PROBLEM OF DOUBLE BURDEN DISEASE
(UNDER & OVER NUTRITION)
AND THE CONSEQUENCES

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India: Double Burden of Disease

Under nutrition due to Poverty  30% below BPL

Over nutrition and Obesity  5-7% MIG and HIG Urban area

This is most productive workforce of the country Academics/Planners/Administrators/Professionals

SHOULD BE GIVEN PRIORITY
DEFINITION

Undernutrition-
• Inadequate consumption, poor absorption or excessive loss of nutrients.

Overnutrition-
• Overindulgence or excessive intake of specific nutrients

Malnutrition-
• Refers to both undernutrition as well as overnutrition.
Protein energy malnutrition

Range of pathological conditions arising from lack, in varying proportions, of protein and calories.

- Marasmus: weight for age < 60% expected
- Kwashiorkor: weight for age < 80% + edema
- Marasmic kwashiorkor: wt/age < 60% + edema
EPIDEMIOLOGY

- Global burden - more prevalent in developing countries. “Often starts in the womb and ends in the tomb”
- PEM affects every 4th child world-wide
- More than 50% of deaths in 0-4 years are associated with malnutrition
- Median case fatality rate is 23.5% in severe malnutrition reaching 50% in edematous malnutrition
INDIAN SCENARIO

- Childhood malnutrition underlying cause of death in 35% of all deaths under 5.
- During 1st 6 months, when most babies are breastfed, 20-30% are already malnourished.
- By 18-23 months, during weaning, 30% are severely stunted, 1/5th are underweight.
<table>
<thead>
<tr>
<th>Indicator</th>
<th>Interpretation</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stunting</td>
<td>Low height for age</td>
<td>Chronic malnutrition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prolonged food deprivation/disease</td>
</tr>
<tr>
<td>Wasting</td>
<td>Low weight for height</td>
<td>Acute malnutrition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recent food deficit/illness</td>
</tr>
<tr>
<td>Underweight</td>
<td>Low weight for age</td>
<td>Combined indicator to reflect both</td>
</tr>
<tr>
<td></td>
<td></td>
<td>acute on chronic malnutrition.</td>
</tr>
</tbody>
</table>
GOMEZ CLASSIFICATION

- Only wt for age taken into account
- No comment about height
- All cases of edema in 3rd degree irrespective of wt for age

<table>
<thead>
<tr>
<th>Nutritional status</th>
<th>Wt FOR AGE ( % of expected )</th>
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</thead>
<tbody>
<tr>
<td>normal</td>
<td>&gt; 90</td>
</tr>
<tr>
<td>1st degree PEM</td>
<td>75-90</td>
</tr>
<tr>
<td>2nd degree PEM</td>
<td>60-75</td>
</tr>
<tr>
<td>3rd degree PEM</td>
<td>&lt; 60</td>
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</tbody>
</table>
RISK FACTORS

- LBW
- Multiple birth
- Closely spaced birth
- Early stoppage of breast feeding
- Too early or late weaning
- Recurrent infections
- Illiteracy, poverty
- Secondary due to malabsorption
KWASHIORKOR

- **Essential Features**
  - Marked growth retardation
  - Psychomotor changes
  - Wasting of muscles
  - Dependent pitting edema

- **GI Manifestations**
  - Diarrhoea
  - Infections / Parasitic infestations
  - Mucosal atrophy
  - Enteropathy sec. to anemia
  - Liver enlargement
  - Fatty liver

- **Mineral & Vitamin deficiency**

- **Super added infections**
  - Tuberculosis, bronchopneumonia, measles, enteritis..
• Mucus membrane lesions
  ➢ Smooth tongue
  ➢ Cheilosis, angular stomatitis
  ➢ Herpes simplex stomatitis
• Edema
• Muscle wasting - weak, hypotonic and unable to stand or walk.

