Journal of Cardiovascular Disease Research

ISSN:0975 -3583,0976-2833 VOL13, ISSUE 08, 2022

Original research article

A study on determinants of growth in very low birth weight babies

[1]Dr. Prithvish CM, [2]Dr. Girish G

[1]Assistant Professor, Department of Pediatrics, BMCHRC, Chitradurga, Karnataka, India

[2]Consultant Neonatologist and Pediatrician, Apollo BGS Hospital, Mysore, Karnataka, India

Corresponding Author:

Dr. Girish G

Abstract

Even though there has been a substantial improvement in neonatal survival, the incidence of chronic morbidities and adverse outcomes in the survivors continues to be high. They suffer from increased incidence of respiratory infections, increased need for hospitalization and increased need for nebulized medications, severe disabilities like cerebral palsy, neurosensory impairment (blindness and deafness), cognitive, learning disabilities and behavioral problems like ADHD and depression. All the babies admitted to NICU on day one of life with birth weight/admission weight of less than 1500g are eligible for inclusion. These babies will be regularly followed up in outpatient department. Between gestational age 26-30 weeks (n=14), 2 babies had frequent cough, wheeze and required nebulization and hospitalization, and one baby used inhalers/steroids. Between 30-33 weeks of gestational age (n=12), 3 babies had cough, 2 had wheeze and required nebulization. Between 34-36 weeks, none had respiratory symptoms.

Keywords: Determinants, growth, very low birth weight babies

Introduction:

VLBW neonates constitute 3.4% of all live births in India. These babies are heterogeneous groups containing both premature and IUGR babies. Last two decades have witnessed more and more VLBW babies surviving in our country mainly because of improvements in[1,2]

- Antenatal care (prenatal steroids, management of preterm labour, bacterial vaginosis, intrauterine growth retardation, premature membrane rupture and other pregnancy complication).
- Labour management for prevention of birth asphyxia, hypothermia, and drugs during labour and stabilization of neonate before transport to higher center.
- Advances in technology for monitoring, intensive care, mechanical ventilation, postnatal surfactant, management of various systemic problems etc.

These babies face multiple problems in early life in NICU. The short term survival of these babies is low compared to the term AGA counterparts. Even though there has been a substantial improvement in neonatal survival, the incidence of chronic morbidities and adverse outcomes in the survivors continues to be high. They suffer from increased incidence of respiratory infections, increased need for hospitalization and increased need for nebulized medications, severe disabilities like cerebral palsy, neurosensory impairment (blindness and deafness), cognitive, learning disabilities and behavioral problems like ADHD and depression.

It is well established fact that preterm VLBW grow poorly in postnatal period. During postnatal life though the target is to achieve intrauterine growth rate as well as to maintain fetal body composition, however in reality they grow very poorly due to several factors like sickness and inadequate nutrition which contribute to the poor growth. According to NICHD 2007 reports 97% of all VLBW babies and 99%of ELBW babies had weight less than 10% centile at 36 weeks of postmenstrual age. These babies continue to grow poorly throughout childhood. This growth restriction is believed to persist in adult life too.[3]

VLBW babies faces primarily RDS and CLD. A complex interplay of factors plays into the risk of these injuries, including incomplete development, Mechanical development, oxidative stress and inflammation. They suffer from recurrent respiratory symptoms in their first year of life. Also there are increased chances of physician diagnosed asthma and increased incidence of hospitalization for respiratory reasons.[4]

Methodology:

All the babies admitted to NICU on day one of life with birth weight/admission weight of less than 1500g are eligible for inclusion. These babies will be regularly followed up in outpatient department.

ISSN:0975 -3583,0976-2833 VOL13, ISSUE 08, 2022

The parents of these eligible babies will be contacted at postnatal age of 11 months and will be asked to come for a checkup between 11.5 to 12.5 months of age. An informed consent for enrollment in the study will be taken telephonically and written consent is taken on arrival for outpatient visit. During this visit length, weight and head circumference are measured by standard methods as described below:

- Length is measured using a standard infantometer. Infant is placed in supine position on infantometer. An assistant/mother is asked to keep the vertex or top of the head snugly touching the fixed vertical plank so that external auditory meatus and lower margin of orbits are aligned perpendicular to the table. The legs are fully extended by pressing over the knees and feet are kept vertical at 90°.The non-movable pedal plank of infantometer is snuggly apposed against the soles and length is measured from scale to the nearest 0.1 cm.
- Weight is measured using an electronic weighing scale with an accuracy of +/- 5 g.
- Head circumference is measured using a non-stretchable fiber glass tape. Occipitofrontal head circumference is measured, by encircling the tape over the most prominent parts of occiput i.e. plane of supraorbital ridge anteriorly and external occipital protuberance posteriorly with sufficient pressure to compress hair and occipitofrontal circumference is recorded to the nearest 0.1 cm.

