Reproductive and Maternal health: Nutritional deficiencies among women

Dr Geeta K Vemuganti,
Prof & Dean, School of Medical Sciences, University of Hyderabad
5th September 2017
Why special needs?
What happens to the food that we eat?...

1. Ingestion
2. Digestion
3. Absorption
4. Assimilation
5. Egestion

---

**Energy Stores in Man**

<table>
<thead>
<tr>
<th></th>
<th>Energy/g Dry</th>
<th>Water/g dry wt</th>
<th>Energy/g Wet</th>
<th>Total Stored Energy, kcal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrates</td>
<td>4</td>
<td>2.3</td>
<td>1.15</td>
<td>340</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>9</td>
<td>0</td>
<td>9</td>
<td>133,000</td>
</tr>
<tr>
<td>Protein</td>
<td>4</td>
<td>2.3</td>
<td>1.15</td>
<td>24,000</td>
</tr>
</tbody>
</table>

---

**Figure 38-4: Energy Nutrients and the Krebs Cycle**

- Protein
- Carbohydrates
- Fat
- Glucose
- Amino acids
- Pyruvate
- Glycerol
- Fatty acids
- Acetyl-coenzyme A
- H$_2$O
- Krebs cycle
- CO$_2$
- ENERGY (ATP)
Total energy expenditure for an average young adult woman and man

**Energy expenditure from physical activity**

**Basal metabolic rate**

Energy expended breaking down food

**WOMAN**

**MAN**

15 MJ/day (About 3,600 calories)

SOURCE: Adapted from Frontiers in Physiology (2013)

<table>
<thead>
<tr>
<th>ENERGY EXPENDITURE</th>
<th>Basal Metabolism</th>
<th>Physical Activity</th>
<th>Eating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breathing</td>
<td>Walking</td>
<td>Chewing</td>
<td></td>
</tr>
<tr>
<td>Organ function</td>
<td>Running</td>
<td>Swallowing</td>
<td></td>
</tr>
<tr>
<td>New cell formation</td>
<td>Tennis</td>
<td>Stomach contractions</td>
<td></td>
</tr>
<tr>
<td>Circulation</td>
<td>Bowling</td>
<td>Digestive juices</td>
<td></td>
</tr>
<tr>
<td>Thinking</td>
<td>Fidgeting</td>
<td>Absorption</td>
<td></td>
</tr>
<tr>
<td>Maintaining body temp</td>
<td>Calisthenics</td>
<td>Elimination</td>
<td></td>
</tr>
<tr>
<td>All basic body functions</td>
<td>Any physical movement</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Global Hunger Index

- ≥ 30.0, extremely alarming
- 20.0 – 29.9, alarming
- 10.0 – 19.9, serious
- 1.5 – 9.9, low to moderate hunger
- no data
- excluded from GHI

Malnutrition – The Indian context

• Underlying cause of half of all child deaths
• More than a third of undernourished children of the world live in India
• More than half of deaths due to major diseases (malaria, diarrhea, pneumonia, measles)
• 37% of children 0-60 months stunted (height for age – undernourished for some time)
• 22% wasted(weight for height – recent illness)
• 34% underweight( weight for age)
• 55% women anaemic
Child stunting declines, but still high

- 50 % of child malnutrition in the developing world is in India
- 37% children stunted
- 22% wasted
- 34% underweight

**SLOW PROGRESS ON NUTRITION**

Although there is improvement in child nutrition over the last decade, one in three children is still stunted.

| % children under the age of 5 who are stunted | NFHS-3 (2005-6) | 42% | NFHS-4 (2014-15) | 37% |
| % children under the age of 5 who are wasted | 48% | 48% | 22% |
| % children under the age of 5 who are underweight | 39% | 34% |

**States with highest malnutrition (2014-15)**

- Bihar: 48.30% stunted, 20.80% wasted, 43.90% underweight
- Meghalaya: 43.80% stunted, 15.30% wasted, 29.00% underweight
- Madhya Pradesh: 42.00% stunted, 25.80% wasted, 42.80% underweight
Effects of Malnutrition

• Lasting effects on the growth and functional status
• Under nutrition during childhood leads to stunted growth and reduced production
• Severe PEM is associated with infections and carries high mortality
• Malnutrition accounts for 0.2 million deaths
• 30 percent of newborns have low birth weight
• 52 percent of women and 74 percent of children anaemic.
• Other major nutritional deficiencies
  Vitamin A deficiency
  Iodine deficiency
## Burden of NMR and IMR in India

