Preterm Nutrition at Home

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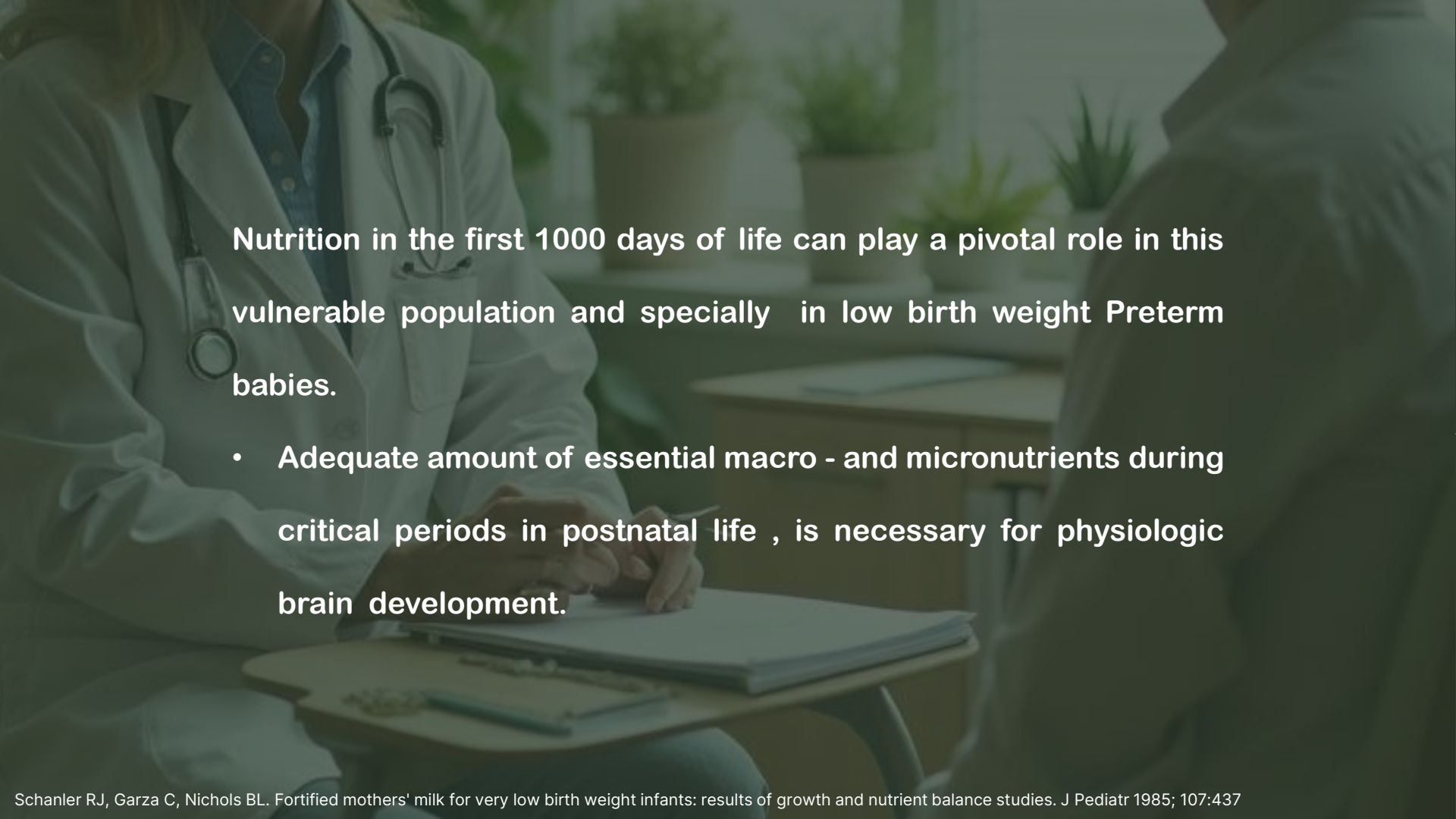
- **Prematurity is the leading cause of newborn mortality and morbidity in the first years of life.**
- **Preterm Infants complete their organogenesis in a non-physiological environment, and they undergo structural and functional changes that lead to an increased risk of cardiovascular disease ,arterial hypertension , and metabolic and renal disease.**

Martin, R. J., Fanaroff, A. A., & Walsh, M. C. (2020). *Fanaroff and Martin's neonatal-perinatal medicine : diseases of the fetus and infant* (11th edition). Elsevier.



