

## Growth and Development of Preterm/Very Low Birthweight Infants at 12 to 24 Months of Corrected Age: A Marker of Quality Survival

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**G**rowth and development are the characteristics of infancy and childhood. Growth occurs by both hyperplasia and hypertrophy and can be measured in units that determine size. It can be assessed by age-dependent and age-independent parameters. Common age-dependent markers of growth are body weight, length/height, head circumference and body mass index. Growth monitoring is an invaluable, inexpensive, simple and acceptable tool for assessing health status of a child.

Development, on the other hand, denotes capacity and ability of an individual to integrate task performance, coordination, language, and social and behavioral adjustment. In general, growth and development go hand in hand in an orderly, organized, sequential and predictable manner [1]. Neurodevelopmental delay is a state of severe, lifelong impairment in areas of development that affects motor functions, socio-emotional behavior, sensory function, language, attention, memory and adaptive skills during the early period of a child's growth and development [2-4]. Neuro-development of a child is a result of complex interplays between genetic, environmental and nutritional factors profoundly affected by the intrauterine milieu and quality of transition at birth from the intra uterine sojourn to extra uterine existence. Intrauterine environment provides proper physical moorings for growth and development of the fetus like adequate temperature, moisture, and humidity; sufficient space for movement and sensory stimuli from the maternal heart beats, respiratory excursions, bowel sounds and locomotion; effective barrier to trauma, noise, light, external thermal changes and infection; constant supply of macro and micro nutrients for daily requirement and body stores; development of circadian rhythm for sleep and secretion of placental neuro-steroid hormones for GABA neurotransmitter regulation and neuroprotection; appreciation of smell from maternal pheromones, which drives the infant towards breasts, and immediate skin-to-skin touch at birth helps stabilizing the infant; acquiring

skills of sucking and swallowing of the amniotic fluid; conferment of passive humoral immunity and yet complete freedom to develop his/her own destiny. A shortened intra uterine period will adversely affect the fetus in all aspects described above. Preterm infant born too soon will be at a disadvantage compared to his peers born at term because adequate artificial 'intrauterine care' is a far cry today and whether that will ever be available in future is a million dollar question. Similarly a preterm infant subjected to intrauterine growth restriction will be doubly disadvantageous and will have greater risk of neurodevelopmental delay and poor physical growth.

In this issue of the journal, Mukhopadhyay, *et al.* [5] and Murki, *et al.* [6], from two different regions in India, reiterate that a significant number of preterm or very low birth weight infants suffer from growth failure and delays in cognitive, language and neurodevelopment at corrected age of 12 months to two years. Infants with intrauterine growth restriction, as expected, fared worse than appropriate for gestation age peers. In another study from one of these centers, Debata, *et al.* [7] had previously reported very high prevalence of language delay in very low birth babies at 6-36 months of corrected age. Similar observations have made by many authors from around the world.

A multifactorial etiology contributes to growth and developmental delay. These can be broadly divided into five categories: prenatal; perinatal; neonatal; post neonatal; and miscellaneous causes. Structural malformations and metabolic injury of the brain, genetic disorders, inborn errors of metabolism, early maternal infections and maternal substance abuse during pregnancy, preterm birth, intrauterine growth restriction, perinatal asphyxia and hypoxic ischemic encephalopathy, neonatal sepsis, hypoglycemia, micronutrient deficiency particularly iron and folic acid deficiency and inadequate infant feeding practices, especially deprivation of breastfeeding/breast milk feeding and, poor social interaction and separation from the mother are some of the important causes of neurodevelopmental delay.

Very preterm infants frequently require resuscitation in the labor room, NICU care, ventilatory support, surfactant and oxygen administration, body temperature management, intravenous fluids, vasopressive agents, antibiotics, and other medications like caffeine and PDA closing drugs. They suffer from many metabolic derangements like hypoglycemia, hypocalcemia and hypothermia; intraventricular hemorrhage and acidosis with resultant neuronal insult and injury. Achieving adequate enteral feeding of very preterm infants is a bigger challenge. Bronchopulmonary dysplasia and permanent brain damage are long term serious complications. Many of these complications were present in the subjects of the two studies [5,6].

In recent years, perinatologists have started looking at the fetal physiology beyond intrauterine weight gain and structural integrity. Sleep develops during fetal life with a recognizable pattern of sleep states in the preterm fetus associated with the development, maturation and neural connectivity within the brain. Impaired sleep development in the preterm infant may lead to altered neurocognitive, behavioral and motor capabilities in infancy and childhood and later on as adult [8]. Sleep is greatly disturbed in a preterm infant due to NICU protocols, noise, and intense light that may affect neurodevelopment.

It is, therefore, essential that assessment and monitoring of growth and development of all infants and children, especially high risk infants, should be carried out from early life. There is convincing scientific evidence that early identification of developmental delays and appropriate early intervention improve a child's long-term outcome and prognosis [10].

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## REFERENCES

- Hyde JS, Linn MC. Gender differences in verbal ability: A meta-analysis. *Psychol Bull.* 1988;104:53-69.
- Dornelas LF, Duarte NMC, Magalhaes LC. Neuro-psychomotor developmental delay: Conceptual map, term definitions, uses and limitations. *Rev Paul Pediatr.* 2015;33:88-103.
- Shevell M, Ashwal S, Donley D, Flint J, Gingold M, Hirtz D, *et al*; Quality Standards Subcommittee of the American Academy of Neurology; Practice Committee of the Child Neurology Society. Practice parameter: Evaluation of the child with global developmental delay. *Neurology.* 2003; 60:367-80.
- Scherzer AL, Chagan M, Kauchali S, Susser E. Global perspective on early diagnosis and intervention for children with developmental delays and disabilities. *Dev Med Child Neurol.* 2012;54:1079-84.
- Mukhopadhyay K, Malhi P, Kumar J, Singhi P. Cognitive, language, and visuomotor abilities of very low birth weight infants at corrected age of two years. *Indian Pediatr.* 2020;57:296-300.
- Murki S, Kallam VR, Gururaj J, Bashir T, Oleti TP, Kiran S. Growth and neurodevelopmental outcomes at 12 to 18 months of corrected age in preterm (gestation <35 weeks) infants born small for gestational age. *Indian Pediatr.* 2020;57:301-04.
- Debata P, Kumar J, Mukhopadhyay K. Screening for language delay between 6 months and 3 years of corrected age in very low birth weight children. *Indian Pediatr.* 2019;56:481-4.
- Bennet L, Walker DW, Horne RSC. Waking up too early - The consequences of preterm birth on sleep development. *J Physiol.* 2018; 596:5687-708.
- vanKarnebeek CDM, Scheper FY, Abeling NG, Alders M, Bartg PG, Hoovers JMN, *et al.* Etiology of mental retardation in children referred to a tertiary care center: a prospective study. *Am J Ment Retard.* 2005;110:253-67.
- Scherzer AL, Chagan M, Kauchali S, Susser E. Global perspective on early diagnosis and intervention for children with developmental delays and disabilities. *Dev Med Child Neurol.* 2012;54:1079-84.