**Hair Changes**

• Hypopigmented hair.
• Sparseness (alopecia)
• Change in texture (coarse / silky)
• Easy pluckbility
• Flag sign

**Mental Changes :**

• Lethargy
• Apathetic
• Poor appetite – difficult to feed
MARAUSMUS

Essential Features
• Gross wasting of muscles – skin and bones.
• Emaciation- loss of buccal pad of fat-monkey facies, loose skin of buttocks hanging down- baggy pants appearance
• Marked stunting
• No edema

Non-essential Features
• Mineral and vitamin deficiency
• Indolent ulcers and sores
• GI symptoms – hungry
• Liver is shrunk
• Psychomotor changes – irritable

Grade 1 : Wasting starts in axilla & groin
Grade 2 : Wasting extended to thigh and buttocks
Grade 3 : Chest and abdomen
Grade 4 : Wasting of buccal pad of fat also
SEVERE ACUTE MALNUTRITION

- Weight-for-height of 70% (extreme wasting)
- Presence of bilateral pitting edema of nutritional origin, “edematous malnutrition
- Mid-upper-arm circumference of less than 115 mm in children age 1-5 years old

MANAGEMENT

Mild and moderate malnutrition

- Mainstay of treatment is to give adequate amounts of protein and energy
- At least 150kCal/kg/day, protein intake of 3g/kg/day
- Best measure of efficacy of the treatment is weight gain
4- Ready-to-use-therapeutic-food (plumpy-nut)

- It is consumed as it is, without prior dilution in water, which eliminates the risk of bacterial contamination, associated with using polluted water.
- It is easy to distribute with a nutritional value of 500 Kcal / sachet.
- It can be distributed to the beneficiary with prior knowledge of quantity distributed and therefore food value (1 sachet = 500Kcal).
- A child on its own without help can consume it.
- It allows use at home with follow up from the medical centre.
- It offers logistics facilities with an optimized ratio weight/volume.

Locally produced RUTF

Hyderabad mix
120 g = 500 Kcal
(Wheat, black gram, groundnut flour)
Limited success in uncontrolled studies
B) ORAL FEEDING REGIMEN

1. Initial volume and calories
   - In more severe cases an initial starting volume of 75% of total daily requirements has been used
   - < 7 years old - 80–100 kcal/kg/day
   - 7–10 years - 75 kcal/kg/day
   - 11–14 years - 60 kcal/kg/day
   - 15–18 years - 50 kcal/kg/day
   - If the initial food challenge is tolerated, this may be increased over 3–5 days (Target 150 kcal/kg/day – Rehabilitation phase).
   - Each requirement should be tailored to an individual’s need and the above values may need to be adjusted by as much as 30%.
   - Frequent small feeds (every 2 hrly) are recommended initially. Slowly increase the volume per feed, max of 22 ml/kg/feed (130 ml/kg/day)
   - Feeds should provide minimum of 1 kcal/ml (F-100) to minimize volume overload.
2. PROTEIN

- If a milk-based feed induces diarrhoea with positive faecal reducing substances, a hydrolysate may be used.
- An initial regimen for malnourished children suggests 0.6–1 g/kg/day.
- The feed should be rich in essential amino acids and gradually increased as an intake of 1.2–1.5 g/kg/day is needed for anabolism to occur.
- Slowly increase proteins to 4 – 6 g/kg/day during the catch up phase (Rehabilitation phase after 2 weeks).

3. SUPPLEMENTS

- Twice the recommended daily allowance for vitamins and minerals (Na, K, Ca, PO).
- Supplement with Zinc, copper, folic acid, Vit B12.
- Oral Vit A on day 1.
FOLLOW UP

- Child should be seen after 1 week, 2 weeks, 1 month, 3 months and 6 months. More frequently if any problem found.
- After 6 months, visits should be twice yearly until the child is at least 3 years old.
- The child should be examined, weighed and measured, and the results recorded.
- Any needed vaccine, vit A should be given.
- Training of the mother should focus on areas that need to be strengthened, especially feeding practices, and mental and physical stimulation of the child.