<table>
<thead>
<tr>
<th>Metric</th>
<th>Rate/Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Births</td>
<td>25 million</td>
</tr>
<tr>
<td>Prematurity rate</td>
<td>12 - 15 %</td>
</tr>
<tr>
<td>In numbers</td>
<td>3 million</td>
</tr>
<tr>
<td>LBW</td>
<td>25 - 30 %</td>
</tr>
<tr>
<td>In numbers</td>
<td>6 million</td>
</tr>
<tr>
<td>IMR</td>
<td>60 / 1000</td>
</tr>
<tr>
<td>Deaths</td>
<td>1.5 million</td>
</tr>
<tr>
<td>NMR</td>
<td>40 / 1000</td>
</tr>
<tr>
<td>Deaths</td>
<td>1 million</td>
</tr>
<tr>
<td>HMD</td>
<td>2 % of births</td>
</tr>
<tr>
<td>In numbers</td>
<td>500,000</td>
</tr>
</tbody>
</table>
Hidden hunger

- **Nutrient**: Element or compound used in an organism's metabolism or physiology.
- **Micronutrients**: Nutrients needed for life in small quantities.
  - Minerals: Iron, Iodine, Zinc, Cobalt, Chromium, Copper, manganese etc
  - Vitamins: Water soluble and fat soluble
- More than two billion people (i.e. one in three persons worldwide) suffer from micronutrient deficiency.
According to current stats...

1. 1 billion insufficient kcals and nutrients (hunger)

2. 2 billion sufficient kcals, but insufficient nutrients (hidden hunger)

3. 3 billion sufficient kcals and nutrients (healthy)

1.4 billion excess kcals (some with insufficient nutrients) (overweight/obesity)


FAO. 2013. Food Systems for better Nutrition.


Consequences of Hidden Hunger throughout life

- Elderly: Increased morbidity (osteoporosis, mental impairment, etc.), Increased mortality
- Baby: Low birth weight, Higher mortality rate, Impaired mental development, Increased risk of chronic disease
- Adult: Reduced productivity, Poor socioeconomic status, Malnourished
- Pregnant Women: Increased mortality, Increased perinatal complications, Reduced productivity
- Child: Stunted, Reduced mental capacity, Frequent infections, Inadequate growth catch up, Reduced productivity, Higher mortality rate
- Adolescent: Stunted, Reduced mental capacity, Fatigue, Increased vulnerability to infection

Inadequate vitamin and mineral status


Adapted from the United Nations Administrative Committee on Coordination Sub-Committee on Nutrition (ACC/SCN), Fourth Report on the World Nutrition Situation, 2000, Geneva: ACC/SCN in collaboration with IFPRI.
Malnutrition - Embryo / Fetus

- IUGR - leads to Low Birth Weight (LBW)
- IDD - Brain Damage
- Folate deficiency - Neural Tube defects, Still births
- ↑ Infant Mortality Rate
- ↑ Premature deliveries
- ↑ Pregnancy Wastage
- Risk of Metabolic Syndrome
- 1 out of 3 children have some form of malnutrition - many are invisible
INFECTION AND UNDERNUTRITION
..... a Vicious Cycle

INFECTION
(water and foodborne)

Reduced Food intake/absorption

Undertreatment

Lowered resistance/ Frequent infections

Death
Safe water and basic sanitation

• 7.5% deaths are related to water, sanitation and hygiene “Safer Water, better health” (WHO report, 2008)
• Cases reported are gastroenteritis and cholera
• Contaminated water- A matter of ‘serious concern’
• Polluted water claims lives at Bholakpur
• Sanitation, water engineering skills and capacity building.

• Food Safety

• Building awareness to address climate change
On the Flip side: Overnutrition

**More common**

- In urban areas
- Among the affluent and educated

<table>
<thead>
<tr>
<th>Urban Hyderabad</th>
<th>males</th>
<th>females</th>
</tr>
</thead>
<tbody>
<tr>
<td>overweight</td>
<td>21.8%</td>
<td>27.4%</td>
</tr>
<tr>
<td>obese</td>
<td>2.1%</td>
<td>8.9%</td>
</tr>
</tbody>
</table>

Table: Visweswara Rao et al. (1995)

**Major causes**

- Increasing urbanization (Urban housing)
- Sedentary lifestyles
- Changing food habits
- Occupational work patterns
- Transport
- New stress of working in Call Centers and IT
- Fast Food
Risks related to obesity

In India, alarming rise of NCDs

- accounting for 53% of the deaths in 2008.
- ICMR India Diabetes (INDIAB) study (2011), with data from three states (Tamil Nadu, Maharashtra and Jharkhand) and one union territory (Chandigarh), representing nearly 18.1% of the nation’s population indicates that around 62.4 and 77.2 million people were diabetic and pre-diabetic in 2012 respectively.

