Obesity: The Indian Perspective

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Chief Project Officer
Diabetes Foundation (India)
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The Myth

“You are talking of obesity, while malnutrition is everywhere”
Reality: The Double Jeopardy
# Prevalence of overweight/obesity among Adolescents (14-18 yrs), Delhi

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>Gender</th>
<th>Public Schools</th>
<th>Age wise prevalence in Public Schools</th>
<th>Government Schools</th>
<th>Age wise prevalence in Government Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Male</td>
<td>29.7</td>
<td>32.6</td>
<td>12.9</td>
<td>12.7</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>39.6</td>
<td></td>
<td>12.4</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Male</td>
<td>23.3</td>
<td>29.9</td>
<td>11.8</td>
<td>11.5</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>39.0</td>
<td></td>
<td>11.0</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Male</td>
<td>28.0</td>
<td>25.1</td>
<td>7.8</td>
<td>8.4</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>20.8</td>
<td></td>
<td>9.4</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Male</td>
<td>27.0</td>
<td>25.3</td>
<td>9.4</td>
<td>11.0</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>21.6</td>
<td></td>
<td>13.8</td>
<td></td>
</tr>
</tbody>
</table>

Total% (N = 3548) 29.0 11.1

OVERALL PREVALENCE = 24.2%

Misra et al. Ann Nutr Metab.2011
## Prevalence of Childhood Overweight/Obesity

<table>
<thead>
<tr>
<th>Country/City</th>
<th>Year</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>2004</td>
<td>10</td>
</tr>
<tr>
<td>USA/UK</td>
<td>2000</td>
<td>20</td>
</tr>
<tr>
<td>Australia</td>
<td>1995</td>
<td>20</td>
</tr>
<tr>
<td>India/Chennai</td>
<td>2002</td>
<td>22</td>
</tr>
<tr>
<td>India/Delhi</td>
<td>2004</td>
<td>16</td>
</tr>
<tr>
<td>India/Delhi</td>
<td>2006</td>
<td>29</td>
</tr>
</tbody>
</table>

*Misra et al., 2006*
Obesity is Caused by Long-Term Positive Energy Balance

↑ 2% = 2.3 kg in a year
Current Eating Habits

- More than 40% of the children eat out once or more in a week
- 70% children eat chips once or more in a week
- 38% children eat burgers once or more in a week
- 48% children eat pizzas once or more in a week
- 40% eat french fries once or more in a week
- 60% eat noodles and drink colas once or more in a week

Misra et al., Unpublished data, 2008
The Myths

2. “Fat children are healthy. With age ‘baby fat’ will go away.”

Reality:
50-70% of obese children will remain obese adults.
Obesity has reached alarming figures. Current figures in New Delhi indicate that every second person fulfills criteria of obesity or has excess abdominal fat.
The Myths

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“What will happen if a child is fat. He/she will not have any diseases”

Reality:

• Diabetes may strike early
• Polycystic ovaries, excess facial hair and infertility may occur in girls
GIRTH OF A NATION

Urban Indians are getting richer and fatter. With 1.2 billion middle class Indians, overweight, obesity, with its health risks, is now a major killer.

Fast food restaurants have seen a dramatic growth. Intense competition for market share has led to increased portion sizes, as well.

Urban sprawl, less walking space and dynamic growth of two-wheelers and four-wheelers provide less incentive for burning the fat.

Obesity tends to flourish as a disease of affluence in countries that are developing and becoming westernised.

6 A global epidemic
One out of five is overweight or obese in the world.

in awareness drives with NGOs and in schools, walk the corridors of power to sensitise the nation’s high and mighty, and alert international health bodies. “There are clear and hard facts in urban areas that things are as bad as they could be,” says Anoop Misra, an obesity expert involved with anti-obesity drives initiated by ANMs. The first Asia Pacific Obesity Conclave took place in Delhi in March. Chowbey, the driving force behind the conclave, is also a laparoscopic surgeon to the President of India. “I made a presentation to President A.P.J. Abdul Kalam in January,” says Chowbey. What better way to start a campaign? “I’ve never seen a President with such ideal weight,” he laughs. “Dr Kalam has promised to help us out with the anti-obesity awareness drive.”

