FAILURE TO THRIVE

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Failure to thrive

AN OVERVIEW

Q1: What factors influence / control growth?

Q2: How to know that a child is not growing normally?

Q3: What causes failure to thrive? How to classify it?

Q4: What specific points in history you need to know?

Q5: How to approach examination of a child who has growth failure?

Q6: What investigations you need to do on a child with failure to thrive?

Q7: How to treat children with failure to thrive?

Q8: Take home message.

What does a child need to grow ?

Foods

Hormones

LOVE

Good Genes

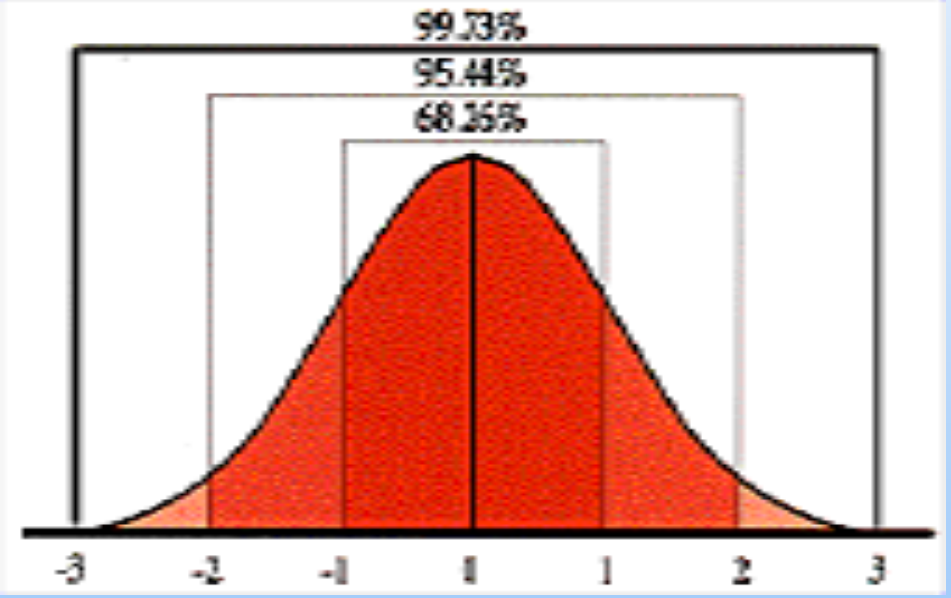
Good Start (intrauterine)

absence of disease, infection, &stress

DEFINITION

- FTT is a symptom rather than a disease or diagnosis.
- Weight below 3rd/ 5th centile for age.
- Weight (or weight for height) is more than 2 SD below the mean for age and sex.
- A child whose weight curve has crossed downward more than 2 major percentiles over aperiod of 6 months.

DEFINITION



DEFINING FAILURE TO THRIVE CAN BE DIFFICULT

3rd percentile vs 5th percentile

2 standard deviations, 5th percentile

2.2 standard deviations, 3rd percentile

FTT - definition

FTT could be defined as an:

- Infant's growth deviated from an established pattern of age-appropriate growth.
- Regardless of the anthropometric indicator and cut off value selected, accurate interpretation of the growth data is dependent on serial measurements and not one point in time.

NORMAL GROWTH

- Diagnosis of abnormal growth requires knowledge of normal growth patterns
- “Patterns of progression in weight and height that is consistent with the established standards for age”.

So, What's Normal?

- Infants should regain their birth weight by 2 weeks (15-30 g per day)

AGE	MEAN DAILY WEIGHT GAIN
0-3 M	**25-30 g**
3-6 M`	**17-18g**
9-12 M	**10 g**
1-3 Y	**7-10 g**
4-6 Y	**6 g**

What is normal growth?

AGE	Median daily weight gain (grams)	Recommended daily allowance (kcal/kg/d)*
0-3 months	26-31	108
3-6 months	17-18	108
6-9 months	12-13	98
9-12 months	9	98
1-3 years	7-9	102
4-6 years	Approximately 6	90

*National Research Council, Food and Nutrition Board; Recommended Daily Allowance. Washington, DC. National Academy of Sciences, 1989.