Source: S. Khandelwal and K. S. Reddy *obesity* reviews (2013) 14 (Suppl. 2), 114–125:
Why high Malnutrition

Health Infrastructure
- Non-availability of health services/low inst. delivery
- Immunization / ANC / PNC/ emergency care

Human Resource Constraints
- Absence of community workers/ANMs/Nurses
- Non-access to cheap medicines

Food insecurity
- Food availability
- Nutrient in-take
- Seasonality of food
- Nutrition and health education

Gender
- Early marriage/ pregnancy
- Non-spacing
- Anaemia among women
- Low Birth Weight Babies

Weak public health measures against
- Malaria, Water
- Infections, Diseases
- Diarrhoea, dysentery, fever

Cultural practices
- Breast feeding
- Food consumption during pregnancy
- Unsafe and unclean deliveries
Nutritional factors in Diabetes & Barker’s theory

• The prevalence of type 2 diabetes in a given population depends on past prevalence of LBW and present presence of adult obesity

• Causes of LBW
  Macro & micro nutrient deficiencies during pregnancy

• Causes of obesity
  Catch up growth, faulty food habits and sedentary lifestyle
Diabetes Epidemic In India

Diabetes patients in millions

Year

Millions

2000

32.7m

2013

65.1m

Gulati S., Nutrients 2014.
## Diabetes Prevalence in India

<table>
<thead>
<tr>
<th>City</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyderabad</td>
<td>16.6%</td>
</tr>
<tr>
<td>Chennai</td>
<td>18.6%</td>
</tr>
<tr>
<td>Mumbai</td>
<td>9.3%</td>
</tr>
<tr>
<td>Bangalore</td>
<td>12.4%</td>
</tr>
<tr>
<td>New Delhi</td>
<td>10.3%</td>
</tr>
</tbody>
</table>

Baruah M.P., Indian J of Endocrinol Metab, 2014
Three common diseases

Diabetes

Hypertension (BP)

Arthritis
Risks Continued…

• Cardiovascular diseases

Chronic diseases now a leading cause of death in rural India—mortality data from the Andhra Pradesh Rural Health Initiative International Journal of Epidemiology 2006

• Orthopaedic and hepatic problems

• Depression
Tackling the triple burden

- Struggling with problem of Malnutrition- undernutrition
  Undernutrition still kills almost 1.5 million women & children
- Micronutrient deficiency can exaggerate in certain conditions
- Alarming increase in overweight & obesity
  In urban India, more than 23% of women are either overweight or obese, which is higher than the prevalence among men (20%)
- Undernutrition-micronutrient def-obesity (triple burden)
- Hunger and obesity affect same population – Double burden (More than 800 million people go hungry yet half a billion people are obese)
National Nutrition Policy 1993

Direct intervention – short term

• Nutrition intervention for specially vulnerable
• Expanding the Safety Net (UIP, ORT, ICDS)
• Improving Growth monitoring (0 to 3 years)
• Reaching the adolescent girls through ICDS
• Better coverage of expectant mothers to reduce Low Birth Weight babies
• Fortification of essential foods
• Popularization of low cost nutritious diet
• Control of micronutrient deficiencies among vulnerable groups
Food Security: All people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life
Food System

• Food systems are the time from when the food is produced in the field, the processes it goes through, all the way until the food lands on our plate.
• During that time, the food or the products can go through a number of processes – harvesting, transportation, processing – that affects quality of food systems are stretching our natural resources without meeting our nutritional needs.
• Poor families in low-income countries struggle to get their daily bread, maize or rice while marketing and cheap prices push food that is high in fat, sugar and salt.
• Fixing food systems is the key to ending malnutrition.
Food hygiene

A major concern

• 1 in every 10 diseases and 6% of all deaths globally are caused due to lack of Sanitation In India

• 1.03 crore (10 million) people die annually

• 7.8 lakh (~7.5%) deaths are related to water, sanitation and hygiene as per “Safer Water, better health” (WHO report, 2008)

• Diarrhoeal diseases cause 4.02 lakh deaths

• Antibiotic resistance, drug/pesticide residue

• Implementation of Food Safety and Standards Act 2006
Economic Impact of unsafe food

Individuals
- Medical costs
- Missed work & lost wages
- Travel to get care
- Expenses for care taker
- Chronic disease

Society
- Loss of productivity
- Cost of disease investigation
- Loss of revenue due to business closure and product avoidance
- Chronic disease
Good Practices in Food Chain

- GAPS
- Pesticide use
- Manure use
- Harvesting
- Processing
- Packaging
- Storage
- Transport
- Worker Hygiene

HACCP
- Grading and Sorting Tables
- Elevated auction platforms
- Washing and Disinfection
- Washing of Crates
- Worker Hygiene
- Cold Storage

HACCP
- Grading and Sorting Tables
- Washing and Disinfection
- Worker Hygiene
- Cold Storage

- Consumer Education
- Consumer Awareness

FROM FARM TO FORK
We have a collective responsibility to make a difference.
Food is essential for life

“What is amazing is the quiet acceptance of the consistent deprivations”
- Amartya Sen