ADOLESCENT NUTRITION IN FEMALES

Topics for Discussion

• Adolescent growth and development
• Psychosocial development
• Nutritional issues for adolescents
  — Acute and chronic disease risk

**Puberty encompasses** - Somatic Growth & Sexual development

• Adolescent growth spurt,
• Development of secondary sexual characteristics.
• Attainment of fertility.
• Establishment of individual sexual identity.
• Timing for Puberty onset has wide variability -
  • Girls- 8-12 years and Boys- 9-14 years of age.

**Adolescent Growth Spurt**

• Begins distally with enlargement of Hand and Feet, followed by the Arms & Legs and finally by the Trunk and Chest.
  2 Larynx, pharynx and lungs—Voice
  3 Androgens- a) Sebaceous glands- Acne, b) Optic globe-myopia and c) dental- jaw growth, loss of deciduous teeth eruption of permanent cuspids, premolars, and finally molars.

**Bone Growth- Completes in Adolescence**

• Quantitatively important bone mineral accretion occurs-increase in bone density during SMR-2 to 4(Cortical bone growth).
• Bone mineral density- 50% completes during first month of life to puberty onset; 30% in puberty and 20% in late adolescence to adult.
• 1 cm height gain needs Ca-20g; 30% gets absorbed (need 1300 mg/d Natl Acad. Sci. USA-97-98; AJCN 2005;-p 175). Take 4 cups of milk/d. DEFICIENCY-FRACTURES

**Brain Growth in Adolescence**

• Early Childhood- Maximum Brain grows as “Frontal circuits”- related to organization and planning.
• Adolescence- Brain grows in the rear of the brain- linked more to language learning and spatial understanding. Thus brain development continues.
• Myelination of the prefrontal cortex continues in adolescence.
The Vulnerable Life Stage

- Girls—get taller and fatter
  - % body fat increases from the teens into the mid-20s
  - Gain almost 50% of their adult ideal weight 6-9 mo before ht rate increases during puberty
    - Dieting can have a negative impact on linear growth during this time
  - Calorie needs increase by only 200 kcal from 10 yr to 15 yr

Adolescents

- Biological, psychosocial and cognitive changes affect nutritional status
- Rapid growth increases nutrient needs
- Nutrient deficiencies common / health-compromising eating behaviours
- Need for calcium and Vitamin D to build bone density; Iron to prevent iron-deficiency anaemia; Zinc for essential mineral growth

Eatwell Model

Energy/ Protein/ Fat

- Needs around 136500Kcal as total cost of adolescent growth spurt. Peak energy needs- In girls with budding of mammary gland in girls is 2200/d
- Protein 15% of energy- Girls 0.28g/cm ht.
- Fat--<30-35% of total Kcal; 7% saturated/ 10% polyunsaturated and 10% monounsaturated fat. Cholesterol ideally 200mg/day.
• Carbohydrates- 50%

**Requirement and Intake**

- Total carbohydrate should provide up to 50% energy
- Non-milk extrinsic sugars should not exceed 11% energy intake
- Starches, intrinsic and milk sugars should contribute to 39% energy intake
- Certain diets promote restricted intake of carbohydrates
  - Atkins Diet – low carbohydrate diet
  - GI Diet – Encourages foods with low glycaemic index (GI) <60

**Sources of Dietary**

**Biological Functions of Protein**

- Enormous functional diversity
  - Cell membrane structure and function
  - Enzymes & antibodies
  - Hormones and other chemical messengers
- Source of energy
- Structural and Mechanical – Collagen in bone and skin; Keratin in hair and nails; Motor proteins, which make muscles work

**Source of Energy**

- Proteins are the last to be used for energy
  - Occurs in starvation and low carbohydrate diets
- When the body has excess protein stores, some amino acids are converted and stored as fat in body
- Sources of protein

**Fats**

- Functions include:
  - Provide energy
  - Efficient storage of energy (adipose tissue)
  - Insulation & Physical protection to internal organs
  - Essential nutrients required for; metabolic and physiological processes, structural and functional integrity of cell membranes
  - Control body temperature
  - Transport fat soluble vitamins