PREVENTION

At national level

1. Nutrition supplementation- Fortification, iodination
2. Nutritional surveillance- define the character and magnitude of nutritional problems and strategies to tackle.
3. Nutritional planning- formulation of nutrition policy, improve food production and supplies, ensure distribution.
PREVENTION

At community level-

- Health and nutritional education
- Promotion of education and literacy in the community
- Growth monitoring
- Integrated health package
- Vigorous promotion of family planning programs

PREVENTION

At family level

- Exclusive breast feeding
- Complementary feeds at 6 months
- Vaccination
- Spacing between pregnancies
The Vicious Cycle Of Childhood Obesity

1. Healthy Child
2. Obese Child
   - Asthma, Diabetes, & Musculoskeletal Disease Prevent Exercise and Bring On Depression & Low Esteem
3. Obese Adult
   - Coronary Artery Disease
   - Diabetes
   - Pulmonary disease
   - High medical bills
   - Mortality
4. Severely Obese Child
   - Extra 20-50 lbs
   - Exercise uncomfortable & painful
   - The other kids make fun of me
5. Mildly Obese Child
   - Extra 10 lbs. Inhibits Movement
   - I'm no good at sports
   - I'm too tired to climb stairs
6. Video Games
    - All Study - No Action
7. Television
8. High Fat Foods

The cycle continues...
**Effects on health**

The first problems to occur in obese children are usually emotional or psychological. Childhood obesity however can also lead to life-threatening conditions including diabetes, high blood pressure, heart disease, sleep problems, cancer, and other disorders. Some of the other disorders would include liver disease, early puberty or menarche, eating disorders such as anorexia and bulimia, skin infections, and asthma and other respiratory problems. Asthma severity is not affected by obesity however. Overweight children are more likely to grow up to be overweight adults. Obesity during adolescence has been found to increase mortality rates during adulthood.

Obese children often suffer from teasing by their peers. Some are harassed or discriminated against by their own family. Stereotypes abound and may lead to low self-esteem and depression.

A 2008 study has found that children who are obese have carotid arteries which have prematurely aged by as much as thirty years as well as abnormal levels of cholesterol.

**Childhood obesity**

is a condition where excess body fat negatively affects a child's health or wellbeing. As methods to determine body fat directly are difficult, the diagnosis of obesity is often based on BMI. Due to the rising prevalence of obesity in children and its many adverse health effects it is being recognized as a serious public health concern. The term overweight rather than obese is often used in children as it is less stigmatizing.
Long term health effects
Children who are obese are likely to be obese as adults. Thus, they are more at risk for adult health problems such as heart disease, type 2 diabetes, stroke, several types of cancer, and osteoarthritis. One study showed that children who became obese as early as age 2 were more likely to be obese as adults. According to an article in the New York Times all of these health effects are contributing to a shorter lifespan of five years for these obese children. It is the first time in two centuries that the current generation of children in America may have a shorter life span than their parents.

Causes
Childhood obesity can be brought on by a range of factors which often act in combination. “Obesogenic environment” is the medical term set aside for this mixture of elements. The greatest risk factor for child obesity is the obesity of both parents. This may be reflected by the family's environment and genetics. Other reasons may also be due to psychological factors and the child's body type. A 2010 review stated that childhood obesity likely is the result of the interaction of natural selection favoring those with more parsimonious energy metabolism and today's consumerist society with easy access to energy dense cheap foods and less energy requirements in daily life.
Causes ....

Prevention
Schools play a large role in preventing childhood obesity by providing a safe and supporting environment with policies and practices that support healthy behaviors. At home, parents can help prevent their children from becoming overweight by changing the way the family eats and exercises together. The best way children learn is by example, so parents need to lead by example by living a healthy lifestyle.

- Dietary
- Legal
- Home environment
- Physical Activity
- Developmental Factors
- Medical Effects
- Psychological Factors
Physical inactivity of children has also shown to be a serious cause, and children who fail to engage in regular physical activity are at greater risk of obesity. Researchers studied the physical activity of 133 children over a three-week period using an accelerometer to measure each child’s level of physical activity. They discovered the obese children were 35% less active on school days and 65% less active on weekends compared to non-obese children.

