Research Article

A longitudinal study to assess the survival of low-birth-weight neonates born in a tertiary hospital, Ahmedabad

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Received July 10, 2015. Accepted July 24, 2015

Abstract

Background: Birth weight is the most important predictor of the survival chances, growth, and development of a newborn child. It also predicts perinatal, neonatal, and infant mortality rates and child survival index.

Objective: To assess the survival of low-birth-weight (LBW) neonates born in a tertiary hospital, Ahmedabad.

Materials and Methods: Two hundred and two LBW babies (birth weight below 2,500 g) were selected by simple random method from all the babies born live in the hospital during the study period, and equal numbers of babies were also selected from normal birth-weight (NBW) babies for matching control. Babies with congenital anomalies were excluded. Both the cases and controls were followed up for 6 months in the hospital and in the community to assess their survival and, if died, then cause of death.

Result: During the follow up study, a total 40 babies died—38 babies from LBW category and only two babies from NBW. Of the 38 LBW babies, 28 babies died in the hospital. All the babies weighing < 1,500 g did not survive. The death rate decreased as the birth weight increased. The major causes of deaths are found to be birth asphyxia, acute respiratory distress syndrome (ARDS), and infections.

Conclusion: This study concluded that LBW babies are more prone to early neonatal deaths owing to complications in comparison with NBW babies. The main causes of deaths are birth asphyxia and infection. Intervention program is highly essential to prevent the LBW babies rather than the treatment of LBW babies born later.

KEY WORDS: Low birth weight (LBW), normal birth weight (NBW), survival chance

Introduction

The birth weight of an infant is the single most important determination of its survival, illness, growth, and development.[1–7] The infant mortality rate is about 20 times greater for all low birth-weight (LBW) babies than for normal babies. The lower the birth weight, the lower is the survival chance.[8] The first hours and days of a baby's life are especially critical. About three-quarters of all newborn deaths (over 2 million) take place within 1 week of birth. About 36% of newborn deaths (over 1 million) occur on the day a child is born.[9] LBW is an important guide to the extent of care required by individual babies.

In both the developed and developing countries, LBW presents as one of the most significant problem in the mother and child health. The factors that are attributed to its public health significance are—its high occurrence; its association with mental retardation and a high risk of perinatal and infant mortality and morbidity; human wastage and suffering; very high cost of special care and intensive care units (ICUs); and its association with socioeconomic underdevelopment.[10]

Access this article online	
Website: http://www.ijmsph.com	Quick Response Code:
DOI: 10.5455/ijmsph.2016.1007201549	

Materials and Methods

This longitudinal study has been carried out in a tertiary-care hospital in Ahmedabad, Gujarat, India. Of all the babies born alive in the hospital during the study period, 202 LBW babies were selected by simple random method and equal numbers of babies were selected from normal birth-weight (NBW) babies as a matching control for the follow-up study for 6 months to assess their survival chance. Babies with congenital abnormalities were excluded from studies. Criteria applied for matching both the cases and controls were (a) sex, (b) area of residence, (c) birth date falling within 3 days of birth index of the baby, (d) socioeconomic status, and (e) mother's educational status.

The babies so selected were registered, and their complete residential address was recorded in a predesigned and pretested pro forma. After the first assessment of newborn in the hospital, six visits at monthly intervals were paid to each sampled child in the community to know the survival of baby; in case of death, the cause of death was assessed by asking the history and perusing the medical documents. In case of family migration, the child was considered "lost to follow-up" and necessary entry of it was made in the pro forma.

Data thus collected from the follow-up study of both the LBW babies and their matching controls were analyzed by using the modified life table analysis.

Result

Four hundred and four babies (202 pairs, where each consisted of a LBW and a NBW baby) were followed up from birth to end of 6 months. The distribution of such babies according to their birth weight is shown in Table 1.

It was observed that 10 babies with birth weight under 1,500 g did not survive. The mortality, however, declined with the increase in the birth weight [Table 1]. Male babies accounted for 60% of deaths among LBW babies.

Modified life table method was applied to compute the chance of mortality and survival at each month of age up to 6 months as shown in Table 2. It was observed that LBW babies, during the first month of life, experienced a significantly higher mortality than do NBW babies ($z = 5.24$). The chance of survival, at the end of the sixth month of life was better for NBW babies (99%) than LBW babies (80.3%) ($z = 13.95$).

Of the 40 deaths recorded during the follow-up study, 38 (95%) deaths occurred among LBW babies and only two (5%) deaths occurred among NBW babies. Of the total deaths, 28 (70%) deaths occurred in the hospital. Among the various causes of deaths in LBW babies, total infections accounted for 49.97%, which included meningitis, septicemia, pneumonia, and gastroenteritis. Other causes of deaths are birth asphyxia (18.42%) and respiratory distress syndrome (15.78%) as shown in Table 3.

Discussion

This study revealed that, when compared with NBW babies, LBW babies during the first month of life experienced significantly higher mortality. It was further observed that all babies with birth weight below 1,500 g could not survive. Similar observations were reported by others.[11,12] However, reduction in mortality and better chances of survival were observed as the birth weight increased. This is in accordance with other studies.[12–14] Causes of deaths observed in this study concurred well with the other studies.[11,12,15,16] It was, however, difficult to assess how many of these were owing to the poor survival of a LBW baby and poor environment and infections. These two factors cannot be easily dissociated.

