in our patients who developed RDS, with CPAP (in 58.9%) and surfactant (in 41.0%); however, we had to start mechanical ventilation in 30.7% of these newborns. Despite these measures, 35.8% died, which underlines the severity of RDS in our patients, although the use of CPAP and surfactant failure was compatible with the earlier studies [16-19].

NEC was observed in 8% of the study population which is similar to the results of National Institute of Child Health and Human Development (NICHD) Neonatal Research Network report in 2001 which reported 7% incidence. As per the National Neonatal-Perinatal Database, 5% of all newborns in India develop significant jaundice with total serum bilirubin of more than 15 mg/dL. In our study, we observed neonatal hyperbilirubinemia in 36% of VLBW babies which is much lower than the earlier reports of 60% [20].

According to the study of Comblath et al. [21], 6.1% of the neonates admitted in NICU during the first 24 h of life showed hypoglycemia and all were LBW or VLBW. We observed hypoglycemia in 13% of the neonates in the present study which was higher as compared to the previous studies. Hypocalcemia occurs frequently in LBW infants during the first 48–72 h of life [22,23]. However, we observed hypocalcemia in only 2% of neonates.

According to the study by Ferri et al. [24] in 2014 and MacQueen et al. [25] in 2017, a high prevalence of anemia of 26.5% and 17%, respectively, was observed in VLBW infants. In the present study, we observed only 6% of VLBW neonates with anemia. We observed 5% of the VLBW neonates developed HIE which was higher as compared to the other studies [26,27] from developed countries due to better antenatal and perinatal monitoring and care.

The incidence of sepsis was 45% in our study and was much higher than the report from the NICHD. The sepsis-related mortality rate of VLBS neonates was 32.6% which was higher when compared to the rates reported in the literature of 17.3%–29% [28-32]. VLBW neonates with Gram-negative sepsis were at the greatest risk of death. K. pneumoniae was the most aggressive agent of sepsis, responsible for the highest sepsis-related mortality, whereas Pseudomonas aeruginosa was the main organism in the study done by Gordon and Isaccs in 2006 [31]. There is a discrepancy in the literature regarding the incidence of sepsis in VLBW and the causative organisms, due to poor perinatal aseptic precautions in the developing countries as compared to the Western world. The mortality was 19% in our study and the most common cause was sepsis.

In a study performed by Richards et al. [32], mean birth weight was lower in infants of PIH mothers (18.4%) than infants of non-PIH mothers. In our study, we observed PIH in 16% of mothers of VLBH neonates which was lower as compared to the previous results [33]. RDS occurred in 34% of VLBW neonates in the current study which was low as compared to a recent study done by Wen et al. [34] in 2019 who observed the incidence of 86% and that of severe RDS as 41.2%. In the current study, apnea observed was comparatively less with 11% of the VLBW neonates affected, whereas, in a study done by Zhao et al. [35], it was around 54%.

Our study had a few limitations. The study had a small number of infants enrolled. This study represents outcomes in a single tertiary care center; thus, our results cannot be generalized to all VLBW infants.

CONCLUSION

Knowledge of the incidence of complications is important for parent counseling as well as anticipating and planning before birth. In addition, accurate knowledge of trends in incidence is important for quality improvement. Future clinical trials are required to further assess the outcomes in such infants.

REFERENCES

1. Mathews TJ, MacDorman MF. Infant mortality statistics from the 2007 period linked birth/infant death data set. Natl Vital Stat Rep 2011;59:1-30.
2. Zapancic JA. A systematic review of costs associated with preterm birth. In: Behrman RE, Stith Butler A, editors. Preterm Birth: Causes, Consequences, and Prevention. Washington, DC: Institute of Medicine, National Academies Press; 2007.
3. Payne NR, Carpenter JD, Badger GJ, Horbar JD, Rogowski J. Marginal increase in cost and excess length of stay associated with nosocomial bloodstream infections in surviving very low birth weight infants. Pediatrics 2004;114:348-55.
4. Schmidt B, Asztalos EV, Roberts RS, Robertson CM, Sauve RS, Whitfield MF, et al. Impact of bronchopulmonary dysplasia, brain injury, and severe retinopathy on the outcome of extremely low-birth-weight infants at 18 months: Results from the trial of indomethacin prophylaxis in preterms. JAMA 2003;289:1124-9.
5. Stoll BJ, Hansen NI, Adams-Chapman I, Fanaroff AA, Hintz SR, Vohr B, et al. Neurodevelopmental and growth impairment among extremely low-birth-weight infants with neonatal infection. JAMA 2004;292:2357-65.
6. Horbar JD, Badger GJ, Carpenter JD, Fanaroff AA, Kilpatrick S, LaCorte M, et al. Trends in mortality and morbidity for very low birth weight infants, 1991-1999. Pediatrics 2002;110:143-51.
7. Bhat BV, Adhisivam B. Trends and outcome of low birth weight (LBW) infants in India. Indian J Pediatr 2011;46:137-43.
8. Quinn GE, Dobson V, Saigal S, Phelps DL, Hardy RJ, Tung B, et al. Health-related quality of life at age 10 years in very low-birth-weight children with and without threshold retinopathy of prematurity. Arch Ophthalmol 2004;122:1659-66.
9. Roy KK, Baruah J, Kumar S, Malhotra N, Deorari AK, Sharma JB. Maternal antenatal profile and immediate neonatal outcome in VLBW and ELBW infants. Indian J Pediatr 2013;80:660-2.
10. Basu S, Rathore P, Bhartia BD. Predictors of mortality in very low birth weight neonates in India. Singapore Med J 2008;49:556-60.
11. Navaei F, Aliabady B, Moghtaderi J, Moghtaderi M, Kelishadi R. Early outcome of preterm infants with birth weight of 1500 g or less and gestational age of 30 weeks or less in Isfahan City, Iran. World J Pediatr 2010;6:228-32.
12. Canbak Y, Silifker I, Dorum BA, Kunarz H, Dorun S. The ratio of mortality and morbidity in very low birth weight infants in a public hospital. Turk Arch Pediatr 2011;46:137-43.
13. Neocosur GC. Very-low-birth-weight infant outcomes in 11 South American NICUs. J Perinatol 2002;22:2-7.
14. Horbar JD, Carpenter JH, Badger GJ, Kenny MJ, Soll RF, Morrow KA, et al. Mortality and neonatal morbidity among infants 501 to 1500 grams from 2000 to 2009. Pediatrics 2012;129:1019-21.

