Malnutrition in Pediatrics

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Disclosures

• None
Objectives

• Describe the criteria that define malnutrition and undernutrition
• Brief review of abnormal growth patterns reflected in established growth charts
• Brief review of pathologic disease processes in children that can lead to malnutrition
• Discuss risk factors for malnutrition that can be more subtle and escape detection

Malnutrition

• A state of the body in which due to insufficient supply or incorrect absorption of essential nutrients, the body composition changes and the body’s function is impaired
General Trends to Recognize

- Decline in weight centiles over time (precipitous or very gradual)
- Decline in height centiles over time (gradual)
- Failure to follow expected height accrual pattern based on mid-parental height prediction
- Unexpected change in BMI with increased stature

Recognizing Patterns: Sometimes It’s Obvious..

10 month old breastfed twin

Patient diagnosed at 15 with Ulcerative Colitis
6 yo with ASD and feeding difficulties. Intake consisted solely of Banana Blueberry puree and yogurt.

..and sometimes it is not so obvious

Patient with Cystic Renal Dysplasia/renal failure diagnosed at 3 yo
<table>
<thead>
<tr>
<th>Decreased absorption of nutrients</th>
<th>Increased Energy Expenditure</th>
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<tbody>
<tr>
<td>Celiac disease</td>
<td>Cardiac disease</td>
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<td>Crohn's disease</td>
<td>Renal disease</td>
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<td>Eosinophilic enteropathy</td>
<td>Systemic inflammatory disorders</td>
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<td>Protein losing enteropathy</td>
<td>Cystic fibrosis</td>
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<td>Pancreatic insufficiency</td>
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<td>Cystic Fibrosis</td>
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### Definitions/cut offs

- **Undernutrition:**
  - Weight for height z score of less than -2
  - Height for age z score of less than -2
  - BMI of less than 18 for women

- **Overweight:**
  - BMI z score of greater than 2 for 0-18yo
  - BMI of greater than 25 for adults

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### Initial Approach

- Detailed dietary history
- Detailed history around eating behaviors/preferences/aversions/restrictions
- Screening labs: CBC, CMP, CRP, TTG IgA, total IgA
- Stool testing: Fecal calprotectin, fecal elastase

**Lancet 2020**
Clinical Signs of Malnutrition

- Weight loss, lack of gain (acute malnutrition)*
- Lack of height accrual (chronic malnutrition)*
- Fatigue
- Dizziness
- Abdominal pain
- Constipation
- Cold intolerance
- Amenorrhea
- Dry skin, hair loss
- Bradycardia
- Orthostatic tachycardia/hypotension
- Lanugo
- Pallor*

*Easy to miss with well-child only visits

Vitamin C, Zinc deficiency- poor wound healing

Xerosis: Vit A and Zinc deficiency

B12 deficiency

Vitamin B12 deficiency
Scurvy/Vit C deficiency

Iron deficiency

Dietary history positive for restriction/aversion OR food insecurity

Consider referral to GI

Consider referral to psychiatry, adolescent medicine

Referral to nutritionist, Social Work

Screening labs positive for inflammatory issue

None of the above but concerning growth trends

Consider referral to GI or Endocrine

Dietary history positive for restriction/aversion OR food insecurity.
What Lies Beneath the Obvious

Other things to consider

Food Insecurity

What does food insecurity look like in Maine?

1 in 8 percent of households, or nearly 300,000 Mainers, are food insecure. Mainers need better access to food assistance programs.

Food Insecurity: "Food Insecurity or Hunger: A Brief Assessment of the Problem According to Laboratory Tests."

3 in 8 Mainers exhibit food insecurity.

1 in 8 percent of Maine families/individuals are food insecure or at risk of becoming food insecure.

One-third of all Mainers who report food insecurity are contacted and provided assistance.
Food Insecurity in Maine

- Often difficult to find work: closure of paper mills, downsizing of fisheries
- Summer Food Service Program: USDA funds meals for eligible children, but the SFSP reaches only a small number of eligible children
- Maine’s labor market does not provide adequate wages to meet basic needs
- Higher paying jobs are geographically far from rural areas where factory jobs are disappearing
Food Insecurity in Maine

Respondents to survey identified three key factors affecting hunger:

1. Ailing labor market/insufficient wages
2. Lack of access to SNAP benefits
3. Lack of transportation options/cost of gas to get to the store

From Survey Respondents

- “I feed my children before I feed myself. And I hate this, but I have to limit the portions that my children can have for a meal.” (Middle aged mother, Lakes Region)

- “South Portland has some places to get food, but I can’t get there on the buses, and walking is hard because I have to carry all of the stuff by myself.” (Single mom, Portland)
GSFB/Preble Street Policy Recommendations

• Require high need schools to serve breakfast after the bell
• Invest in more summer meals sites across the state
• Eliminate the reduced-price category for school meals
• Create a statewide online application for school-based meals
Maine has been an outlier nationally and regionally, with above average rates of household food insecurity every year since 2005 (USDA, Feeding America). Even as the national food insecurity rate recovered following the 2008 recession, the problem in Maine grew worse, reaching a high of 16.4% for 2014-2015. Since at least 2005, Maine has had the highest rate of food insecurity in New England, a region otherwise notable for its low food insecurity.