AVERAGE GAINS IN WEIGHT AND LENGTH IN THE FIRST FIVE YEARS OF LIFE

Age	↑Weight	↑Length
0 – 1 week	↑10% loss	
1- 2 weeks	Birth weight regain	
2 weeks – 5 months	150 – 200 grams/week	
5 months	Birth weight doubled	1.3 x birth length
5 months – 1 year	Wt. gain velocity declines	
1 year	Birth weight trebled	1.5 x birth length
1 – 2 years	2 -3 kg/year	11 – 12 cm./year
2 – 5 years	2kg/year	Birth length doubled at about age 4.

GROWTH GUIDELINES

WEIGHT-

- Birth weight is regained by the 14th day.
- During the first 3 months, the average gain is about 1 kg/month (about ½ to 1 oz/ day).
- Birth weight doubles at about 4 months, triples at 12 months, quadruples at 24 months.
- By six month, the average gain per month is 0.5kg.
- During the second year, the average gain per month is 0.25 kg.
- After age 2, the average annual increment is 2.3 kg

  (5 lb) until the adolescent growth spurt.

GROWTH GUIDELINES

HEIGHT –

- Average birth length is 50cm (20 in).
- By the end of the first year, birth length increases by 50%.
- Birth length doubles by 4 years.
- Birth length triples by 13 years.
- Average annual growth is 5 cm (2 in) or better per year.

GROWTH GUIDELINES

- A nice rule of thumb for head circumference is the 3 & 9 rule. A newborn has a head circumference of 35 cm, a 3 month has a circumference of 40 cm, a 9 month has a circumference of 45 cm, a 3 year old has a circumference of 50 cm, and a 9 year old has a circumference of 55 cm.

FTT classification?

- FTT is best considered a physical sign of undernutrition and not a clinical syndrome caused by "organic" or "nonorganic" factors
- The underlying cause of FTT is INSUFFICIENT USABLE NUTRITION TO MEET THE DEMANDS FOR GROWTH.
- FTT = INADEQUATE NUTRITION.
- GROWTH = ENERGY INPUT – E. OUTPUT

NOT FTT

- Infants and young children may cross major percentile lines on growth curves during a normal course of growth. Therefore, documentation of weights or lengths falling off of growth channels is not, by itself, proof of FTT.
- Approximately 25% of normal children will have a shift in their wt curve,then follow a normal curve– this is not FTT.
- Premature/ IUGR wt may be less than 5th centile but grow parallell to centiles and may catch up late.

Failure to thrive : category causes

Most pathological explanations for failure to thrive can be broken up into of the following groups:

- Inadequate caloric intake
- Inadequate absorption
- Increased metabolism
- Defective utilization

Failure to thrive: category causes

- Inadequate caloric intake
  - Incorrect preparation of formula (too diluted, too concentrated).
  - Unsuitable feeding habits (food fads, excessive juice)
  - Behavior problems affecting eating
  - Poverty and food shortages
  - Neglect
  - Disturbed parent-child relationship
  - Mechanical feeding difficulties (oromotor dysfunction, congenital anomalies, central nervous system damage, severe reflux)

Failure to thrive: category causes

- Inadequate absorption
  - Celiac disease
  - Cystic fibrosis
  - Cow's milk protein allergy
  - Vitamin or mineral deficiencies (acrodermatitis enteropathica, scurvy)
  - Biliary atresia or liver disease
  - Necrotizing enterocolitis or short-gut syndrome

Failure to thrive: category causes

- Increased metabolism
  - Hyperthyroidism
  - Chronic Infection (human immunodeficiency virus or other immunodeficiency, malignancy, renal disease).
  - Hypoxemia (congenital heart defects, chronic lung disease)

Failure to thrive: category causes

- Defective utilization
  - Genetic abnormalities (trisomies 21, 18, and 13)
  - Congenital infections
  - Metabolic disorders (storage diseases, amino acid disorders).

