NUTRITION AND GROWTH IN INFANTS

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1403

Fars Pediatric Association

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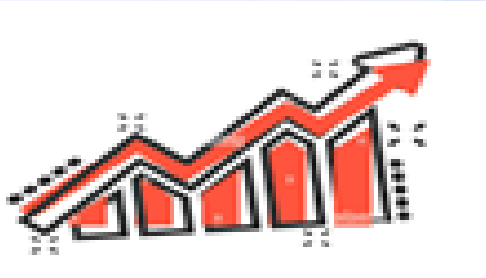
- **Normal growth** is the progression of **changes in height, weight**, and **head circumference** that are compatible with established standards for a given population.

Normal growth is a reflection of overall **health** and **nutritional status**



Growth parameters at the **time of birth** and during the **first month** of life

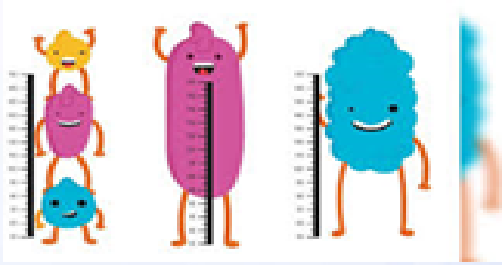
Maternal nutrition

Intrauterine environment

Genetic factors have a later influence

General evaluation

- The **general assessment of nutritional status** begins by obtaining, plotting, and interpreting weight, length, and head circumference data on sex- and age-specific **growth curves**



- **Growth velocity**, the change in growth over time, is a **more sensitive index of growth** than is a **single measurement**

- To determine the **child's growth percentiles**, weight and length and head circumference should be plotted on the appropriate growth chart at **each well-child visit** and as indicated at interval visits

Growth charts

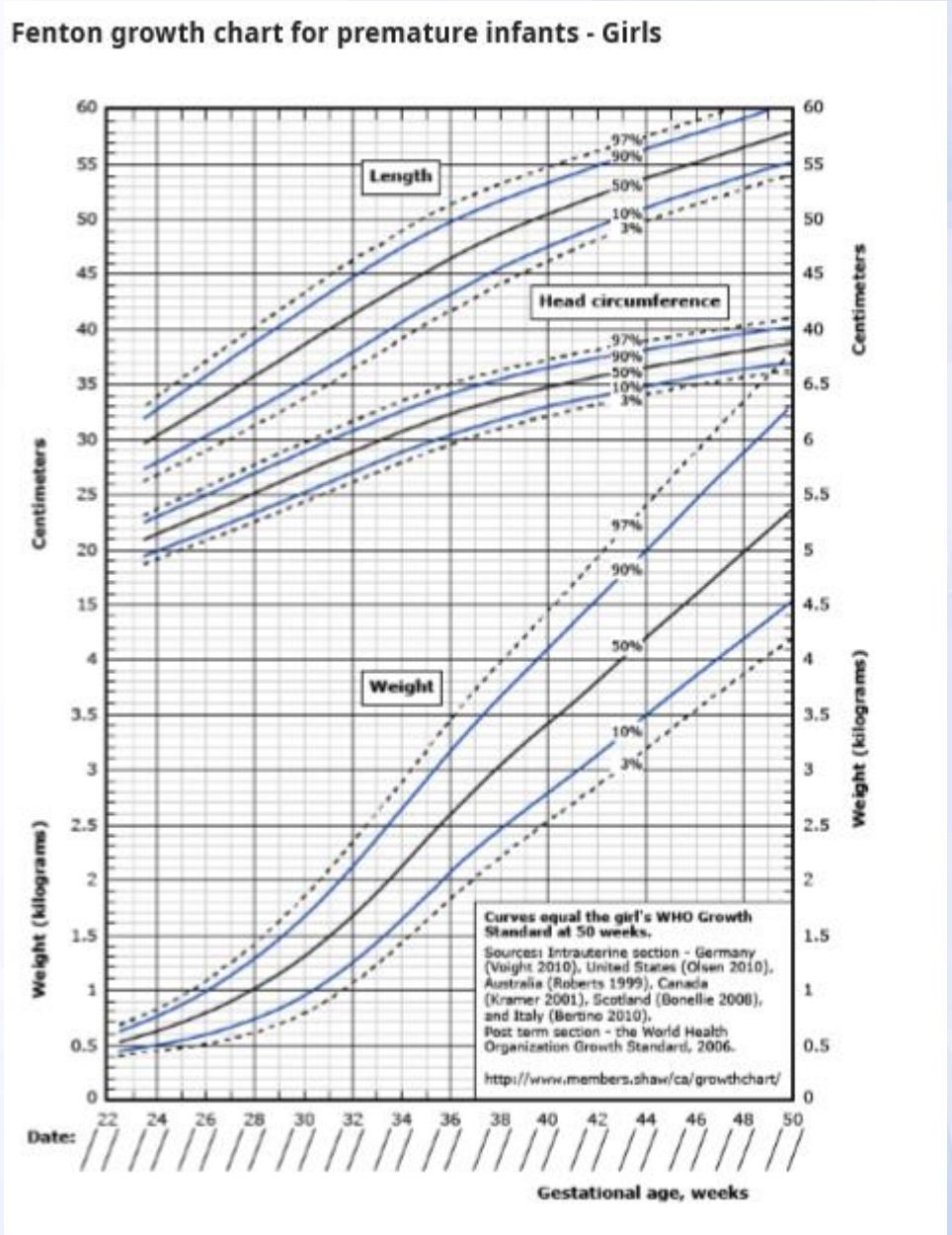
- **For full-term infants** up to 24 months of age, the growth charts developed by the WHO should be used regardless of **ethnicity**, **socioeconomic status** and **method of feeding** (these standards were derived from healthy infants who were exclusively breastfed)
- Compared with formula-fed infants, breastfed infants gain weight relatively rapidly during the first three to four months of life and relatively slowly thereafter.