All these parameters will be plotted on WHO growth chart and percentile of these measurements will be noted.

A standard questionnaire will be given to the parents (Mother and/or father who will accompany the baby during this visit) and they will be asked to complete the questionnaire about their baby's respiratory symptoms and treatment requirements and possible risk factors. The primary investigator will explain the questionnaire to parents and help them in filling the questionnaire.

The antenatal, intrapartum and postnatal data will be collected from Inpatient records of these cases. The data will be entered in Microsoft excel 2007 format and statistical analysis will be done.

Results

Table 1: Comparision between gestational age and respiratory morbidities (N=29)

Gestational age at birth in wks	cough	wheeze	Neb	inhalers	steroids	hospitalizations	ICU
26-30(n=14)	2	2	2	1	1	2	0
31-33(n=12)	3	2	2	0	1	2	1
34-36(n=3)	0	0	0	0	0	0	0

Table 2: Comparison between birth weight and respiratory morbidities (n=29)

Weight at birth in kgs	cough	wheeze	neb	inhalers	steroids	hospitalizations	ICU
<1.0(7)	0	0	0	0	0	0	0
1.01-1.25(12)	4	4	4	1	2	4	1
1.26-1.5(10)	1	0	0	0	0	0	0

Table 3: Association between PIH and its outcomes in terms of growth (n=12)

Percentiles	WT	L	HC
Less than 3rd	6	6	8
3-15th	5	3	3
15-50th	2	2	1
50-85th	1	1	0
85-97th	0	0	0
More than 97th	0	0	0

Table 4: Association between DM and its outcomes in terms of respiratory morbidities (n=6)

Percentiles	WT	L	HC
Less than 3rd	3	3	2
3-15th	0	0	2
15-50th	1	1	1
50-85th	2	2	0
85-97th	0	0	0
More than 97th	0	0	1

Table 5: Association between PIH, DM, type of delivery, ventilation, surfactant use and its outcomes in terms of respiratory morbidities

	Cough	Wheeze	Nebulization	Inhalers	Steroids	Hospitalizations	ICU
PIH (n=12)	3	2	2	0	0	2	1
DM	1	1	1	0	0	1	0

ISSN:0975 -3583,0976-2833 VOL13, ISSUE 08, 2022

(n=6)							
NVD (n=6)	1	1	1	1	1	1	0
LSCS (n=23)	4	3	3	0	1	3	1
CPAP (n=7)	1	1	1	0	0	1	0
IMV (n=2)	0	0	0	0	0	0	0
Surfactant(n=2)	1	1	1	0	0	1	0

Discussion

Besides acute and chronic conditions, infants born with birth weights below 2,500 grams also experience poorer growth. The first 3 years of life evidence a discrepancy in the growth patterns of children with birth weights below 2,500 grams, compared to those with normal birth weights [1, 2]. Poor growth resulting from intrauterine, neonatal, or postnatal growth failure has been documented widely among children with birth weights below 1,500 grams [1, 2].

A more recent study of children with birth weights less than 1,500 grams documented catch-up growth during the first 8 years of life, with poorer growth attainment among those who were small for gestational age (SGA) [3]

Studies on the ultimate growth attainment or growth during the adolescent years and into early adulthood for individuals born preterm are only recently appearing in the literature.

Doyle and colleagues found compromised growth among survivors up to age 8 who were born with birth weights less than 1,000 grams, but by age 14 and up to age 20 they had reached average height and weight [4].

Despite the persistence of lower height among survivors with birth weights less than 1,000 grams, Saigal and colleagues showed that most of their adolescents were within 2 standard deviations of the mean [5].

Furthermore hack and colleagues documented gender differences. In childhood (8 years), males with birth weights less than 1,500 grams were shorter and lighter than counterparts with normal birth weight, whereas females were lighter but not significantly shorter than their counterparts with normal birth weights [6].The predictors of height and weight also differed for males and females. For females, black race and chronic illness predicted weight, and maternal height and birth weight standardized score predicted height at 20 years of age [6]. The predictors of height for males were the same as the females' with duration of neonatal hospital stay and SGA birth as additional predictors of height [6].

Many of these findings suggest that by adolescence children born preterm experience catch-up growth.