Food Insecurity Defined:
Lack of consistent access to enough food for an active and healthy life for all household members due to inadequate economic resources at the household level. (USDA)

Maine’s Roadmap to End Hunger by 2030

Among food-insecure Mainers, 43% have incomes higher than the eligibility threshold for SNAP and WIC, the two most effective anti-hunger programs available. The phenomenon of struggling with food insecurity yet being ineligible for anti-hunger programs affects far fewer families nationally, indicating that the way poverty is defined and calculated is particularly ill-suited for capturing the economic realities and living costs in Maine.
Maine's Roadmap to End Hunger by 2030

Policy Changes in Action

THE PLAN IN ACTION: Scaling Benefits to Match Economic Realities is Critical
On October 1, 2021, Maine residents who qualify for the Supplemental Nutrition Assistance Program got a boost in their buying power. The US Department of Agriculture announced a 21% permanent increase to the program after re-evaluating the cost of healthy meals. It took into account convenience foods, like pre-cooked canned beans and pre-cut salads, chopped frozen vegetables, and pre-cut salads have been added to help increase nutrition values for each meal.

THE PLAN IN ACTION: Universal School Meals Lowers Barriers to Child Nutrition
The federal government made breakfast and lunch free for all students during the coronavirus pandemic, and Maine will continue to offer free meals at least through 2023. The effort has highlighted the importance of providing meals to all students, not just those who meet income eligibility requirements. Making school meals free for all students dramatically improves access to healthy food for thousands of Maine children.
Change the Narrative of Food Insecurity to Focus on Collective Responsibility & Amplify the Voices of Impacted People

Poverty and hunger in our communities are the result of systemic failures and structural inequities.

Strategy 1:
Rethrone Hunger and Food Insecurity and their Costs as a Collective Responsibility to Be Addressed with Urgency and Ours That Impact All Maine People

Strategy 2:
Empower and Invest in the Leadership & Inclusion of Impacted People

Proposed Initiatives & Investments:

Maine's Roadmap to End Hunger by 2030

40% of households with children reported using a pantry > once per month

Preventive Medicine Reports 2018

Fig. 1. Free and rates of non-profit organizations in the U.S. (Dewar et al., 2018; Strange et al., 2019, Fig. 2)
Refugee/Asylum Seeking Population

- Often difficult to access food that is culturally appropriate (Halal, etc)
- Halal foods are often difficult to find, much more expensive
- Compensatory behaviors-parents offering calorie dense/nutritionally poor foods so children do not experience hunger
- Children may not ask for non-pork items at school, refuse to eat home cooked meals at school: go hungry instead

Food Insecurity among African/ME migrants

- Obesity/overweight associated with food insecurity
- 2018 study of food insecure migrant children: Alasagheirin and Clark
  - 46% of children had lean mass index >1 SD below normal
  - 1/3 of children had very low bone mineral content
  - 38% had low spinal bone density
  - 21% of children demonstrated wasting
  - 26% were overweight or obese
  - ¼ of children had elevated cholesterol levels
  - No child over 12 years reached recommended 10,000 steps per day

MIXED PICTURE OF MALNUTRITION

Intl Journal of Env Research and Public Health 2020
Malnutrition: Does not always = Thin

- Obesity: a paradoxical state of malnutrition, which despite excessive energy consumption is associated with a shortage of individual microelements

Double Burden Malnutrition

- When obesity occurs alongside malnutrition in the same individual, family, or community
- USA: 53% of households with an underweight individual also house on obese individual

Obesity Facts 2022

Preventive Medicine Reports 2018
Household Level DBM

- One or more individuals with wasting, stunting or thinness AND
- One or more individuals with overweight or obesity in the same home
  - Child is stunted and overweight
  - Mother is overweight, young child is wasted
  - Mother is overweight, young child is stunted
  - Mother is thin, child is overweight

Lancet 2020
Micronutrient deficiencies in Obesity

- USA: 27-30% of daily calorie intake comes from low nutrient foods, desserts, added sugars
- Diet >30% fat: lower levels of Vit A, C, and folic acid
- Vit D deficiency associated with obesity (stored in adipose tissue)
- B Vitamin deficiency (Thiamine, B12)
- Vitamin C deficiency
- Vitamin E deficiency
“Double Duty Actions”

• WHO Definition:
  - Interventions, programs and policies that have the potential to simultaneously reduce the risk or burden of both undernutrition (including wasting, stunting, and micronutrient deficiency or insufficiency) AND overweight, obesity, or diet related non-communicable diseases
ARFID
Avoidant Restrictive Food Intake Disorder
Avoidant Restrictive Food Intake Disorder (ARFID)

