

Ensuring Neurologically Intact Survival in Low Birth Weight Newborns

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Eight million low birth weight (LBW) infants constituting one third of the total annual births are born each year in India as a result of intrauterine growth restriction and/or prematurity [1]. Combined efforts of the obstetricians and neonatologist along with advancement in technology and perinatal care have greatly improved the survival rates of LBW infants over the last two decades. However, these infants remain at risk of developing a wide array of complications not only in the immediate neonatal period but also in later life. Although most organs are immature, brain in particular is especially susceptible to the perinatal insult which leads to high rates of long-term neurodevelopmental disabilities.

There is a paucity of data on long term neurological outcome of LBW infants from our own country. The only study from India which has prospectively followed the cohort of LBW infants weighing < 2000 grams from birth to adulthood found that 5% had mental retardation, 4.8% had cerebral palsy and 1.5% had sensorineural hearing loss at 3 yrs of age; and 17% had intelligence quotient (IQ) less than 70 at 6 years of age. Also the preterm small for gestational age (SGA) children had the lowest IQ among preterm AGA and term AGA infants [2-4]. Nair, *et al.* [5] found significantly lower self-esteem scores at 13 years of age.

Strategies to ensure neurologically intact survival start right from the antenatal interventions. Treatment with antenatal steroids has not only shown short term neonatal benefits including reduction of cerebroventricular hemorrhage, but also associated with less developmental delay and a trend towards reduction in the risk of cerebral palsy between 2 to 6 years of age [6]. Magnesium sulfate therapy in women at risk of preterm birth has reduced the risk of cerebral palsy and gross motor dysfunction in their child [7]. Therapeutic hypothermia is the most established neuroprotective therapy available for hypoxic ischemic encephalopathy (HIE); however it is still not being used much in developing countries including India due to

issues like availability of the therapeutic window, effect of natural hypothermia while transportation and the safety concerns. Erythropoietin administration in term newborns with HIE has resulted in improved neurologic examinations, as well as decreased death, disability and incidence of cerebral palsy at 18 months [8], but more data are required in this field.

Kangaroo mother care (KMC) has been a big boon in resource limited set ups like ours and also shown to improve neurological outcome [9]. Similarly promotion of prolonged and exclusive breastfeeding has shown to improve the child's cognitive development at 6.5 years of age [10]. Another simple intervention is the strict maintenance of the oxygen saturation in the desired range specifically to prevent retinopathy of prematurity (ROP). The available evidence supports the target saturation to be in the range between 90-95% due to the concern of increased mortality with the lower targets range of 85-89% [11].

An important aspect while monitoring LBW infants is to anticipate and timely intervene for the common morbidities like hypoglycemia, hypothermia, respiratory distress, jaundice, sepsis and meningitis which add not only to the mortality but also leads to neurodevelopmental impairment. Ventilation *per se* is an independent risk factor affecting the brain development. Continuous positive airway pressure (CPAP) is the preferred initial mode for stabilizing preterm infants with respiratory distress as compared to mechanical ventilation but the available data has shown no difference in the composite outcome of death or neurodevelopmental impairment at 18-22 months of corrected age [12]. Apart from these established modalities, various other therapies have been tried to improve long-term neurological outcome. Caffeine therapy was found to decrease the incidence of cerebral palsy and cognitive delay at 18 to 21 months of age in VLBW infants but the follow up at five years was no longer associated with a significantly improved rate of survival without disability [13].

Short of universal hearing screening in our country, at least high risk LBW infants should be definitely screened for any hearing impairment before discharge from the hospital. This is because early intervention in hearing-impaired infants improves language and communication skills thus improving the long term outcome. ROP is emerging as one of the leading causes of preventable childhood blindness in India. ROP screening and timely intervention in at risk LBW infants will help in combating this problem to a large extent and will improve the visual outcome. Prior to discharge, a detailed medical and neurological assessment should be done and early intervention should be started in the NICU itself. All health facilities caring for sick neonates must have a structured follow up program and formal developmental assessment must be performed at regular intervals with the help of a multidisciplinary team.

Neurodevelopmental morbidities remain high and have not kept pace with the improvements in the survival of LBW infants. Survival and short term morbidities are no longer considered as the end points to measure perinatal outcomes. Target should be to achieve the best antenatal, neonatal and postnatal care supplemented with good follow up services with early intervention programs to achieve the best potential of LBW infants. Research to prevent and/or reduce the LBW infants should continue. This should be supplemented with the improvement in the psychosocial risk factors encountered by the children in their early years of life. With upcoming Sick Newborn Care Units in a big way in our country, there is a need to develop long term follow up program to middle age and beyond not only to assess the neurodevelopmental outcome but also its impact on the family and the society. Further, these programs should also determine the morbidities related to cardiovascular, respiratory and metabolic disorders too to give these LBW infants a complete intact survival.

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