EVALUATION

- Accurately plotting growth charts at every visit.
- Use correct growth charts!
- Evaluate the trends
- History and Physical more important than labs

FTT - History

- Generally, children who fail to thrive have nutritional inadequacies.
- The history and physical examination initially should focus on these problems, with special attention to feeding disorders and vomiting.
- Review of specific dietary practices, formula preparations, and feeding techniques, including caregiver/child interaction, is imperative.

HISTORY

- **Pregnancy/Birth**
  LBW, IUGR, prematurity, postnatal complications, tube feeding. **Substance abuse? postpartum depression?**
- **Dietary** type of food, time spent over meal, number of meals, self feed, formula/supplements, unusual feeding behavior, who feeds?
- **Past medical history**
  Illnesses, hospitalizations, reflux, vomiting, stools, difficulty swallowing
- **Social**
  Who lives in the home, family stressors, poverty, drugs?
- **Family**
  Parental height, siblings, Medical condition (or FTT) in siblings, mental illness, stature?

DIETARY HISTORY

- Assess methods of feeding
- breastfeeding patterns (including maternal diet use of medications that can affect milk production and let-down such as alcohol or diuretics)
- formula preparation
- volume consumed
- feeding techniques.
- Caloric counts- food diary
- A detailed his**to**ry of formula preparation :may reveal a dilute formula that contains insufficient calories and excess water.

Dietary Associations With Poor Growth in Young Children

- Breastfeeding difficulties
- Improper formula mixing
- Poor transition **to** food (6 **to** 12 months of age)
- Excessive juice consumption
- Avoidance of high-calorie foods

Examination: Key Points

- Infant eye contact (if avoids may be abuse)
- Poor suck or motor skills
- Watch caretaker feed the infant!!!
- Plot height, weight and head circumference
- Dysmorphic features
- Systems examination
- Skin: scars, jaundice, eczema, bruises or rash
- Signs of neglect or abuse.
- Inappropriate behavior.

Physical Examination

- Observe parent-child interactions
  - Especially during a feeding session
    - How is food or formula prepared?
    - Oral motor or swallowing difficulty?
    - Is adequate time allowed for feeding?
    - Do they cuddle the infant during feeds?
    - Is TV or anything else causing a distraction?

INVESTIGATIONS

- Lab tests should be guided by H&P.
- Less than 2% of the lab studies performed in evaluating children with FTT were useful.
  Sills RH AM J Dis Child 1978

Investigations

Rule 1 ⇒ if Hx & exam is negative
unlikely to find a cause

Rule II ⇒ NO FISHING

Rule III ⇒ Guided by finding Hx and exam.

Initial work up

- **CBC-d + ESR**
- **Electrolyte profile**
- **Urine analysis**
- **Stool analysis**
- **Bone profile.**

Specific investigations.

FTT

- It is unclear how many children have adverse neurodevelopmental outcomes from FTT.
- Extensive laboratory screening is of little utility in the evaluation of FTT.
- Certain children who appear to have FTT may be biologically programmed to be smaller and thinner than most children. Insulin resistance may be a mechanism, and aggressive nutritional intervention may put these children at risk of developing metabolic syndrome

Why isn't this baby growing?

Age on onset	Diagnostic considerations
Before birth (IUGR, prematurity)	Especially in "symmetric" IUGR, consider prenatal infections, congenital syndromes, teratogenic exposures (anticonvulsants, alcohol, etc.).
Neonatal	Incorrect formula preparation; failed breastfeeding; neglect; poor feeding interactions; metabolic chromosomal, or anatomic abnormally (less common).
3-6 months	Underfeeding (possibly associated with poverty); improper formula preparation; milk protein intolerance' oral-motor dysfunction; celiac disease; HIV infection; cystic fibrosis; congenital heart disease.
7 -12 months	Autonomy struggles; overly fastidious parent; oral-motor dysfunctions; delayed introduction of solids; intolerance of new foods.
After 12 months	Coercive feeding; highly distractible child; distracting environment; acquired illness; new psychosocial stressor (divorce, job loss, new sibling, death in the family, etc.)