The ones who really need help are finding out just what a weighty problem it is. “I’ve always loved food. Lots of food, no exercise and slowly I bloated up over time, till one day I realised I was 100 kg.” Diabetes and high blood pressure came hand in hand with it. Finally, I went in for bariatric (weight reducing) surgery,” says Ashok Kumar Anand, 54, a resident of Gurgaon. More traumatic was the case with Mrs Ghose of Kolkata. She ballooned to a point that her 10-year-old son begged her not to come to his school for PTA meetings. “You can’t imagine how bitterly she cried,” says Dr Veena Aggarwal, head of ANMs at V.B.H. Healthcare Ltd, Delhi, who treated her. “Can you imagine how it hurts to be an object of shame for your child?”

These are just two among millions of Indians who are discovering that fat is not just ugly, it is dangerous as well. The major victims of obesity are among the 300 million-strong Indian middle class, with around 35 per cent—or 120 million—reaching dangerous levels of obesity. Last year, an ANMs survey conducted on 35,000 people in 10 industrial cities revealed that waistlines had grown rotund by more than eight inches worldwide, 37 per cent of all schoolchildren were found to be overweight. Changes in

35 MILLION DIABETICS IN INDIA. OBESITY IS A MAJOR CAUSE OF DIABETES.
Once fat, you could develop diabetes and heart disease as early in twenties!!!!
The current load of diabetes in India is expected to increase by 170% in the next 20 years. Our India-US collaborative study indicates that 1 in every 10 person in Delhi is a diabetic and 1 in every 5 Indian in US is a diabetic.
The Myths

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“Heart Disease starts at old age”

Reality:
Hardening and blockage of the arteries starts at 11 years in boys and 15 years in girls
Prevalence of Fibrous Plaques in Young Adults:  
*The Bogalusa Heart Study*

Hardening and blockage of the arteries starts at 11 years in boys and 15 years in girls.

The Evidence

High Blood Pressure

One in three urban Indians have high blood pressure. It is predicted to increase by 60% in next 20 years.
The Myths

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“A fat child is otherwise healthy”

Reality:

28% of urban children have syndrome X, one step away from diabetes and 2 steps away from heart disease
**Syndrome X**

Nearly 35% of the general population and 1/4th of the adolescents have syndrome X, which predates diabetes and heart disease.
### Prevalence of Insulin Resistance (by HOMA-IR)
Asian Indian Children (n=396)

**Overall Prevalence; Males, 21.8%, Females, 35.8%**

<table>
<thead>
<tr>
<th></th>
<th>% Prevalence</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal BMI</td>
<td>20</td>
<td>21.3</td>
<td></td>
</tr>
<tr>
<td>High BMI</td>
<td>66.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal BF</td>
<td>16.7</td>
<td>20.4</td>
<td></td>
</tr>
<tr>
<td>High BF</td>
<td>58.2</td>
<td>47.6</td>
<td></td>
</tr>
</tbody>
</table>

Misra et al., *Int J Obesity*, 2004
hs-CRP in Asian Indian Children:

Levels Correlate to Obesity

Misra et al., Atherosclerosis, 2004
Diet and CRP: The Recommendation for Saturated Fat

- Mean CRP: 1.3 mg/L in children (moderate CV risk category)
- 1% decrease in energy intake by saturated fat: CRP levels decrease by 0.14 mg/L
- Saturated fat intake < 7% of energy intake would result in mean CRP level < 1 mg/L (Low risk for CVD)

Misra et al., Atherosclerosis, 2005
The Myths

6

“A child does not develop high blood pressure or high cholesterol”

Reality:

Many children will have high blood pressure and low good cholesterol
The Evidence

Heart Disease

The absolute death rate due to heart disease shall increase in India from 1.6 million/y in the year 2000 to 2 million in 2010 and 2.6 million by the year 2020, an increase by 61%.
The Myths

7

“A child should enjoy, and eat and relax. Such time will not come again later”

Reality:

