Original Article

Long Term Neurodevelopmental outcomes of very low birth weight and extremely low birth weight infants

Uzma Afzal, Noreen Faiz, Ejaz Ahmad Khan, Munir Malik, Khawaja A. Abbas

ABSTRACT

Objective

To determine the neurodevelopmental outcomes, functional limitations and medical conditions associated with very low birth weight and extremely low birth weight infants.

Subjects and Methods

The neonatal intensive care unit (NICU) admission and outpatient clinic follow up records of all newborns, treated at Shifa International Hospital from January 1, 2000 to December 31, 2004 were analyzed. Infants weighing less than 1500 grams were included in the study. Neonates with weight <1.5 Kg were termed as very low birth weight (VLBW) and those with weight <1000 gm were termed as extremely low birth weight (ELBW) infants. Their follow up was at 3, 6, 9, 13 and 36 months.

Results

Out of 163 neonates, 76 (46.6%) expired while 87 (53.4%) survived. Out of these 87 surviving neonates, 21 (24%) were lost to follow up. Out of the 66, 7 (10.6%) were ELBW and 59 (89.4%) VLBW babies. The most commonly encountered neurodevelopmental sequalae were developmental motor delay 22 (33%), cerebral palsy or spastic diplegia 11 (16.6%), recurrent acute respiratory infections (ARI)/asthma 16 (24.2%), speech defects 6 (9%), hearing defects 3 (4.5%) and seizures 4 (6%).

Conclusion

Despite the marked improvement in survival rates in recent years for very preterm or tiny infants, neurodevelopmental morbidity remains high and has not kept pace with improvements in survival. In general, morbidity follows a gestational age gradient that is inversely related to the degree of prematurity. (Rawal Med J 2009,34:).

Key Words

Extremely low birthweight, neurodevelopment outcome, cerebral palsy.

INTRODUCTION

The clinical course of very low birth weight infants (<1500gms) is often associated with adverse neurodevelopmental outcomes. Therefore, their long term follow up is necessary in order to evaluate cognitive, vision, hearing and language problems in them. Very few studies have been conducted on the survival rates, morbidity pattern and long term outcomes of very low birth weight and extremely low birth weight infants in Pakistan. Data on VLBW infants from the developing world are scarce and available information is largely restricted to reports from infants admitted to hospital. Because of methodological problem in follow-up studies, it is difficult to characterize outcome definitively. VLBW neonates have a higher incidence of re-hospitalization during the first year of life for sequaele of prematurity, neurological sequalae and psychological disorders.[1] The aim of this study is to determine prevalence and long term neurodevelopmental outcome of neonates weighing <1500 gms.

SUBJECTS AND METHODS

This retrospective descriptive study was conducted at Shifa International Hospital, Islamabad from January 1, 2000 to December 31, 2004. Consecutive infants weighing less than 1500 gms were included in the study. The VLBW neonates were defined as birth weight less than 1500 gms and extremely low birth weight (ELBW) infants were those below 1000g. Case notes with incomplete record were excluded. Follow-ups were done at 3, 6,9,12 and 36 months. Gestational age, maternal age, mode of delivery and long-term outcome information were collected from hospital records using a pretested questionnaire. Data were analyzed using SPSS version 10.

RESULTS

During the study period 163 VLBW and ELBW neonates were admitted to NICU. Out of these 163 neonates, 76 (46.6%) expired with a survival rate of 53.4% (n=87). Among these 87 surviving neonates, 66 could be followed while 21 (24%) were lost to follow up.

Table 1. Demographic features of VLBW and ELBW babies (n = 66).

	No.	%age
Total	**66**	
Males	**27**	**42%**
Females	**38**	**58%**
Gestational age<28weeks	**15**	**22%**
<32weeks	**22**	**33%**
>32weeks	**29**	**44%**
Birth weight <750g	**59**	**89%**
750g-1 kg	**6**	**9%**
1kg-1.5kg	**1**	**1.5%**

There were 38 (58%) females and 27 (42%) males. Thirty nine (58%) infants were born to primigravida mothers and 70% were delivered by SVD. The majority of babies were

between 32-34 weeks of gestation and birth weight of 89% was <750 gms (Table 1). Mean Apgar scores of 28 (42.4%) VLBW and ELBW babies at 1 minute was 7 and 52 (78.7%) neonates had >7 Apgar score at 5 minutes.