Medical causes of inadequate intake that may be overlooked

Infectious: Giardiasis other parasites (e.g., nematodes) Chronic UTI, Chronic sinutis
Mechanical: Adenoid hypertrophy, Dental lesions, Vascular slings, GE reflux with esophagitis
Neurologic: Oral-motor dysfunction (gagging, tactile hypersensitivity).
Toxic/metabolic: Lead toxicity, Iron deficiency, Zinc deficiency
Gastrointestinal: Celiac disease, Malabsorption (various causes), Chronic constipation.

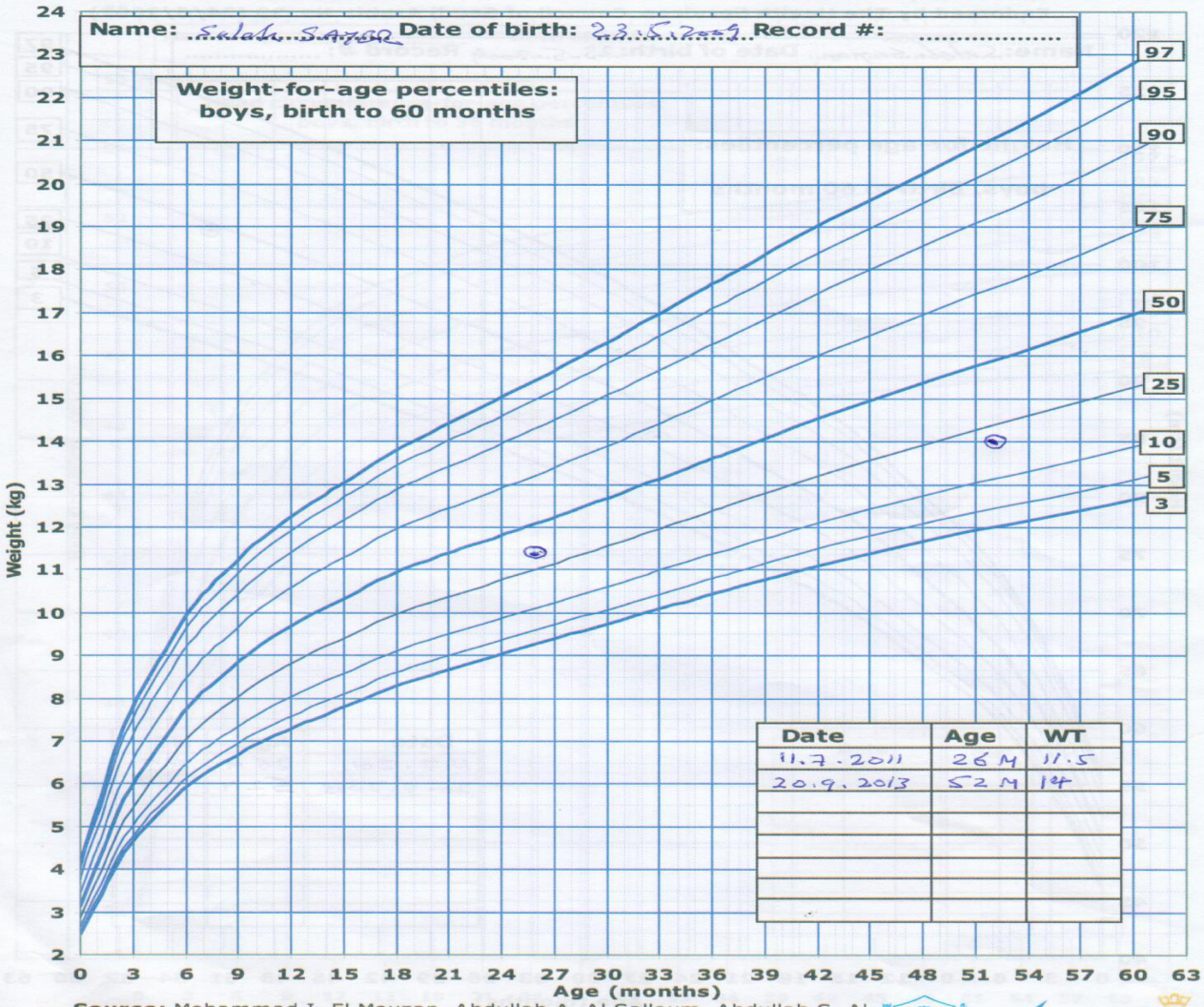
Diagnostic red flags for FFT

History	Diagnostic consideration	Investigation
Spitting, vomiting	Gastroesophageal reflux	Upper GI series, Ph probe, esophagoscopy
Abdominal distension, cramping, diarrhea	Malabsorption (e.g., cystic fibrosis, celiac disease, lactase deficiency)	D-xylose test, stool fat, antigliadin titer or biopsy, swear chloride.
Travel to or from developing country; homeless, overcrowded, or living in shelter	Parasitosis (especially giardia), TB inadequate access to cooking facilities and refrigeration	Stool O & P, duodenal biopsy, string test, PPD