Parents do not realize, but children are eating junk food all the time.
<table>
<thead>
<tr>
<th>Item</th>
<th>Younger children</th>
<th>Older Children</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt; 2-3 times a week</td>
<td></td>
</tr>
<tr>
<td>Chips/ Pringle</td>
<td>67.5</td>
<td>66.3</td>
</tr>
<tr>
<td>Corn Puffs etc.</td>
<td>58.6</td>
<td>52.4</td>
</tr>
<tr>
<td>Popcorn</td>
<td>32.8</td>
<td>28.2</td>
</tr>
<tr>
<td>Soft Drinks</td>
<td>30.0</td>
<td>41.0</td>
</tr>
<tr>
<td>Sherbets</td>
<td>42.3</td>
<td>45.6</td>
</tr>
<tr>
<td>Ice-Creams</td>
<td>43.7</td>
<td>57.9</td>
</tr>
<tr>
<td>Cakes/muffins</td>
<td>34.7</td>
<td>31.7</td>
</tr>
<tr>
<td>Chocolates</td>
<td>71.3</td>
<td>74.7</td>
</tr>
<tr>
<td>Fried Food</td>
<td>39.7</td>
<td>56.7</td>
</tr>
<tr>
<td>Fast Food (Pizza/burger)</td>
<td>22.0</td>
<td>30.93</td>
</tr>
</tbody>
</table>

Misra et al. Unpublished data. 2011
The Evidence

High Lipids

1/3\(^{rd}\) Indians have high levels of triglycerides (a form of bad cholesterol) and 30-70\% have low levels of HDL (good cholesterol).
The Myths

8

“All children are doing required physical activity”

Reality:
Time on TV, internet and studies leaves little time for play. Even in pd assigned for physical activity, many do not participate.
## Willingness to be physically more active

<table>
<thead>
<tr>
<th>Physical activity</th>
<th>Younger Children 9-11 years % (N=600)</th>
<th>Older Children 12-18 years % (N =1200)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willing</td>
<td>67.3 (404)</td>
<td>71.0 (852)</td>
</tr>
<tr>
<td>Not Willing</td>
<td>32.7 (196)</td>
<td>28.6 (343)</td>
</tr>
<tr>
<td>Do not know</td>
<td>-</td>
<td>0.4 (5)</td>
</tr>
</tbody>
</table>

Misra et al. Unpublished data. 2011
# Sedentary Activities among Children

<table>
<thead>
<tr>
<th>Activity More than 60 Minutes</th>
<th>Younger Children % (N)</th>
<th>Older Children % (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV viewing</td>
<td>70.3 (407)</td>
<td>84.7 (987)</td>
</tr>
<tr>
<td>Book Reading</td>
<td>55.0 (269)</td>
<td>58.9 (551)</td>
</tr>
<tr>
<td>Working on Computer</td>
<td>55.6 (163)</td>
<td>67.9 (477)</td>
</tr>
<tr>
<td>Listening to Music</td>
<td>30.6 (129)</td>
<td>47.6 (487)</td>
</tr>
<tr>
<td>Video Games</td>
<td>53.7 (122)</td>
<td>56.2 (200)</td>
</tr>
</tbody>
</table>

Misra et al. Unpublished data. 2011
The Myths

9

“All of us (parents, teachers) teach them correct diet and lifestyle”

Reality:
Most do not have correct knowledge or time to educate children. Healthy snacks are not prepared at home. Many parents and teachers are obese themselves! No cohesive intervention program in India
## Consumption of lifestyle foods among Mothers

<table>
<thead>
<tr>
<th>Item</th>
<th>Mothers of Younger Children</th>
<th>Mothers of Older Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chips/ Pringle</td>
<td>53.3</td>
<td>56.7</td>
</tr>
<tr>
<td>Corn Puffs etc.</td>
<td>31.0</td>
<td>47.2</td>
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<tr>
<td>Popcorn</td>
<td>28.7</td>
<td>35.7</td>
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<td>Soft Drinks</td>
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<td>27.8</td>
</tr>
<tr>
<td>Sherbets</td>
<td>42.0</td>
<td>43.7</td>
</tr>
<tr>
<td>Ice-Creams</td>
<td>43.4</td>
<td>48.2</td>
</tr>
<tr>
<td>Cakes/muffins</td>
<td>23.7</td>
<td>29.16</td>
</tr>
<tr>
<td>Chocolates</td>
<td>47.3</td>
<td>57.2</td>
</tr>
<tr>
<td>Fried Food</td>
<td>38.8</td>
<td>37.7</td>
</tr>
<tr>
<td>Fast Food</td>
<td>14.7</td>
<td>14.8</td>
</tr>
</tbody>
</table>

Chips/Pringles, Corn Puffs, Popcorn, Soft Drinks, Sherbets, Ice-Creams, Cakes/Muffins, Chocolates, Fried Food, and Fast Food were consumed more than 2-3 times a week, as per Misra et al. Unpublished data. 2011.
Knowledge Regarding Unhealthy Diet and Diseases among Children