- ICD-11: disorder characterized by avoidance or restriction of food intake, resulting in the intake of insufficiency quantity or variety of food to meet energy OR nutritional requirements
- Subcategories:
  - Selective eating since early childhood (infantile anorexia)
  - Generalized anxiety
  - GI symptoms
  - Insufficient/low interest in eating
  - Restriction due to sensory issues
  - Aversive/traumatic experiences
**ARFID**

- Younger
- More common in males
- Longer duration of illness before treatment
- More comorbidities
- 5-12% of patients in ED clinics, 22-24% of patients in day ED programs meet criteria for ARFID
- NO body image disturbance
- Co-occurrence of ASD can complicate the diagnosis

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**ARFID**

- Eat smaller portions of food
- Want to avoid unpleasant sensations
- Early satiety signaling, lack of appetite, lack of interest in food, anxiety during eating, fear of consequences of eating
- Don’t like the look, taste, smell, texture, temperature of food
- Prevalence: largely unknown (5-20%, more often boys)

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Nutrients 2022

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Nutrients 2022
Infantile Anorexia (IA)

- Food refusal, growth deficiency
- No communication of hunger
- Lack of interest in food
- Difficult temperament/fussy baby + mom with anxiety, depression, dysfunctional eating attitudes
- True dyad, can lead to interactional conflict
- Long term outcome not well understood
  - Potential risk factor for eating disorder later in life
  - Potential risk for anxiety/behavioral difficulties

ARFID: Longitudinal study of malnutrition and Psychopathological risk factors from 2-11 years

- 80% were severely or moderately malnourished at dx
- Steady improvement over time but only 27% showed no malnutrition at age 11
- Most mothers had significant eating difficulties, anxiety and depression
- Striking correlation between symptoms of mom and child
- Mom’s anxiety, depression, and dysfunctional attitudes around eating are best predictor of child’s emotional/behavioral issues
Consequences of ARFID

- Weight loss, lack of interval weight and height gain
- Obesity (juice or energy drinks given to kids to provide “vitamins” can lead to overweight)
- Deficiencies if minerals, vitamins, complete proteins, EFAs despite a normal weight
- Vit B1, B2, B12, C, K, zinc, potassium, iron are most commonly deficient in ARFID
- Social consequences
ARFID Cases: TB

- Previously healthy 16 yo female
- Acute onset of dysphagia while eating scalloped potatoes
- Felt it was ‘hard to breathe’
- Taking small bites of food at a time but has had episodes of panicking while trying to eat. Repeated forceful expiration during visit
- 30 pound weight loss in 2 ½ weeks
- No history of anxiety, no body image issues, extremely stoic child who never complains
- Admitted to BBCH for workup

*PSYCHIATRY CONSULTATION: Acute ARFID
OUTCOME: Discharged home on full po

Endoscopy: normal
ARFID Cases: AW

8 yo with multiple food aversions, low volume food intake, poor appetite. Onset of dietary limitations was as a toddler

Treatment: initially started on Cyproheptadine, but aversions worsened

Seen in follow up in GI clinic, discussion took place re: enteral feeding tube

Started again on Cyproheptadine and made good progress
ARFID: MC

17 yo with one year of nausea, early satiety, 10 pound weight loss, gastroparesis on gastric emptying scan. Failed all prokinetics and had NJ tube placed.

ARFID: GV

6 yo with ASD and feeding difficulties. Intake consisted solely of Banana Blueberry puree and yogurt. Due to failure of years of feeding therapy, G Tube placed.
Anecdotal Patient Outcomes

• 1- acute ARFID self resolved, no medical therapy
• 2- after discussion of enteral feeding tubes and restarting Cyproheptadine, symptoms resolved
• 3- Long Term NJ tube feeds necessary
• 4- Long Term Gastrostomy tube feeds necessary
• 5-many others treated in conjunction with child psychiatry, local counselors, Kaleidoscope program, adolescent medicine

Treatment Strategies

• Food Chaining
• Lowering emotions around eating
• Family Based Therapy
• CBT
• Multidisciplinary approach is the best approach (psychiatry, adolescent medicine, GI, RD, Pediatrician)
Summary

• Malnutrition in pediatrics comes in various forms and can have a wide variety of causes
• Growth charts are very important but do not always tell the whole story
• Social Determinants of health are likely of equal importance to disease processes in placing children at risk of malnutrition
• Ask detailed dietary questions and be on the lookout for ARFID

References


References

- Everyone at the Table: Maine's Roadmap to End Hunger by 2030 (maine.gov/dacf)
- “My Daughter Does Not Know How To Make the Chappati”; Vol. 23 No. 3 (2012): Actions and Trends Shaping the Metropolitan University Mission
References

- Kurowska et al: Malnutrition in Obesity: Is it Possible?


Thank you!

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