Snoring, periodic breathing during sleep, restless sleep, noisy or mouth breathing	Adenoid hypertrophy	Lateral neck film (soft tissues and airway)
Symptoms of asthma, bronchitis	Chronic aspiration, cystic fibrosis.	Chest film, radionuclide scan for aspiration, sweat chloride*
Polyuria, polydypsia, polyphagia	Diabetes	Blood glucose
Frequent (minor) infections	HIV, other immune deficiency	Serologic tests, immunoglobulins, * PPD with control for anergy*

* May be abnormal secondary to malnutrition

The Growth Charts for Saudi Children and Adolescents

Endorsed by The Health Services Council of Saudi Arabia No.29 (24/6/2007)



Source: Mohammad I. El Mouzan, Abdullah A. Al Salloum, Abdullah S. Al Herbish, Peter J Foster, Mansour M. Qurashi, Ahmad A. Al Omar. The 2005 Growth Charts for Saudi Children and Adolescents (No. AR-20-63). King Abdulaziz City for Science and Technology 2009, Riyadh, KSA.

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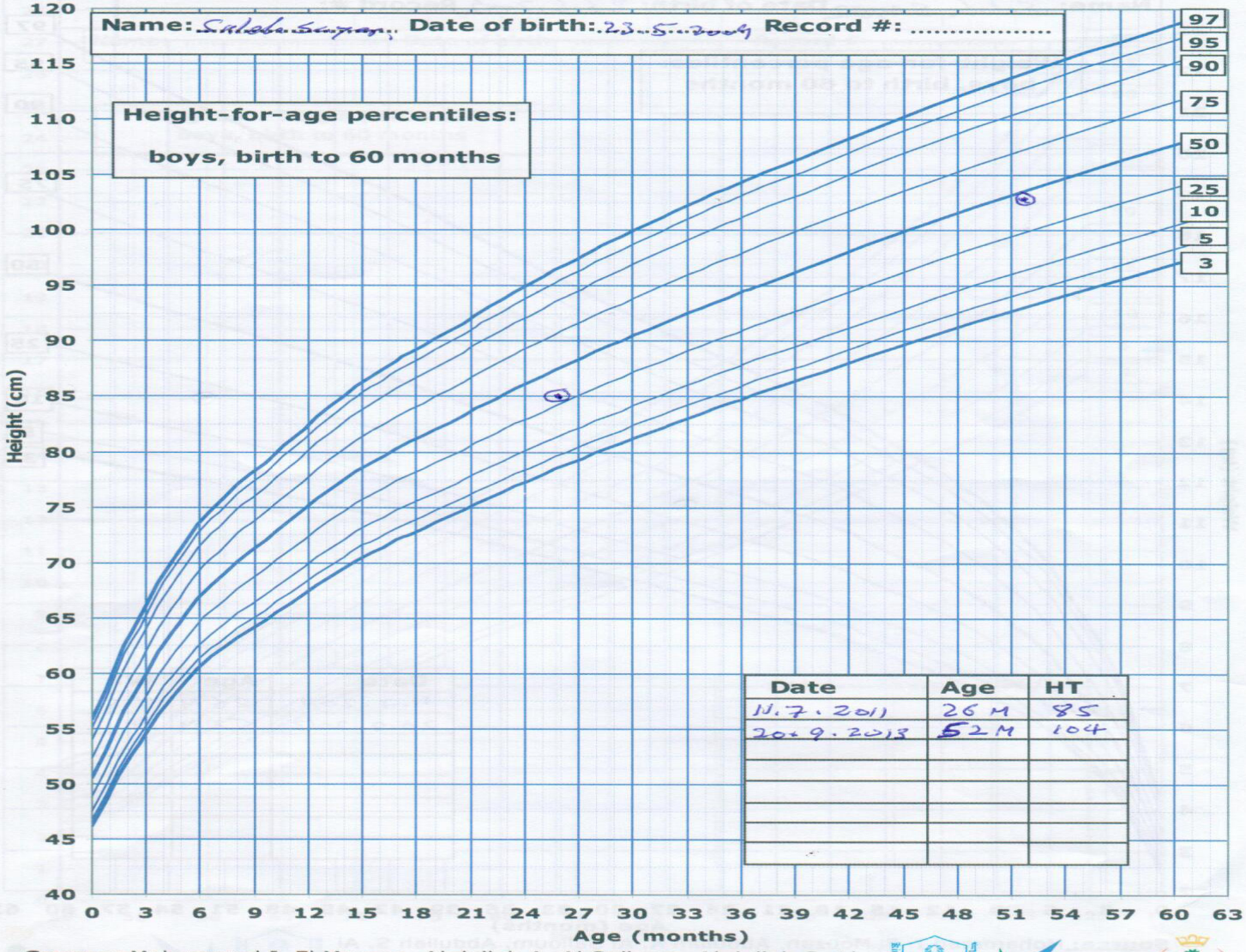