Physical inactivity as a child could result in physical inactivity as an adult. In a fitness survey of 6,000 adults, researchers discovered that 25% of those who were considered active at ages 14 to 19 were also active adults, compared to 2% of those who were inactive at ages 14 to 19, who were now said to be active adults. Staying physically inactive leaves unused energy in the body, most of which is stored as fat. Researchers studied 16 men over a 14 day period and fed them 50% more of their energy required every day through fats and carbohydrates. They discovered that carbohydrate overfeeding produced 75–85% excess energy being stored as body fat and fat overfeeding produced 90–95% storage of excess energy as body fat.
Children's food choices are also influenced by family meals. Researchers provided a household eating questionnaire to 18,177 children, ranging in ages 11–21, and discovered that four out of five parents, let their children make their own food decisions.
Fruits are nature’s wonderful gift to the mankind; indeed, medicines packed with vitamins, minerals, anti-oxidants and many phyto-nutrients (Plant derived micronutrients). They are an absolute feast to our sight, not just because of their color and flavor but for their unique nutrition-profile that help the human body free of diseases and stay healthy!

• Fruits are low in calories and fat and are a source of simple sugars, fiber, and vitamins, which are essential for optimizing our health.
• Fruits provide plenty of soluble dietary fiber, which helps to ward off cholesterol and fats from the body and to get relief from constipation as well.
• Fruits contain many anti-oxidantssuch as poly-phenolic flavonoids, vitamin-C, and anthocyanins. These compounds, firstly, help human body protected from oxidant stress, diseases, and cancers, and secondly, help the body develop capacity to fight against these ailments by boosting our immunity level. Many fruits, when compared to vegetables and cereals, have very high anti-oxidant value, which is something measured by their "Oxygen Radical Absorbent Capacity" or (ORAC).
Eating Vegetables Provides Health Benefits

- The nutrients in vegetables are vital for health and maintenance of your body.
- Eating a diet rich in vegetables may reduce risk for stroke, cancer, heart diseases and type-2 diabetes.
Eating Enough Green Vegetables
How much is enough? The daily recommendations vary depending on age, gender and activity level but basically, according to the USDA, adults need between 2 and 3 cups of vegetables daily. While that may not seem like a lot, many of us are not meeting the daily requirement. Fortunately many of Diet-to-Go's meals are full of green (and various other) vegetables.

And for those times when you don't have a Diet-to-Go meal, just be sure to sneak in some vegetables with every meal (yes, even breakfast). Most vegetables can be cooked, steamed, stir-fried, sautéed and eaten raw.
food

1. buy it with thought
2. cook it with care
3. use less wheat & meat
4. buy local foods
5. serve just enough
6. use what is left

Don't waste it

U.S. Food Administration
## Problems of Undernutrition

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>At-Risk Group(s)</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>All ages</td>
<td>Dehydration, collapse and death</td>
</tr>
<tr>
<td>Protein/Energy</td>
<td>Infants/Teenagers</td>
<td>Reduced growth/Anorexia Nervosa</td>
</tr>
<tr>
<td>Iron</td>
<td>Infants</td>
<td>Anaemia, poor learning ability</td>
</tr>
<tr>
<td>Zinc</td>
<td>Children/Teenagers</td>
<td>Reduced height and poor immunity</td>
</tr>
<tr>
<td>Fibre</td>
<td>All ages</td>
<td>Constipation</td>
</tr>
<tr>
<td>Iron</td>
<td>Menstruating women</td>
<td>Anaemia</td>
</tr>
<tr>
<td>Folate</td>
<td>Pregnant women</td>
<td>Birth defects</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>Pregnant Asian women</td>
<td>Reduced bone development in infants</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>Vegetarians and elderly</td>
<td>Fatigue, poor concentration, anaemia</td>
</tr>
<tr>
<td>Calcium and vitamin D</td>
<td>Elderly</td>
<td>Osteoporosis and increased risk of fracture</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>Elderly</td>
<td>Increased risk of stroke</td>
</tr>
</tbody>
</table>
Severe Malnutrition: Consequences

Mental development
- Lower IQ levels
- Poorer school performance

Behaviors of recovered severely malnourished children
- shy, isolated, withdrawn
- decreased attention span
- immature, emotionally unstable
- fewer peer relationships/reduced social skills
- played less/stayed nearer to mothers
Teen nutrition deficiency and consequences

Most eating habits are already established by the late teen years.