Growth charts of preterm infants

- The 2009 United Kingdom-WHO growth charts suggest **corrections for gestational age** (GA) of all three parameters:
  - Until age **2 years for children born before 32 weeks' gestation**,
  - At least until age **12 months for children born between 32 and 36 weeks' gestation**

Growth chart of preterm infants

- We recommend using the **Fenton preterm infant growth chart** until the infant is **44 to 48 weeks postmenstrual age**, at which point the WHO growth curves for term infants can be utilized.



Growth in Term newborns

Weight gain:

- Term neonates may lose up to 10 percent of their birth weight in the first few days of life and typically regain their birth weight by 10 to 14 days
- **Term newborns** gain approximately **30 g per day** until three months of age

Growth in Term newborns

Linear growth:

- The average length at birth for a **term infant** is 20 inches (50 cm)
- **0 to 6 months** – 1 inch (**2.5 cm**) per month
- Infants grow 10 inches (**25 cm**) during the **first year of life**
- Toddlers grow 4 inches (**10 cm**) between **12 and 24 months**

Growth in Term newborns

Head growth:

- The average head circumference **at birth** is **35 cm**
- The most rapid growth occurring during the first six months, with an increase of **2 cm/ month** in first 3 months in **term newborns**.
- Brain weight doubles by **four to six months** of age and triples by **one year of age**
- **Most head growth** is complete by **four years of age**

Growth of preterm newborns

- **weight gain**
  - **Weight < 2 Kg** :15 to 20 g/kg/day (from 23 to 36 weeks gestation).
  - **Weight ≥ 2 kg**: 20 to 30 g/day.
- **Length increment** :1 cm / week.
- **Head circumference increment** :1 cm/ week.

- Growth parameters should be monitored on a **weekly** to **biweekly** basis for the first four to six weeks after hospital discharge.

Nutrition and supplementation

Nutrition in term healthy neonates

- Average energy requirements in healthy infants are approximately 110 kcal/kg/day at 1 month of age

- This is equivalent to 150 to 175 mL/kg/day of unfortified human milk or standard formula.

- The healthy newborn wakes to feed at least 8 to 12 times per 24 hours (on-demand feeding) and fasting should not last more than 4 hours.

Nutrition in term healthy neonates

- The Academy of Breastfeeding Medicine suggests the following volumes for healthy term infants based on age of the infant:
  - **First 24 hours** – 2 to 10 mLs/feed
  - **24 to 48 hours** – 5 to 15 mLs/feed
  - **48 to 72 hours** – 15 to 30 mLs/feed
  - **72 to 96 hours** – 30 to 60 mLs/feed (full fed)

Nutrition in term healthy neonates

- In the breast fed infant , If the intake is inadequate we sugest:
  - Mother's **expressed breast milk** in addition to ongoing breastfeeding
  - Supplementing with **formula**

- It should be given via one or more alternative techniques, including use of :
  - syringe
  - cup
  - spoon

rather than using a bottle and artificial nipple

Nutrition in term healthy neonates

Vitamin D supplementation

- **Vitamin D supplementation** is recommended for **all** breastfeeding infants and **all** formula feeding infants who are consuming <27 oz of infant formula daily.
- The recommended dose of vitamin D is 10 micrograms (**400 international units**) daily, beginning within a few days after birth(in the first week of life)

Nutrition in term healthy neonates

Iron Supplementation:

- Full term – **1 mg/kg daily** (**maximum 15 mg**)

- **iron supplements** should initiate between four and six months of age for term infants and is continued **until 12 months** of age or until adequate iron from dietary sources is assured when solid foods are introduced.