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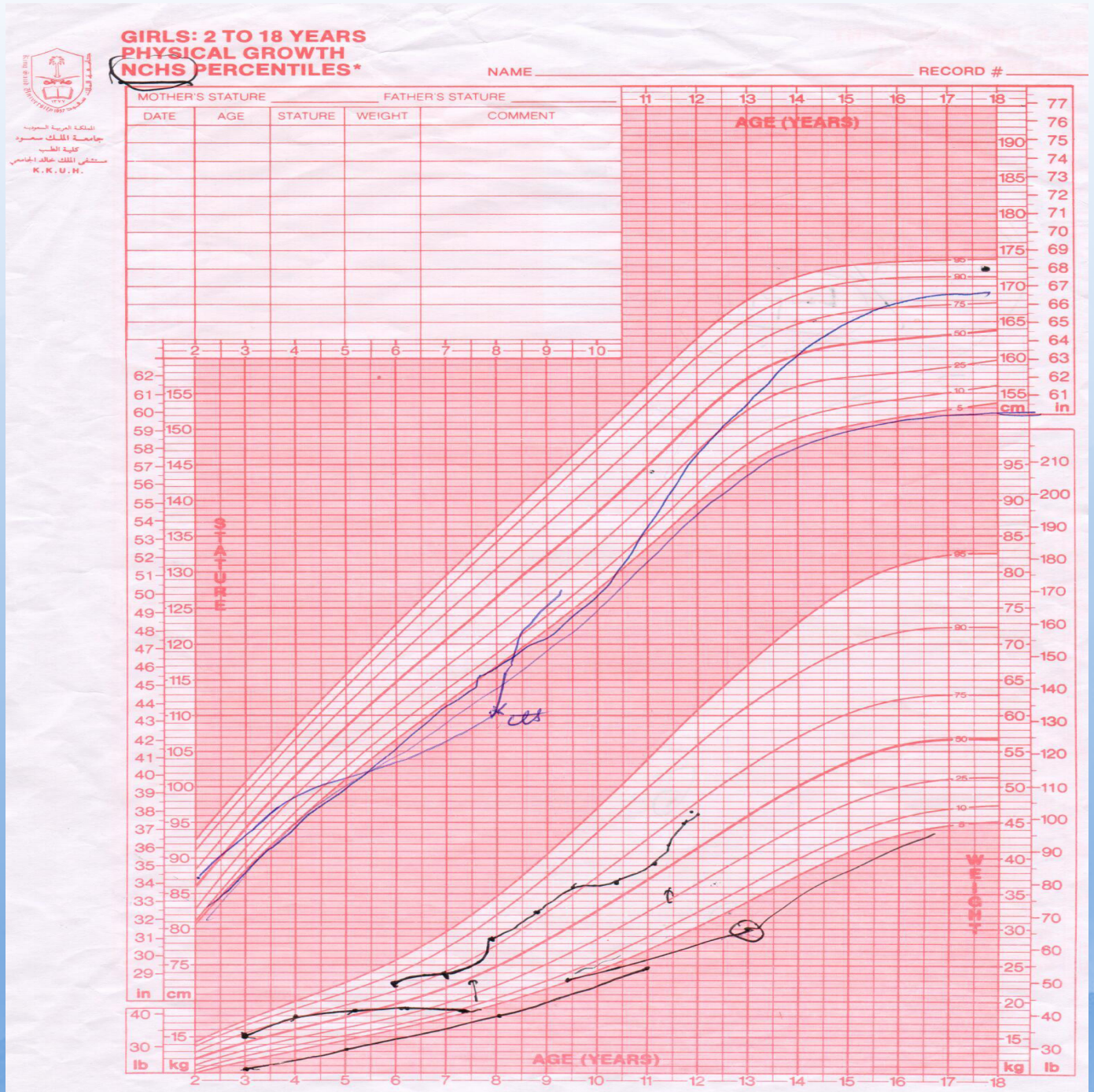
GIRLS: 2 TO 18 YEARS
PHYSICAL GROWTH
NCHS PERCENTILES*
NAME
RECORD #
MOTHER'S STATURE
FATHER'S STATURE
DATE
AGE
STATURE
WEIGHT
COMMENT
AGE (YEARS)
STATURE
WEIGHT
cm
in
kg
lb
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K.K.U.H.