- Overweight
- Hypertension
- High Triglycerides
- Cholesterol
- High Sugar
- Heart Disease
- Cancer

Percentage

Younger Children
Older Children

Misra et al. Unpublished data. 2011
Knowledge Regarding Unhealthy Diet and Diseases among Mothers

- Overweight and Obesity
- Hypertension
- High Triglycerides
- High Cholesterol
- High sugar
- Heart Disease
- cancer

Misra et al. Unpublished data. 2011
Relationship Between Food Consumption Pattern of Mother and Children

Correlation analysis was done for food consumption of mothers and children. A very high order correlation was found for the following food items:

- cereals
- pulses
- vegetables
- Milk and Milk products
- Meat and Poultry
- Fruits and fruit juices
- Nuts

Misra et al. Unpublished data. 2011
So what if there are metabolic abnormalities or diseases, these can be easily treated

Reality:
Most of these diseases are catastrophic and have complications that cannot be reversed. Most will shorten lifespan
Complications of Obesity

- Pulmonary disease
  - abnormal function
  - obstructive sleep apnea
  - hypoventilation syndrome

- Nonalcoholic fatty liver disease
  - steatosis
  - steatohepatitis
  - cirrhosis

- Gall bladder disease

- Gynecologic abnormalities
  - abnormal menses
  - infertility
  - polycystic ovarian syndrome

- Osteoarthritis

- Skin

- Gout

- Phlebitis
  - venous stasis

- Idiopathic intracranial hypertension
  - Stroke

- Coronary heart disease
  - Diabetes
  - Dyslipidemia
  - Hypertension

- Severe pancreatitis

- Cancer
  - breast, uterus, cervix
  - colon, esophagus, pancreas
  - kidney, prostate

- Cataract
Obesity and Health risks

- Hypertension
- Diabetes
- Respiratory Problems
- Gall Bladder disease
- Cancer
- Infertility
- Renal Disease
- Stroke
- Optical disorders
- Osteoarthritis
- Heart Diseases
- Depression
Causes And Prevention
Unhealthy Eating Habits

Erratic eating habits
Frequent fast and fried food consumption
Excess intake of colas
Excess consumption of refined foods
Not consuming enough fruits and vegetables
Sedentary Lifestyle

Lack of Physical Activity

67% children spend less than 1 hour in physical activity
# Macronutrient Intake Profile of the Asian Indian Adolescents (Urban)

*Recommended Dietary Allowance (Figures mentioned are Mean ± SD)*

<table>
<thead>
<tr>
<th>Macronutrients</th>
<th>Gender</th>
<th>RDA* %energy</th>
<th>13-15y (n=254)</th>
<th>16-18y (n=543)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy (kcal/day)</strong></td>
<td>Boys</td>
<td>–</td>
<td>2339±498</td>
<td>2324 ± 549</td>
<td>0.856</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td></td>
<td>1905 ± 472</td>
<td>1820 ± 421</td>
<td>0.045</td>
</tr>
<tr>
<td><strong>Protein (g/day)</strong></td>
<td>Boys</td>
<td>10-15%</td>
<td>69 ± 19</td>
<td>68 ± 18</td>
<td>0.900</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td></td>
<td>53 ± 16</td>
<td>50 ± 13</td>
<td>0.001</td>
</tr>
<tr>
<td><strong>Carbohydrate (g/day)</strong></td>
<td>Boys</td>
<td>55-65%</td>
<td>316 ± 71</td>
<td>313 ± 77</td>
<td>0.352</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td></td>
<td>238 ± 53</td>
<td>239 ± 62</td>
<td>0.892</td>
</tr>
<tr>
<td><strong>Total fat (g/day)</strong></td>
<td>Boys</td>
<td>15-30%</td>
<td>85 ± 26</td>
<td>84 ± 30</td>
<td>0.681</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td></td>
<td>77 ± 25</td>
<td>71 ± 21</td>
<td>0.030</td>
</tr>
</tbody>
</table>

* Misra et al., JACN 2009
Health and Nutrition Education Initiatives by Diabetes Foundation (India)
Diabetes Foundation (India) has pioneered in launching Health and Nutrition Education initiatives, the first of their kinds in the whole of South Asia to spread the awareness of Obesity and Diabetes prevention amongst the youth.
Diabetes and Obesity Awareness for Children/Adolescents & Adults