Table 2. Frequency of different neurological complications in all children (n = 66).

Neurological complications	Frequency	Percentage
Spastic diplegia	**4**	**6%**
Spastic Quadreparesis	**7**	**10.6%**
Recurrent ARI/Asthma	**16**	**24.2%**
Motor delay	**22**	**33%**
Seizures	**4**	**6%**
Speech defects	**6**	**9%**
Hearing problems	**3**	**4.5%**
Normal	**4**	**6%**

Out of 66 survivors, only 4 (6%) infants had normal development with no neurological sequalae. Eleven (16.6%) neonates had cerebral palsy and out of them four had spastic diplegia. Delayed motor mile stones were seen in 24 (33%) babies and seizures in 4 (6%). ARI (acute respiratory tract infections) and asthma were seen in nearly ¼ of VLBW and ELBW babies (Table 2).

DISCUSSION

Although VLBW and ELBW neonates account for only 1.5% and 0.7% of live births respectively, they contribute disproportionately to neonatal mortality, morbidity and health care costs.[2] Advances in perinatal care have improved the chances for their

survival but neonatal morbidity increases with decreasing gestational age and birth weight.[3] In our study, the survival rate was 53% which is significantly lower than 85% reported earlier.[2] This may be due to lack of resources and expertise for early detection and management of complications among these high risk neonates. Another study showed survival of 66% in high risk neonates which is quite comparable to our study.[6]

In our study, ELBW neonates were 7 (10.6%) and VLBW were 59 (89.4%) which compares with 2% and 8% reported from Sheikh Zayed Hospital, Lahore.[4]

Infants of shorter gestation are at increased risk of cerebral palsy (CP) although maternal infection and sepsis in the neonatal period along with other serious illnesses contribute to its occurrence and the commonest form of CP in these infants is spastic hemiplegia and quadriplegia.[5] Because of advanced neonatal care and better facilities, the frequency of CP in VLBW and ELBW infants has come down from 13% to 5% in western countries.[7] But in our study, 11 (16.6%) of the neonates had CP which is comparable to 14% reported by others.[7] Three (4.5%) infants had hearing problems in their first 36 months of life while in developed countries 3% of infants born at <28 weeks of gestation with birth weight <1.5kg required hearing aids, though more infants had milder hearing impairment or high frequency hearing loss.[8] Etiology of hearing loss is multifactorial and associated with delayed language development and speech disorders.[5] Severe hearing impairment in infancy was reported in 7 % of infants with <1000g weight and 4% had mild hearing loss.[9,10]

Six (9%) patients had difficulty in speech and had delayed speech development. Speech problems have been reported in 22% of the neonates.[7] Seizures were seen in 4 (6%) neonates which is comparable to study which reported it to be 3.4%.[9] Delayed mile stones

were quite common in our patients, one-third of them had delayed milestones. There are also significant behavior problems among them which can later in life affect the school attendance and performance.[5] ARI and respiratory problems are considered to be more common among VLBW and ELBW infants because of high rate of prolonged mechanical ventilation and Broncho pulmonary dysplasia, which has been reported in upto 40% of VLBW survivors and its incidence increases as the birth weight falls below 1500 gm.[10] In our study, 16 (24.2%) infants had asthma or repeated episodes of ARI, comparable to a study that reported it to be 21%.[7] Recent reports of caffeine therapy for apnea of prematurity, reducing CP[11] and antenatal magnesium sulfate therapy, which reduced the rate of CP at 2 years [12]are encouraging.

CONCLUSION

Most of neonates in our study had some kind of neurological problem. Further prospective longer-term follow-up to middle age and beyond is warranted to determine whether very preterm or tiny survivors are at increased risk for future cardiovascular, respiratory, or metabolic problems or other adult diseases at earlier ages than would otherwise be expected.

From Department of Pediatrics, Shifa College of Medicine, Islamabad,.
Correspondence: Dr. Uzma Afzal
MBBS, FCPS, MCPS. Senior Registrar, Pediatrics,
Shifa College of Medicine, Islamabad, Pakistan.
E-mail, uzma484@hotmail.com. Tel: 0512296935,
Mobile #: 03005233156
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