MANAGEMENT

- Goal is “catch-up” weight gain
- Most cases can be managed with nutrition intervention and/or feeding behavior modification
- General principles:
  - High Calorie Diet
  - Close Follow-up
- Keep a prospective feeding diary-72 hour
- Assure access to food programs and other community resources

CALORIC REQUIREMENT

- To determine caloric requirements for infants :
- RDA for age (kcal/kg) x ideal weight for height (kg)/actual weight (kg)

INTAKE

- Energy intake should be 50% greater than the basal caloric requirement
  - Concentrate formula, add rice cereal to pureed foods
  - Add taste pleasing fats to diet (cheese, peanut butter, ice cream)
  - High calorie milk drinks (e.g Pediasure has 30 cal/oz vs 19 cal per oz in whole milk)
  - Multivitamin with iron and zinc
  - Limit fruit juice to 8-12 oz per day

WHEN TO HOSPITILIZE

- Do you hospitalize?
  - Rarely necessary
  - Consider if:
    - the child has failed output management
    - FTT is severe
      - Medical emergency if wt <60-70% of ideal wt
      - Hypothermia, bradycardia, hypotension
    - safety is a concern

HOSPITILIZATION

- For difficult cases:
  - Multidisciplinary team approach produces better outcomes
    - Dietitians
    - Social workers
    - Occupational therapists
    - Psychologists
  - NG tube supplementation may be necessary

TAKE HOME MESSAGES

1. Evaluation involves careful H&P, observation of feeding session, and should not include routine lab or other diagnostic testing

2. Nutritional deprivation in the infant and toddler age group can have permanent effects on growth and brain development

4. Earlier intervention may make it easier to break difficult behavior patterns and reduce sequelae from malnutrition

TAKE HOME MESSAGES

- Accurate plotting is essential
- Most important evaluation is H&P
- Dietary history and social milieu are important clues.
- Key is to observe family/infant interactions.
- Selective labs may be useful.
- Catch up growth requires increased calories, and there are many ways to achieve this


THANK
YOU