A 50 city country wide awareness and education program

Initiative of National Diabetes, Obesity, and Cholesterol Diseases Foundation

March 5, 2011
Objectives

Overall Aim:

To create mass awareness about diabetes and obesity among children and adults and to thus act as change agents for better lifestyles and prevention of diabetes
Objectives

Specific Objectives

• To enhance awareness among school children, and adults about diabetes and obesity through
  – Lectures on “Diabetes: Causes, Consequences, Prevention & Care”
  – School Health Camps
  – Public Awareness Campaign:
    • Public Health Lectures on “Diabetes: Causes, Consequences, Prevention and Care”
    • Diabetes Health Camps
    • Walk for Awareness about Diabetes Prevention on November 14, 2011 – World Diabetes Day
    • Distribution of printed education material to children and adults
    • Message dissemination through media
Participating Teams

Project Dishaa (50 city Initiative)

Across 50 cities in India

Initiative of National Diabetes, Obesity, and Cholesterol Diseases Foundation & Emcure Pharmaceutical (India) Pvt. Ltd

March 5, 2011
Initiatives being implemented in various cities of India

New Delhi
Mumbai
Jaipur
Agra
Chandigarh
Vadodara
Noida

Dehradun
Allahabad
Bangalore
Pantnagar
Pune
Lucknow
Bhubaneshwar
“MARG” (The Path)

Medical education for children/
Adolescents for Realistic prevention of
obesity and diabetes and for healthy aGing

A Project of

Diabetes Foundation (India)

Funded by: World Diabetes Foundation (Denmark)
The initiatives are organizing activities to focus on:

1. changing the individual (children, family, teachers)
2. changing the environment (school, home)
Information and Educational Material for Children, Parents and Teachers

Project “MARG”: The Path
Medical Education for Children / Adolescents for Realistic Prevention of Obesity and Diabetes and for Healthy Aging

“Health Awareness Program for the Prevention of Obesity and Diabetes through Balanced Diet and Physical Activity”

Promoted by: Diabetes Foundation (India)
Funded by: World Diabetes Foundation

Principal Investigator: Prof. Anoop Misra, Director & Head, Department of Diabetes & Metabolic Diseases, Fortis Hospitals, New Delhi & Noida, WHO Expert in Childhood Obesity

Co-Investigator: Mrs. Rekha Sharma, Former Chief Dietitian, All India Institute of Medical Sciences, New Delhi, Senior Vice President VLCC

Project “MARG”: The Path
A World Diabetes Foundation Funded Project
Office of Project “MARG”: The Path and Diabetes Foundation (India)
C-697, Saketjung Development Area, New Delhi 110 016 (India)
Tel. No.: +91-11-41759672 Telefax: +91-11-4057091
Email: anoopmisra.marg@gmail.com

Choose Healthy... Stay Healthy!!!

Good to Eat... Tough to Burn

Colas/Fruit Juices/ Canned Juices
Whole Fruits/Lass/Soy Milk/ Coconut Water etc.

Butter Popcorns
Steamed Corns (Without Butter)

Pizza/Burger/ White Bread/Noodles
Brown Bread/Atta Noodles/ Wheat Porridge/Sprouts

Ice-Creams/Ice-Cream Shakes/Puddings
Fruit Puddings/Fruit Salads/ Skimmed Milk Shakes
“TEACHER”

Trends in Childhood Nutrition and Lifestyle Factors in India

A 6 City Countrywide Project of

Diabetes Foundation (India)
Incorporate Physical Activity in Your Daily Life

- Do grocery shopping yourself.
- Instead of sitting and chatting go out for walk.
- Make a pact to do some activity with friends, such as yoga & brisk walking for 5 times a week.
- Buy and use a skipping rope at home.
- Take your dog out for a walk.
- Don't sit when you can stand, don't stand when you can walk, don't walk when you can jog.
- Park your car further away from work or home than normal, or get off the bus a stop before and walk rest of the way.
- Use staircase instead of escalator or elevator.
- Walk for 5 minutes after an hour of sitting work.

Benefits of Regular Physical Activity

- Helps in building and maintaining healthy bones, muscles and joints.
- Helps in maintaining an ideal body weight by reducing fat and increasing muscle mass.
- Prevents or delays the development of high blood pressure, diabetes, heart diseases, osteoarthritis and respiratory problems.
- Helps in sound sleep.
- Increases concentration and helps in managing stress.

