

Feeding of low birth weight (LBW) and very low birth weight (VLBW) Infants

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Background

Feeding of Low Birth Weight (LBW) and Very Low Birth Weight (VLBW) infants remains a challenge. While enteral feeding should be the preferred method of feeding in these infants owing, the complications associated with parenteral nutrition, it is often complicated due to inherent risks these infants are predisposed to because of prematurity and low birth weight. Therefore, a balance and consistent approach is required. Our nutritional approach for these sub group of infants should be to attain weight gain and growth equivalent to that which would have occurred in utero in a normal pregnancy. In recent years, there has been a better understanding of the physiological basis of enteral nutrition in VLBW infants. We explore the current recommendations for feeding of infants in this group.

Enteral nutritional requirements of preterm infants

VLBW infants are different from their term counterparts in having been born without significant nutrient stores and having increased expenditure owing to complications inherent to prematurity like respiratory distress, hypothermia etc. Over the years' recommendations of feeding for VLBW babies have recognized the need for higher requirement of calories, protein, sodium, phosphate, calcium and other nutrients (Tables 1 and 2).

Tsang (2005) [1] and ESPGHAN (2010) [2] provide the more recent estimates.

When should enteral feeds be started

In stable low risk infants, there is increasing evidence to start feeding on day 1 in the first few hours after birth [3]. There is no consensus on when to start feeding in high risk infants, however, there is a move to start feeding early even in this group [4]. High risk infants are predisposed to developing necrotizing enterocolitis (NEC) and include infants with severe growth retardation, abnormal dopplersantenatally, extremely preterm infants and infants receiving inotropes.

Caution should also be taken when starting feeds in the following sub-groups:

- <28 weeks gestation or <1000g birth weight
- Complex congenital heart disease
- NSAID treatment for PDA
- Polycythemic infants
- Infants reestablishing feeds after an episode of NEC
- Perinatal hypoxia-ischaemia with significant organ dysfunction

- Infant with congenital gastrointestinal malformations (e.g. gastroschisis)

Unless there is a contraindication these infants can be started in trophic feeds within 48 hours of birth. The volume of trophic feeds is 0.5-1 ml/kg/hour or 12-24 ml/kg/day, the minimum amount being 0.5 ml/hour. 5, 6

Contraindications for early trophic feeding include systemically unstable infants (e.g infants on significant inotropic support, fulminant sepsis) and suspected or confirmed intestinal obstruction or intestinal perforation.6

Increment of feeds

Current evidence suggests once trophic feeds have been started and tolerated, feeds can be safely increased with volumes of 10-30 ml/kg/day in low risk infants [7,8]. Consideration must be given to gestational age and birth weight with infants on the lower end of spectrum feeds must be increased at a lesser volume compared to relatively more mature infants. Increase feeds only if clinical assessment confirms they are being tolerated. e.g. no abdominal distension, no excessive aspirates. Aspirates of 2-3ml/kg may be acceptable, however gastric residuals and abdominal girth should not be checked routinely [9,10]. Persistent bile aspirates indicate ileus or rarely intestinal obstruction and feeds should be withheld in such cases.

There is less evidence on volume of advancement of feeds in high risk infants. The current recommendations are to keep these infants on trophic feeds for several days followed by slow increments of 10 -20 ml/kg/day, keeping a low threshold for stopping feeds if there are signs of feed intolerance or clinical instability [11,12].

Table 1. Tsang (2005) [1] and ESPGHAN (2010) [2] provide the more recent estimates.

Nutrient	Term infant	Preterm infant Tsang 2005[1]		Preterm infant ESPGHAN 2010[2]
		ELBW	VLBW	1000g – 1800g
Energy (Kcal/kg)	95-115	130-150	110-130	110-135
Protein (g/Kg)	2	3.8-4.4	3.4 -4.2	4.0 – 4.5 (<1.0Kg) 3.5-4.0 (1.0 – 1.8 Kg)
Sodium (mmol/kg)	1.5	3.0-5.0	3.0 – 5.0	3.0 – 5.0
Potassium (mmol/kg)	3.4	2.0 -3.0	2.0 – 3.0	2.0 – 3.5
Calcium (mmol/kg)	3.8	2.5 – 5.5	2.5 – 5.5	3.0 – 3.5
Phosphate (mmol/kg)	2.1	2.0 – 4.5	2.0 – 4.5	1.9 – 2.9

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Table 2. Suggests feeding regimen based on gestation and risk groups

Gestation or other age group	Age to start feeds if well	Starting enteral volumes	Initial frequency	Rate of increase	Final Volume
23-25 weeks	When stable and EBM available	10-15ml/kg/day	Hourly	10 - 15 ml/kg/day	150 -180ml/kg/day
26-29 weeks	When stable and EBM available	20-25 ml/kg/day	Hourly	20 -25 ml/kg/day	150 – 180ml/kg/day
30-33 weeks	3-12 hours	60 ml/kg/day	Hourly	30ml/kg/day	150 – 180ml/kg/day
34 -36 weeks	<4 hours	60ml/kg/day	3 hourly	30ml/kg/day	150 ml/kg/day
Unwell preterm/High risk	Consider when EBM available or >4days	10 -15ml/kg/day	Hourly or 2 hourly	Minimal enteral nutrition until baby stabilizes	

Choice of milk for first feeding

Maternal EBM remains the first-choice milk for VLBW babies. Mothers should be actively supported in expressing milk for their babies and should be shown how to express by an experienced member of the nursing staff [13-16]. Formula milk should only be used when mother has clearly expressed that she doesn't want to breast feed, not in a position to express due to significant illness or in cases where maternal breast milk is contraindicated. Whenever possible a preterm formula should be used in such cases[17,18].

Consider fortification of breast milk when the growth is suboptimal on MEBM.

Monitoring growth and nutrition

Monitoring of growth is of vital importance in VLBW babies. Any faltering in growth should be identified early and remedial measures taken to optimize nutrition. Both anthropological and biochemical markers should be employed for monitoring. All babies should have weight and head circumference taken and recorded on growth chart on admission. Thereafter these parameters should be monitored weekly.

Length should be monitored in all preterm babies whose weight is below the 2nd centile. Serial measurements should be taken at least monthly. Bloods for biochemical markers should be done at least weekly in VLBW infants and should include serum levels of sodium, potassium, calcium, phosphate, urea, albumin, Alkaline Phosphatase, Alanine transaminase, bilirubin and full blood counts.

Minerals and micronutrients

Preterm/LBW babies usually require more sodium and phosphate than term babies. If they are receiving pure EBM, this can be supplemented by giving sodium chloride and sodium dihydrogen phosphate. Infants receiving fortified breast milk usually receive sufficient of these nutrients and need not be supplemented.

In addition, all VLBW babies should be supplemented with multivitamins and folic acid once they reach full feeds. Iron should be added once they reach one month of age.

Individualization of feeds

Feeding in preterm/VLBW babies require understanding of the individual babies needs and we should be wary of simple answers. They are a complex, heterogeneous group and often feeding these babies is complicated by existence of one or more risk factors. Hence, while starting feeds in these babies' individual needs and risk factors should be considered carefully. If the nutritional requirements are not being met despite adequate fortification of preterm/LBW formulas dieticians should be involved in formulating feeding plans.

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