The analyses performed by Ehrenkranz RA *et al.* [7] demonstrated that the in-hospital growth velocity of ELBW infants was associated with neurodevelopmental and growth outcomes and with the incidence of rehospitalization at 18 to 22 months' corrected age. As the rate of weight gain and head circumference growth increased, the incidence of CP, abnormal neurologic examination fell. Furthermore, the influence of growth velocity remained after controlling for variables known at birth or identified during the infant's NICU hospitalization. In-hospital weight gain and head circumference growth were significantly related to the likelihood that anthropometric measurements would be below the 10th percentile at 18 to 22 months' corrected age.

Dusick *et al*. reported on growth outcomes at 18 to 22 months' corrected age in a cohort of ELBW infants. Forty-six percent of the infants were below the 10th percentile for weight and 43% were below the 10th percentile for length and head circumference at 18 to 22 months' corrected age. The likelihood of weight, length, and head circumference below the 10th percentile increased as birth weight fell. Additional factors related to poor growth included SGA, severe IVH/PVL, and abnormal swallow and abnormal neurologic examination at 18 to 22 months' corrected age [8].

Georgieff MK *et al*, Gross SJ *et al*, Hack M *et al* have also reported an association between the severity of neonatal illness and postnatal head growth and have directly correlated head growth with neurodevelopmental outcome. In addition, infants with culture-positive and culture-negative infections are more likely than uninfected infants to have adverse neurodevelopmental outcomes at 18 to 22 months' corrected age and to have a head circumference <10th percentile at 36 weeks' postmenstrual age and at 18 to 22 months' corrected age.

Hack *et al* have previously shown that the influence of subnormal head circumference growth persists and is associated with a greater risk of poor cognitive function at school age.

Furthermore, the importance of postnatal body weight gain and head circumference growth were recently demonstrated by Latal-Hajnal and coworkers[14] they reported that the neurodevelopmental outcomes of preterm infants who were appropriate for gestational age at birth, but <10th percentile at 2 years of age were significantly worse than infants who were SGA at birth but >10th percentile at 2 years.

Sridhar k *et al* study on growth pattern for weight and length showed good catch up growth in babies >1.25 kg Birth Weight and >30 weeks gestation, reaching almost the same level as controls by 1 year of age. Babies with Birth Weight <1.25 kg and <30 weeks gestation showed late and poor catch up growth,

ISSN:0975 -3583,0976-2833 VOL13, ISSUE 08, 2022

with considerable lag persisting at 1 year of age. Head circumference increased rapidly in all babies, with maximal growth rate initially followed by a steady decline. All babies showed catch up growth, although those <1.25 kg and <30 weeks gestation still lagged behind even at 1 year.

Conclusion

Between gestational age 26-30 weeks (n=14), 2 babies had frequent cough, wheeze and required nebulization and hospitalization, and one baby used inhalers/steroids. Between 30-33 weeks of gestational age (n=12), 3 babies had cough, 2 had wheeze and required nebulization. Between 34-36 weeks, none had respiratory symptoms.

References

1. Georgieff MK, Hoffman JS, Pereira GR, Bernbaum J, Hoffman-Williamson M. Effect of neonatal caloric deprivation on head growth and 1-year developmental status in preterm infants. J Pediatr.1985;107:581-587.
2. Gross SJ, Oehler JM, Eckerman CO. Head growth and developmental outcome in very low-birth-weight infants. Pediatrics.1983;71:70-75.
3. Hack M, Breslau N, Fanaroff AA. Differential effects of intrauterine and postnatal growth failure in infants of very low birth weight. Am J Dis Child.1989;143:63-68.
4. Stoll BJ, Hansen NI, Adams-Chapman I, *et al*. Neurodevelopmental and growth impairment among extremely low-birth-weight infants with neonatal infection. JAMA. 2004;292:2357-2365
5. Hack M, Breslau N, Weissman B, Aram D, Klein N, Borawski E. Effect of very low birth weight and subnormal head size on cognitive abilities at school age. N Engl J Med. 1991;325:231-237.
6. Latal-Hajnal B, Von Siebenthal K, Kovari H, Bucher HU, Largo RM. Postnatal growth in VLBW infants: significant association with neurodevelopmental outcome. J Pediatr. 2003;143:163-170.
7. Sridhar K, Bhat BV, Srinivasan S. Growth pattern of low birth weight babies in the first year of life. Indian J Pediatr. 2002 Jun;69(6):485-8
8. Saigal S, Stoskopf BL, Streiner DL, Burrows E. Physical growth and current health status of infants who were of extremely low birth weight and controls at adolescence. Pediatrics. 2001 Aug;108(2):407-15.