15. Stool BJ, Hansen NL, Bell EF, Shankaran S, Laptook AR, Walsh MC, et al. Neonatal outcomes of extremely preterm infants from the NICHD neonatal research network. Pediatrics 2010;126:443-56.

16. Morley CI, Davis PG, Doyle LW, Brion LP, Hascoet JM, Carlin JB. Nasal CPAP or intubation at birth for very preterm infants. N Engl J Med 2008;358:700-8.

17. Kugelman A, Feferkorn I, Riskin A, Chistyakov I, Kaufman B, Bader D. Nasal intermittent mandatory ventilation versus nasal continuous positive airway pressure for respiratory distress syndrome: A randomized, controlled, prospective study. J Pediatr 2007;150:521-6.

18. Ramanathan R, Sekar KC, Rasmussen M, Bhatia J, Soll RF. Nasal intermittent positive pressure ventilation after surfactant treatment for respiratory distress syndrome in preterm infants <30 weeks’ gestation: A randomized, controlled trial. J Perinatol 2012;32:199-203.

19. Afjeh SA, Sabzehei MK. The INSURE method in VLBW preterm infant with RDS. Pejoshandeh 2010;15:199-203.

20. Porter ML, Dennis BL. Hyperbilirubinemia in the term newborn. Am Fam Physician 2002;65:599-606.

21. Cornblath M, Schwartz R. Hypoglycemia in the neonate. J Pediatr Endocrinol 1993;6:113-29.

22. Vuralli D. Clinical approach to hypocalcemia in newborn period and infancy: Who should be treated? Int J Pediatr 2019;2019:4318075.

23. Amaral LM, Wallace K, Owens M, LaMarca B. Pathophysiology and current clinical management of preeclampsia. Curr Hypertens Rep 2017;19:61.

24. Ferri C, Procianoy RS, Silveira RC. Prevalence and risk factors for iron-deficiency anemia in very-low-birth-weight preterm infants at 1 year of corrected age. J Trop Pediatr 2014;60:53-60.

25. MacQueen BC, Christensen RD, Ward DM, Bennett ST, O'Brien EA, Sheffield MJ, et al. The iron status at birth of neonates with risk factors for developing iron deficiency: A pilot study. J Perinatol 2017;37:436-40.

26. Graham EM, Ruiss KA, Hartman AL, Northington FJ, Fox HE. A systematic review of the role of intrapartum hypoxia-ischemia in the causation of neonatal encephalopathy. Am J Obstet Gynecol 2008;199:587-95.

27. Vannucci RC, Perlman JM. Interventions for perinatal hypoxic-ischemic encephalopathy. Pediatrics 1997;100:1004-14.

28. Pereira SM, De Almeida Cardoso MH, Figueixedos AL, Mattos H, Rozembaum R, Ferreira VI, et al. Sepsis-related mortality of very low birth weight Brazilian infants: The role of Pseudomonas aeruginosa. Int J Pediatr 2009;2009:427682.

29. Hornik CP, Fort P, Clark RH, Watt K, Benjamin DK, Smith PB, et al. Early and late onset sepsis in very-low-birth-weight infants from a large group of neonatal intensive care units. Early Hum Dev 2012;88 Suppl 2:S69-74.

30. Trotman H, Bell Y. Neonatal sepsis in very low birthweight infants at the university hospital of the West Indies. West Indian Med J 2006;55:165-9.

31. Gordon A, Isaacs D. Late onset neonatal gram-negative bacillary infection in Australia and New Zealand: 1992-2002. Pediatr Infect Dis J 2006;25:25-9.

32. Richards C, Alonso-Echanove J, Caicedo Y, Jarvis WR. Klebsiella pneumoniae bloodstream infections among neonates in a high-risk nursery in Cali, Colombia. Infect Control Hosp Epidemiol 2004;25:221-5.

33. Lu CQ, Lin J, Yuan L, Zhou JG, Liang K, Zhong QH, et al. Pregnancy induced hypertension and outcomes in early and moderate preterm infants. Pregnancy Hypertens 2018;14:68-71.

34. Wen YH, Yang HI, Chou HC, Chen CY, Hsieh WS, Tsou KI, et al. Association of maternal preeclampsia with neonatal respiratory distress syndrome in very-low-birth-weight infants. Sci Rep 2019;9:13212.

35. Zhao J, Gonzalez F, Mu D. Apnea of prematurity: From cause to treatment. Eur J Pediatr 2011;170:1097-105.

Funding: None; Conflicts of Interest: None Stated.

How to cite this article: Mehar V, Muley S, Agrawal S, Malhotra A. Morbidities and mortalities in very low birth weight newborns a cohort study at tertiary care center of Central India. Indian J Child Health. 2020;7(8):340-343.