Teens are growing rapidly during adolescence. Twenty percent of adult height and 50% of adult weight is gained during adolescence.

Because 45% of adult bone mass is added during adolescence, the daily requirement of calcium increases to 1200-1500 milligrams. A significant number of teens are deficient in calcium and other nutrients due to junk food.

Calcium aids in movement of nerve impulses; muscle contraction and relaxation; blood pressure; and the immune system. Caffeine ingestion has been noted to lower bone mineralization and thus increase fracture risk.

Typical caffeine food sources ingested by teens include chocolate, coffee, soft drinks, and tea. The effect of caffeine is enhanced in the absence of a diet inclusive of required amounts of milk.

Symptoms of calcium deficiency include insomnia, tooth decay, depression, headache, and inability to relax.
Stunting: Consequences

• Cross-sectional associations – Low height for age associated with:
  – Reduced cognitive development
  – Poor motor skills
  – Poor neuro-sensory integration
  – Quiet, reserved, withdrawn, timid, passive
  – Difficulty making decisions
  – Decreased involvement with environment, toys, tasks
  – Less able to deal with stressor such as hunger or parasites
Time Scale for the Development of a Deficiency State

• **Days**
  Water; 2-7 days - dehydration, renal and circulatory failure

• **Weeks**
  Protein/Energy 8 weeks - death from respiratory failure if BMI<12.0 kg/m²
  Vitamin B1; 2-8 weeks - fatigue, neurological deficit and cardiac failure

• **Months**
  Potassium; 2 months - fatigue, muscle weakness and necrosis
  Zinc; 4 months - loss of appetite, loss of night vision and infections
  Vitamin C; 4 months - fatigue, haemorrhage and sudden death
  Vitamin B 2-6 months - fatigue, skin changes, inanition and infection

• **Years**
  Vitamin A; 2 years - loss of night vision, infections
  Vitamin B12; 4 years - fatigue, pernicious anaemia, SACD

• **Decades**
  Calcium; 3-4 decades - osteoporosis and fractures
  Chromium; decades - glucose intolerance, type II diabetes and CHD
## Common Problems of Overnutrition

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>At- Risk Group(s)</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>All ages</td>
<td>Obesity</td>
</tr>
<tr>
<td>Sugar - sucrose</td>
<td>All ages</td>
<td>Dental caries</td>
</tr>
<tr>
<td>Sugar - fructose</td>
<td>Adults</td>
<td>Gout, liver disease</td>
</tr>
<tr>
<td>Saturated Fats</td>
<td>Adults</td>
<td>Heart disease</td>
</tr>
<tr>
<td>Animal Protein</td>
<td>Adults</td>
<td>Osteoporosis</td>
</tr>
<tr>
<td>Sodium</td>
<td>All ages</td>
<td>High blood pressure</td>
</tr>
<tr>
<td>Sodium</td>
<td>Elderly</td>
<td>Heart failure and osteoporosis</td>
</tr>
<tr>
<td>Iron</td>
<td>Genetically predisposed</td>
<td>Haemochromatosis</td>
</tr>
<tr>
<td>Vitamin A from food/supplements</td>
<td>Adults and elderly</td>
<td>Osteoporosis</td>
</tr>
<tr>
<td>Water</td>
<td>Elderly and those on antidepressants</td>
<td>Sodium depletion - hyponatraemia</td>
</tr>
</tbody>
</table>
Risk factor for Non Communicable Diseases

- Cardiovascular diseases
  - CAD, CHF, Stroke
- Insulin Resistance and
- Type-2 Diabetes Mellitus
- Reproductive disorders
- Pulmonary diseases
- Gall stone disease
- Cancer- Colon, Rectum, Prostate-Male
- Gall stone–bile duct, breast, endometrium cervix, ovary- Female

- Bone: Joint and skin diseases
Being healthy and fit isn’t a fad or a trend. Instead, it’s a lifestyle.
THANK YOU