- Infants who receive **iron-fortified formula** (12 mg elemental iron per liter) do not require additional iron supplementation.

Nutrition in preterm neonates

- For enterally fed premature infants, the average daily energy requirements are 110 to130 kcal/kg/day
- This is equivalent to:
- 180 – 200 mL/kg per day of breast milk or standard formula (20 kcal/oz)
- 160 mL/kg per day preterm formula (24 kcal/oz) or fortified human milk.

Nutrition in preterm neonates

- **Vitamin D supplementation**

Recommendations from the American Academy of Pediatrics(AAP):

- **For infants < 1500 g body weight :** initial target is **400 international units** daily, when a preterm infant tolerates full enteral feeds

- **When the infant reaches ≥ 1500 g :** some clinicians increase vitamin D to **800 international units** , although the evidence to support this strategy is uncertain

Nutrition in preterm neonates

- **Iron Supplementation:**

- In breastfed preterm or low birth weight infants(B.Wt ≤1500 gr):
- **2 to 4 mg/kg/day** of elemental iron, **maximum 15 mg** in the form of ferrous sulfate is recommended.
- Starting at **two weeks of age** and is continued until 12 months of age or until adequate iron from dietary sources is assured when solid foods are introduced.

Nutrition in preterm neonates

• Minerals:

- For preterm neonate feeding with unfortified human milk provides insufficient intakes of minerals (Ca, Phos)

- For prevention of osteopenia of prematurity , recommendation is:
  - **Approximately calcium *40 mg/kg/day***
  - **Phosphorus *20 mg/kg/day***

Enriched diet

Indications of starting enriched diet:

- Who were born with **B.Wt below 1500 g.**
- **Unable to consume** at least 180 mL/kg/day due to fluid restriction or poor feeding
- **Abnormalities in routine laboratory tests** suggesting suboptimal bone health or inadequate protein intake
- With **weights below the 10th percentile for age at the discharge time**.
- In those infants who initially received standard formula if they fail to maintain adequate growth or **fail to "catch up**"after hospital discharge

Several strategies can be used to enrich the diet:

1. For infants who are **feeding at the breast**, provide two or three feedings daily with a transitional "***post-discharge" formula (22 kcal/oz) or premature infant formula (30kcal/oz).***
2. For infants who are fed **breast milk from an artificial nipple**, add bovine milk-based ***fortifie***r to breast milk (***to provide 22 or 24 kcal/oz)***
3. For infants **fed only standard formula**, we use a transitional ***"post-discharge" formula (22kcal/oz).***

Enriched diet

- For any of above strategies, **sterilized liquid** (rather than powdered) types of **infant formula** or **human milk fortifier** are preferred until the infant is **at least 44 weeks postmenstrual age** due to the small risk of bacterial contamination of powdered products.
- The risk is probably minimal when using **single-serving packets** of powdered human milk fortifier.

Enriched diet

- The commercially available enriched formulas compared with standard formulas:
  - **calorically denser** (75 kcal/100 mL versus 67kcal/100 mL)
  - have a **higher content** of **protein, calcium, phosphorus, zinc, and vitamins A, E, and D.**

Enriched diet

- The choice of whether, **how**, and **how long** to supplement human milk-fed infants needs to be individualized based on the:
  - ✓infant's own risk factors
  - ✓prior and ongoing growth
  - ✓ability of the parents to carry out the suggested regimens

- Typically **enriched formula** used for preterm infants until they are **six months of age post-term (corrected GA)** or until they have achieved **adequate catch-up growth.**

Enriched diet

- Growth monitoring should ensure that growth in weight and length are proportional.

- If **excessive weight is gained** compared with length, or if there is **upwards crossing of weight-for-length centiles**, consideration should be given to reducing nutritional fortification if infants are received enriched formulas or fortified human milk.

Great thanks