**Vitamins**

- Essential organic substances, they yield no energy, but facilitate energy-yielding chemical reactions
- Essential nutrients in maintenance of normal health
- Obtained from food because the body can’t make them
- You need only small amounts (micronutrients) because the body uses them without breaking them down, unlike what happens to carbohydrates and other macronutrients

**Minerals**

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Function</th>
<th>Food Source</th>
<th>Deficiency</th>
<th>Overdose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>Helps build strong bones and teeth, Promotes muscle and nerve function. Helps blood to clot. Helps activate enzymes needed to convert food to energy.</td>
<td>Milk, Yogurt, Cheese, Sardines, Broccoli, Green Beans.</td>
<td>Rickets in children; osteomalacia (soft bones) and osteoporosis in adults.</td>
<td>Constipation, Kidney Stones, calcium deposits in body tissues.</td>
</tr>
<tr>
<td>Iron</td>
<td>Essential for making haemoglobin, the red substance in blood that carries oxygen to body cells.</td>
<td>Liver, Lean Meat, Kidney Beans, Enriched Bread, Raisins.</td>
<td>Skin pallor; weakness; fatigue; headaches; shortness of breath (all signs of iron-deficiency anaemia)</td>
<td>Toxic build up in liver and in rare instances the heart.</td>
</tr>
<tr>
<td>Zinc</td>
<td>Necessary element in more than 100 enzymes that are essential to digestion and metabolism.</td>
<td>Oysters, Shrimp, Crab, Beef, Turkey, whole Grains, Peanuts, Beans.</td>
<td>Slow healing of wounds; loss of taste; retarded growth</td>
<td>Nausea, vomiting, abdominal pain, gastrointestinal bleeding.</td>
</tr>
</tbody>
</table>
Water

- Adults are 60-70% water
- **Functions** - Maintain the health and integrity of every cell in the body, eliminate by-products of body’s metabolism, excess electrolytes. Regulate body temperature.
- Recommended intake depends on age, hot environment etc. Averages between 6-12 glass/day

**Nutrition Issues in Adolescent Health**

- Cardiovascular and cancer disease risk
- Osteoporosis and bone mineralization
- Overweight and obesity
- Type 2 diabetes
- Eating disorders

**Cardiovascular Disease and Cancer Risk**

- One-third of CVD and cancer-related morbidity attributed to dietary patterns
  - Diets high in sat fat, total fat, and sodium and low in fiber
  - Diets low in fruits and vegetables
- Dietary fat
  - Recommended: <10% of calories from sat fat and <30% total fat
  - Consumed: 1/3 of adolescents are in this range
- Sodium
  - Recommended: <2.5 g/d
  - Consumed: 3-5 g/d

**Osteoporosis and Bone Mineralization**

- Osteoporosis affects 25-30 million adults in the US, women > men
  - 15-25% with hip fractures require long-term institutional care
  - Treatment of osteoporosis costs $14 billion/yr
- Etiology complex—genetic, hormonal, physical activity, dietary factors

**Genetic Factors account for 20-40% of heritability of BMI**

34 single gene mutations in 83 individuals reported by 2001
- > 250 susceptibility genes linked with human obesity phenotypes
Overweight tracks into Adulthood

Overweight teenagers are 4-5 times as likely to be obese adults.

Psychological and Economic Consequences of Adolescent Obesity

- Discrimination, rejection and low self-esteem, particularly for females
- Less participation in PE and sports activities
- **Lower college acceptance rates**

Type 2 Diabetes

- 3-10 fold increase in prevalence in adolescents
- Mean age is 13.5 yrs

- 95% of teens with Type 2 diabetes have a BMI >85th ile
  - Increased insulin resistance
- 21% of adolescents with BMI's >95th%ile had impaired glucose tolerance (Rocchini 02)

Effective Nutrition Interventions for Adolescents

- Behavioral therapy
- Use developmentally appropriate strategies
- Include an environmental component
- Sufficient amount of contact with patient
- Use literatures

THANK YOU ALL