Nutrition in the first 1000 days of life can play a pivotal role in this vulnerable population and specially in low birth weight Preterm babies.

- Adequate amount of essential macro - and micronutrients during critical periods in postnatal life , is necessary for physiologic brain development.

Schanler RJ, Garza C, Nichols BL. Fortified mothers' milk for very low birth weight infants: results of growth and nutrient balance studies. J Pediatr 1985; 107:437

Mother 's own milk is the preferred feeding source for premature infants because it is associated with an array of important short- and longer - term health benefits.

- The strongest of this benefits in Preterm Infants is prevention of NEC.
- Mother 's milk is associated with improved neurodevelopment in a dose- response relationship.

Butte NF, Garza C, Smith EO, Nichols BL. Human milk intake and growth in exclusively breast-fed infants. J Pediatr 1984; 104:187.

Nutritional options in Preterm Infants:

- Mother milk
- donor milk
    - human milk fortification
    - Preterm formula

Mother`s own milk is the best choice for Preterm Infants.

Meek JY, Noble L, Section on Breastfeeding. Policy Statement: Breastfeeding and the Use of Human Milk.

BENEFITS OF MOTHER MILK IS PROTECTION AGAINST

- necrotizing enterocolitis
- late- onset sepsis
- chronic lung disease
- improved neurodevelopment

Parker MG, Stellwagen LM, Noble L, et al. Promoting Human Milk and Breastfeeding for the Very Low Birth Weight Infant. Pediatrics 2021; 148.

Human milk include:

Immunoglobulins, acetylhydrolase (which antagonise platelet-activating factor, amajor trigger for NEC in premature infants) .

Human milk oligosaccharides (which promote the growth of a healthy gut microbiom)

Ziegler EE, O'Donnell AM, Nelson SE, Fomon SJ. Body composition of the reference fetus. Growth 1976;

Human milk also contains important host defense including:

- lactoferrin
- lysozyme
- oligosaccharides
- cytokins
- enzymes
- growth factors
- nucleotide and cellular component

Sinclair JC. Energy balance of the newborn. In: Temperature Regulation and Energy Me tabolism in the Newborn, Sinclair JC (Ed), Grune & Stratton, New York 1978. p.187

DONOR MILK

when mother's own milk is not available or is insufficient, pasteurised human milk from a donor may be used

- Donor milk maybe used as a "bridge " until the mother 's milk supply improves with time and intensive lactation support.

Weinstein MR, Oh W. Oxygen consumption in infants with bronchopulmonary dysplasia. J Pediatr 1981; 99:958

Indications for donor milk:

- VLBW infants <1500 g when mother milk is not available
- Preterm Infants above 1500 g who have risks for NEC

There are no clear guidelines for when to discontinue the use of donor human milk .

but common practice is to continue until the infant reaches approximately 34 weeks postmenstural age, weight 2000 g, and/ or is ready for hospital discharge.

Martin, R. J., Fanaroff, A. A., & Walsh, M. C. (2020). *Fanaroff and Martin's neonatal-perinatal medicine : diseases of the fetus and infant* (11th edition). Elsevier.

Preterm formula milks:

some formula milks aim at providing nutrient intake to match intrauterine growth and are enriched in energy content, macronutrients, vitamins, minerals and trace elements.

- some formula milks available are enriched with (LCPUFA) particularly (DHA), necessary for the maturation of the brain and retina.
- Although Preterm formula meets the nutrient needs of Prematures, it fails to replicate the numerous immunological and bioactive factors contained in breast milk

Ehrenkranz RA, Younes N, Lemons JA, et al. Longitudinal growth of hospitalized very low birth weight infants. Pediatrics 1999; 104:280

For this reason:

breast milk represents the gold standard for every infant. but the nutritional requirements of Preterm Infants can not be met with exclusive human milk feedings, because they require more protein, energy, fatty acids, minerals, and micronutrients than do healthy term newborns.

for this reason, human milk fortification is needed.

Shaffer SG, Quimiro CL, Anderson JV, Hall RT. Postnatal weight changes in low birth weight infants. Pediatrics 1987; 79:702

Human milk fortifier dividend into two groups:

- Bovin-based (BOV)
- human milk-based (HMBF)
- They are in two forms: powder and liquid form.
- Both of this fortifier types are enriched with electrolytes, minerals and vitamins, macro and micronutrient better meet the needs of Preterm or at -risk infant

Shaffer SG, Quimiro CL, Anderson JV, Hall RT. Postnatal weight changes in low birth weight infants. Pediatrics

Products in a powder form cannot be sterilized in the same manner as liquids and thus, ara at risk for bacterial contamination such as (coronobacter sakazaki).

