Certainties and uncertainties about very-low-birthweight infants and nutritional status

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Nowadays, although newborns with increasingly lower weight and gestational age have managed to survive, neonatologists and general pediatricians have expressed considerable concern for the quality of life of their patients, given that different aspects are involved, such as somatic growth and neuropsychomotor development.

Among very-low-birthweight (VLBW) infants, special attention should be paid to small-for-gestational-age (SGA) newborns, who probably experience intrauterine growth restriction (IUGR) of variable intensity. In other words, IUGR is the major cause of low birthweight. Low birthweight and intrauterine malnutrition co-occur and therefore increase morbidity and mortality and lead to a poor cognitive development. Incidence rates of low birthweight > 15% and IUGR > 20% constitute serious public health problems, and are a consequence of inappropriate living conditions (mainly socioeconomic ones) of large populations, especially in developing countries. While preterm birth is the main cause of low birthweight in industrialized countries, the UN Standing Committee on Nutrition and the World Bank estimate that around 30 million infants with IUGR are born every year in developing countries.[1]

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Those researchers investigating problems such as prematurity and IUGR and their follow-up have sought to describe the growth pattern of affected patients and attempted to propose a more appropriate nutritional management, thus allowing the nutritional requirements of preterm newborns to be met. Such authors have shown that preterm newborns, especially VLBW ones, suffer from postnatal malnutrition for somewhat long periods, which aggravates their clinical condition and brings about potential problems in the future.[2,3]

Twenty years ago, the American Academy of Pediatrics (AAP) defined that the key objective of nutrition of low birthweight newborns was to attain the same rate of intrauterine growth expected for the same gestational age.[4] However, for this objective to be achieved, it is necessary to supply them, enterally or parenterally, with adequate nutrient intake, since the daily nutritional requirements of preterm newborns may not be met or may transcend the limitations imposed by their immaturity and diseases that result from this condition, resulting in metabolic difficulties for the nutritional management of these nutrients.[5]

A theory was formulated 15 years ago on the fetal origin of adult degenerative diseases, based on the observational studies by Barker et al.,[6] allowing Alan Lucas to postulate the broadest theory on nutritional programming approximately five years later, which states that nutritional deficiencies in the intrauterine environment or in the neonatal period may have deleterious consequences in the future for growth and development processes, resulting in the possible development of metabolic and degenerative diseases in childhood, adolescence and adulthood.[7]

These facts led researchers to reformulate the objectives of nutrition of preterm newborns, that is, besides seeking to obtain a growth rate similar to that attained *in utero*, the limitations imposed by immaturity should be respected and special attention should be paid to the future consequences of nutritional interventions in this group of patients.[5] An observational study that included newborns with 24 and 27 weeks of gestational age, split into two groups, one which received enteral nutrition (100 ml/kg/day up to the third week of life) and the other one which only reached these values after 3 weeks, submitted to regular EEG (every 2 to 4 weeks) up to 15 weeks of postnatal age, demonstrated that postnatal malnutrition was associated with patterns of electroencephalographic immaturity, confirming early neurological involvement.[8] These data concur with the reformulation of nutritional objectives of preterm newborns and with IUGR.

In the current issue of *Jornal de Pediatria*, Gianini et al.[9] demonstrated that 63% of infants belonging to a cohort of newborns weighing less than 1,500 g are classified as postnatally malnourished, so the authors attempted to associate this postnatal malnutrition with clinical and nutritional variables. Among statistically significant findings, the authors found a positive correlation between birthweight

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and nutritional status at a corrected age of term, and negative correlations between weight at term birth and the length of hospital stay, gestational age at birth, time necessary to regain birthweight and the clinical risk index for babies (CRIB). They considered that the risk of being malnourished at term is 12.19 times higher in SGA newborns, and they finally observed a lower risk of being malnourished at term among male newborns, if they are born at a tertiary care unit (with the best perinatal care) and if they reach a full enteral nutrition up to the tenth day, which characterizes these factors as "protective."

Through comparative studies, the authors dealt with important issues related to perinatal care in Brazil, whose quality is quite different when the infant is born and cared for at well-resourced units. These units follow a written routine with a more aggressive nutritional approach, implementation of total parenteral nutrition (TPN) in the first 48 hours of life, early implementation of enteral nutrition, use of breastmilk with supplements or additives and closer monitoring of weight gain, in an attempt to achieve the objective recommended by the AAP. In U.S. hospitals, no great differences are observed among preterm newborns treated at hospital units with different care levels (CRIB, length of hospital stay, weight gain, weight at hospital discharge and postnatal growth restriction rate), despite the great variability found in tertiary care units, contrary to what occurs in Brazil. This contrasting evidence shows that even non-tertiary U.S. hospitals are adequately prepared to offer perinatal care.[10] Without a shadow of doubt, Brazilian hospital units have to be better equipped and the health professionals who work with intermediate and intensive neonatal care must be better trained.

It is interesting to note that the CRIB has been used to assess disease severity in neonatal intensive care units, constituting a negative predictive factor for infants' nutritional outcome (the higher it is, the worse weight gain is at term). Severity scores have been adopted quite frequently by Brazilian neonatal units. Among these scores, we have the SNAP (Score for Neonatal Acute Physiology), used to assess the clinical severity of newborns being treated at neonatal units, and the SNAP-PE (Score for Neonatal Acute Physiology – Perinatal Extension), which includes all physiological variables of the SNAP and also assesses birthweight, data about perinatal history such as the Apgar score, and the classification of infants as SGA.[11] The CRIB is used to assess the initial clinical severity in preterm newborns based on birthweight, gestational age, presence of congenital malformations, base excess and fraction of inspired oxygen.[12]

Finally, if on the one hand, the adoption of strategies that allow for adequate weight gain at term through a more aggressive nutritional approach is securely based on studies which show the advantages of rapid growth in reducing acute neonatal morbidity and mortality,[13] especially in newborns who suffered IUGR, on the other hand, it grapples with Lucas' theory on nutritional programming, which postulates, through a very controversial approach, that the fetal origin of adult degenerative diseases is less important and that catch-up growth could be a negative determining factor for metabolic and degenerative diseases in adult individuals.[14]

The validity of the final model (equation) based on the observed associations for the estimation of birthweight at term deserves careful consideration and should be addressed in future studies.

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