Table 1: Babies included in the community study and their birth weight and mortality

Birth Weight (g)	Babies included in the community study	Deaths during follow–up	
		Number	Percentage
<1,250	3	3	100
1,250–1,500	7	7	100
1,500–1,750	16	12	75
1,750–2,000	33	9	27.27
2,000–2,250	73	3	4.11
2,250–2,500	105	4	3.81
2,500–2,750	62	1	1.61
2,750–3,000	57	—	—
3,000–3,250	34	—	—
3,250–3,500	9	—	—
>3,500	5	1	20
Total	404	40	9.90

Table 2: Life table analysis of 6 months follow-up

Interval (month), *W*	Alive at start, *A š*	No. of deaths, *¡ š*	Withdrawn from study, *õ š*	Alive at mid point of x, *±G*	Death rate during interval, *È š*	Survival		Cumulative death rate, *J W*
						During interval, *I š*	Cumulative, *I W*	
(a) LBW babies (202)								
0–1	202	29	11	196.5	0.148	0.852	0.852	0.148
1–2	162	8	4	160.0	0.050	0.950	0.809	0.191
2–3	150	0	6	147.0	0.000	1.000	0.809	0.191
3–4	144	1	1	143.5	0.007	0.993	0.803	0.197
4–5	142	0	0	142.0	0.000	1.000	0.803	0.197
5–6	142	0	0	142.0	0.000	1.000	0.803	0.197
(b) NBW babies (202)								
0–1	202	2	10	197.0	0.010	0.990	0.990	0.010
1–2	190	0	8	186.0	0.000	1.000	0.990	0.010
2–3	182	0	3	180.5	0.000	1.000	0.990	0.010
3–4	179	0	1	178.5	0.000	1.000	0.990	0.010
4–5	178	0	1	177.5	0.000	1.000	0.990	0.010
5–6	177	0	0	177.0	0.000	1.000	0.990	0.010

Calculations:
o 'x = ox – wx/2; *qx = dx*/*o 'x; px* = 1 – *qx; PX* = (*px*, 0–1) (*px*, 1–2) (*px*, 2–3)……; *QX* = 1–*PX.*

Table 3: Cause of death

Cause	LBW babies	NBW babies
Birth asphyxia	7 (18.42)	1 (50)
Respiratory distress syndrome	6 (15.78)	—
Meningitis	5 (13.15)	—
Septicemia	5 (13.15)	—
Pneumonia	5 (13.15)	—
Neonatal hyperbilirubinemia	4 (10.52)	1 (50)
Gastroenteritis	4 (10.52)	—
Congenital anomalies	2 (5.26)	—
Total	38	2

Figures in the parenthesis indicate proportions.

Conclusion

Our study concluded that LBW babies possess a greater risk of developing complications resulting in death in neonatal period than NBW babies. Babies weighing 1,500 g and less died within the early neonatal period. The important causes of death found are birth asphyxia; respiratory distress; infections such as pneumonia, septicemia, and meningitis. LBW babies require advance care such as neonatal ICU for the management, and although they live, they survive with complications. Hence, it is better to prevent the incidence of LBW babies through good prenatal care and other interventions rather than the treatment of LBW babies born later with high cost.

References

1. Park K. Low birth weight. In: *Park's Text Book of Preventive and Social Medicine*, 22 edn. Park K (Ed.). Jabalpur: Banarasidas Bhanot, 2013. p. 495.
2. Hofvander Y. International comparisons of postnatal growth of low birthweight infants with special reference to differences between developing and affluent countries. Acta Pediatr Scand Suppl 1982; 296:14–8.
3. WHO. *Low Birth Weight: A Tabulation of Available Information*. Geneva: World Health Organization, 1992.
4. Nahar N. Afroza S. Hossain M. Incidence of low birth weight in three selected communities of Bangladesh. Bangladesh Med Res Counc Bull 1998;24(2):49–54.
5. Ullah MA, Hafez MA, Haque MJ, Alam MR. Incidence of low birth weight and its correlates to socio-economic factors in rural Rajshahi. TAJ 1999;12(1):28–32.
6. *World Development Report*. Washington, DC: World Bank, 1995.
7. Bhargava SK, Ramji S, Kumar A, Mohan M, Marwah J, Sachdev HP. Mid-arm and chest circumferences at birth as predictors of low birth weight and neonatal mortality in the community. Br Med J (Clin Res Ed) 1985;291:1617–9.
8. Park K. Low birth weight babies. In: *Park's Text Book of Preventive and Social Medicine*, 23 edn. Park K (Ed.). Jabalpur: Banarasidas Bhanot, 2015. p. 537.
9. Save the Children. *Surviving the First Day. State of the World's Mothers 2013*. http://www.savethechildren.org/atf/cf/%7B9def2e-be-10ae-432c-9bd0-df91d2eba74a%7D/SOWM-FULL-REPORT_2013.PDF Last accessed date 15-07-2015
10. Harfouche JK. Health care problems of the young child in a developing ecological context. Bull World Health Organ 1979;57(3):387–403.
11. Santhankrishnan BR, Gopal S, Jayam S. Perinatal mortality in a referral teaching hospital in Madras city. Indian J Pediatr 1986;53(3):359–63.

12. Shah U. Perinatal mortality in India: can it be reduced through primary health care. Indian J Pediatr 1986;53(3):327–34.
13. Gupta PK, Gupta AP. Perinatal mortality. Indian J Pediatr 1985;22:201–5.
14. Mavalankar DV, Trivedi CR, Gray RH. Levels and risk factors for perinatal mortality in Ahmedabad, India. Bull World Health Organ 1991; 69(4):435–42.
15. Pratinidhi AK, Shrotri AN, Shah U, Bothani ND. Domiciliary care of low birth weight neonates. Indian J Pediatr 1986;53(1):87–92.
16. Bari MI, Ullah MA, Khatun M. Morbidity and mortality of low birth weight baby. TAJ 2008;21(1):35–9.

How to cite this article: Das BN, Mathur N, Syed S. A longitudinal study to assess the survival of low-birth-weight neonates born in a tertiary hospital, Ahmedabad. Int J Med Sci Public Health 2016;5:237-240

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