Tips for Making Healthy Food

- Use whole cereals and grains like oats instead of refined cereals like maida.
- Steam vegetables instead of frying.
- For filling and topping use green leafy vegetables and seasonal vegetables.
- Choose refined oil and mustard oil instead of butter, margarine and vanaspati.
- Choose cottage cheese instead of processed cheese and other spreads.
- Reduce amount of fat by grilling and roasting instead of frying.
- Avoid excess water while cooking vegetables and dals.
- Squeeze lemon in salads, vegetables and dals.
- Avoid tea and coffee immediately after meals as it inhibits iron absorption.
- Use iron vessels for preparation of dal and vegetables.
- Use pressure cooking instead of open pan cooking.
- Use non-stick utensils.
- Increase intake of water/fluids.
- Keep portion size small.

Project “TEACHER”

“Trends in Childhood Nutrition and Lifestyle Factors in India”

Go On a Walking Spree If You Want to be Disease Free

Promoted By: Diabetes Foundation (India)

Prof. Anoop Misra
Director & Head
Department of Diabetes & Metabolic Diseases
Fortis Hospitals, New Delhi

Mrs. Rekha Sharma
Chief Dietician,
All India Institute of Medical Sciences, New Delhi
“CHETNA”

Children’s Health Education Through Nutrition and Health Awareness Program

A Project of

Diabetes Foundation (India)

Funded by: Rotary Club South East (Delhi)
HARD TO GET RID OF THE JUNK THAT YOU EAT

<table>
<thead>
<tr>
<th>Junk Food</th>
<th>Calorific Value</th>
<th>How to Burn It</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Slice Pizza</td>
<td>250 CAL</td>
<td>Bicycling for 1 1/2 hours</td>
</tr>
<tr>
<td>1 Cheese Burger</td>
<td>330 CAL</td>
<td>Swimming for 1 hour</td>
</tr>
<tr>
<td>1 Medium French Fries</td>
<td>300 CAL</td>
<td>Jogging for 1/2 an hour</td>
</tr>
<tr>
<td>1 Mac Combo</td>
<td>700 CAL</td>
<td>Basketball for 2 hours</td>
</tr>
<tr>
<td>1 Pastry</td>
<td>500 CAL</td>
<td>Tennis (Singles) for 1 1/2 hours</td>
</tr>
<tr>
<td>1 Samosa</td>
<td>150 CAL</td>
<td>Dancing for 1/2 an hour</td>
</tr>
<tr>
<td>Cola (200 ML)</td>
<td>110 CAL</td>
<td>Jumping rope for 15 minutes</td>
</tr>
</tbody>
</table>

ARE YOU AT RISK OF OBESITY

Obesity is an excess proportion of total body fat. The best indicator of fatness is Body Mass Index or BMI.

Know your BMI:
- Measure your height in meters
- Take your weight in kilograms

Use the following formula to calculate BMI:

\[ \text{BMI} = \frac{\text{Weight (kg)}}{[\text{Height (m)}]^2} \]

Are you overweight? At Risk BMI

<table>
<thead>
<tr>
<th>Age</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>21.5</td>
<td>21.6</td>
</tr>
<tr>
<td>15</td>
<td>21.9</td>
<td>22.8</td>
</tr>
<tr>
<td>16</td>
<td>22.7</td>
<td>22.8</td>
</tr>
<tr>
<td>17</td>
<td>22.7</td>
<td>22.8</td>
</tr>
<tr>
<td>18</td>
<td>23.2</td>
<td>23.9</td>
</tr>
</tbody>
</table>

Keep your BMI below the above mentioned limits according to your age. Follow a regular diet and physical activity regime today.

Chetna
Children attending the lectures on Healthy Living
Teachers participating in a lecture on Healthy Living
Mothers participating in a Focused Group Discussion
Poster Making Competition
Poster Making Competition
Cooking Competition
Skit Competition
Extempore Competition
Quiz Competition
Other Activities

- Card Making
- Collage Making
- Health Board setup
- Mask Making
- Cartoon strip making
- Poem writing
- Healthy recipe writing
- Healthy Tiffin Day
Study
School-based Intervention Trial for Prevention of Childhood Obesity: The MARG Study

Objective:
To study the effect of an educative and participatory intervention trial for a period of 6 months on the improvement of knowledge levels, anthropometric measurements, body composition and blood profile of urban adolescents aged 15-17 years.