- initiation of fortifier varies by institution and product used , and range from 20 to 120 ml/ kg/day

Martin, R. J., Fanaroff, A. A., & Walsh, M. C. (2020). *Fanaroff and Martin's neonatal-perinatal medicine : diseases of the fetus and infant* (11th edition). Elsevier.

Indications of fortifier:

Human milk feeds for hospitalised (very low) birth weight and other infants are at risk for growth failure should be suppllemented with multinutrient human milk fortifier (HMF).

Shaffer SG, Quimiro CL, Anderson JV, Hall RT. Postnatal weight changes in low birth weight infants. Pediatrics 1987; 79:702

Recommended daily requirements for enteral nutrition inpramature infants

Protein : 3/5 to 4/5 g/kg/ day.

- Preterm human milk protein 1.5 to 2.2g/dl during the first one two postnatal weeks and then decreases to 1.0 to 1.4 g/dl at three weeks and later.
- Fortifying the human milk by adding a human milk fortifier increases the protein content of the feed to 2.5 to 3.25 g/dl

Ehrenkranz RA, Younes N, Lemons JA, et al. Longitudinal growth of hospitalized very low birth weight infants. Pediatrics 1999; 104:280

LIPIDS : The recommended fat intake for Preterm Infants is 4/8 to 6/6g/kg/day.

- Fat content in human milk varies widely from approximately 2/6 to 3/7 g/dl.
- fortifying the human milk by adding human milk fortifier increases the fat content of the feed to 4/4 to 4/8 g/dl in 100 to 140 ml /day.

Sinclair JC. Energy balance of the newborn. In: Temperature Regulation and Energy Me tabolism in the Newborn, Sinclair JC (Ed), Grune & Stratton, New York 1978. p.187

CARBOHYDRATES:

The recommendation carbohydrate intake in fully enterally fed Preterm Infants is 11/6 to 13/2 g/kg/day.

Carbohydrate content of parent's own milk is approximately 7.o to 7.3g/dl.

To meet this requirement, a full enterally fed Preterm Infant with a weight of 1000 g would need to ingest approximately 170 ml/kg/day, which is more than some Infants can tolerate.

- fortifying the human milk increases the carbohydrate content of the feed to approximately 8.2 to 8.5g/dl.

Sinclair JC. Energy balance of the newborn. In: Temperature Regulation and Energy Me tabolism in the Newborn, Sinclair JC (Ed), Grune & Stratton, New York 1978. p.187

Post - discharge fortifier use:

More than one-half of VLBW infants have extrauterine growth failure (weight for gestational age less than 10th percentile) at hospital discharge.

Many providers recommended that fortification be continued after discharge home to support ongoing "cath-up growth ".

- For this reasons ,the European milk bank Association (EMBA) working group on human milk encourage s the use of "individualized fortification " to optimize nutrient intake . And measure in infants with poor growth, BUN <10 mg/dl may suggest the need for more protein intake.

Schanler RJ, Garza C, Nichols BL. Fortified mothers' milk for very low birth weight infants: results of growth and nutrient balance studies. J Pediatr 1985; 107:437

Calcium, phosphorus, alkaline phosphatase:

- in infants <1500 g birth weight , measure starting at 5 to 6 weeks of age. Measure weekly until alkaline phosphatase is <600 IU/L and serum phosphorus is > 4.5 mg/dl.

- once stable beyond thease thresholds, no need to repeat.

Schanler RJ, Garza C, Nichols BL. Fortified mothers' milk for very low birth weight infants: results of growth and nutrient balance studies. J Pediatr 1985; 107:437

Recommended daily requirements for enteral nutrition in premature infants <1500 girth Weigt:

- Calcium : 120 to 220 mg/kg
- phosphorus : 70 to 120 mg /kg
- magnesium: 8 to 15 mg /kg
- Iron 1 t0 3 mg /kg
- Zinc : 2 to 3mg/kg
- Vitamin A : 1332 to 3330 IU
- Vitamin D : 400 to 1000 IU
- Vitamin E : 2.2 to 11 mg alpha – tocopherol
- Folic acid : 22 to 100 mcg/kh
- Vitamin B12 : 0 .12 to 0 .6mcg/kg
- Vitamin C : 16 .5 to 41 mcg/kg

Butte NF, Garza C, Smith EO, Nichols BL. Human milk intake and growth in exclusively breast-fed infants. J Pediatr 1984; 104:187.

Thanks For Your Attention