A Case-Control Community Intervention Trial
101 cases and 108 controls
6 months: July, 2008-January, 2009

Misra et al., Eur J Clin Nutr 2010
Key Activities:

*Intervention Trial (6 months): Case Control Design*

1. Intensive intervention vs. usual intervention

2. Improvements in the following aspects:
   a. Knowledge levels
   b. Dietary habits
   c. Anthropometric measurements
   d. Body fat composition
   e. Glycemic indicators
   f. Insulin levels, CRP levels
   g. Lipid profile
Phase 2: Interventions

- Weekly individual counseling of children
- Lectures
- Activities: Skits, quiz competition, extempore, focused group discussions
- Replacing unhealthy food in canteen with healthy alternatives
- Health camp for parents and teachers
- Recipe demonstration for healthy Tiffin
- Skit demonstration by the intervention group in morning assembly on important days like the World Food Day
- Quiz competition in class
- Paragraph writing on topics like: Ways in which you can prevent yourself from diabetes and heart disease in the next 5-8 years, healthy alternatives to junk food, planning a day’s diet for themselves, planning their own tiffins for a week
- Checking tiffins of younger classes in their school by the intervention group
### % Decrease in Consumption Patterns of ‘Energy-Dense Foods’

<table>
<thead>
<tr>
<th>Consumption of Food Articles</th>
<th>Case School</th>
<th>Control School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweetened carbonated drinks &gt; 3 times/w</td>
<td>15.4%</td>
<td>7.9%</td>
</tr>
<tr>
<td>Western ‘energy-dense’ foods (Burgers, pizzas, french fries, noodles) &gt; 3 times/w</td>
<td>9.2%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Chips/ Namkeen/Maggi &gt; 3 times/w</td>
<td>8.3%</td>
<td>No change</td>
</tr>
<tr>
<td>Indian ‘energy-dense’ food &gt; 3 times/w</td>
<td>6.3%</td>
<td>2.2%</td>
</tr>
</tbody>
</table>

All differences are statistically significant

Consumption of Fruits (brought in Tiffin)

<table>
<thead>
<tr>
<th></th>
<th>Case School</th>
<th>Control School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>10.1%</td>
<td>29.8%</td>
</tr>
<tr>
<td>Follow-up</td>
<td>40.4%*</td>
<td>25.9%</td>
</tr>
</tbody>
</table>

*Statistically significant

% Change in Time Spent in TV Viewing and Physical Activity

<table>
<thead>
<tr>
<th>Variables</th>
<th>Case School</th>
<th>Control School</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV Viewing &gt; 2 h/d</td>
<td>5.2% ↓</td>
<td>2.4% ↑</td>
</tr>
<tr>
<td>Physical Activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-60 min/d</td>
<td>9.8% ↑</td>
<td>3.7% ↑</td>
</tr>
</tbody>
</table>

All differences are statistically significant

Knowledge, Attitude and Practice about Nutrition, Obesity and Diabetes: Pre- and Post Surveys Show significant Increase in Knowledge

Shah P, Misra A et al., Br J Nutr 2010
P< 0.05 in Control SAD
P< 0.001 in Case biceps

<table>
<thead>
<tr>
<th>Variable</th>
<th>Case School</th>
<th>Control School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting Glucose</td>
<td>-4.9%*</td>
<td>-2.2%</td>
</tr>
<tr>
<td>HDL-C</td>
<td>2.2%</td>
<td>-2.3%</td>
</tr>
</tbody>
</table>

*p < 0.001

% Change in Fasting Serum Insulin and CRP

**Insulin**

INT. 6.2  
CONT. 13

**Hs-CRP**

-21.6  
CONT. 47

Misra et al., Unpublished data
Summary

• Rising childhood obesity in urban India and in other Developing Countries is of great concern, and would fuel the diabetes and the metabolic syndrome epidemics further.

• Overall, it is more in urban areas (vs. rural), and public schools.

• Its consequences, insulin resistance, PCOS, hirsutism, type 2 diabetes, subclinical inflammation and hepatic steatosis are now frequently seen in children.

• Countrywide programs, akin to our program “MARG” in schoolchildren are urgently needed.
Thank You

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