

Obesity: The Indian Perspective

Dr. Anoop Misra

Dr. Seema Gulati

Head, Nutrition Research Group
National Diabetes, Obesity and Cholesterol Foundation (N-DOC) &
Center for Nutrition & Metabolic Research (C-NET)

Chief Project Officer
Diabetes Foundation (India)
C-6/57, Safdarjung Development Area

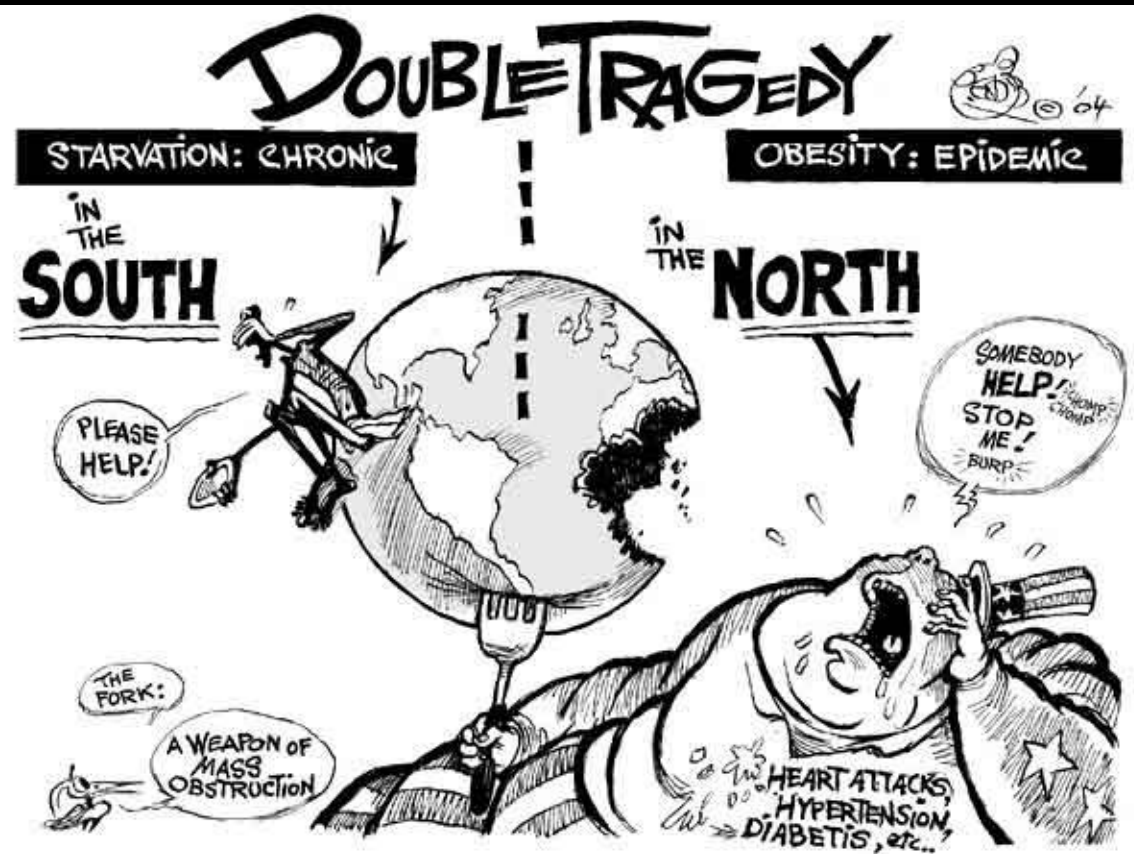




The Myth

**“You are talking of obesity,
while malnutrition is
everywhere”**

Reality: The Double Jeopardy



Prevalence of overweight/obesity among Adolescents (14-18 yrs), Delhi

Age (yrs)	Gender	Public Schools	Age wise prevalence in Public Schools	Government Schools	Age wise prevalence in Government Schools
		Overweight % (N=2593)		Overweight % (N= 955)	
14	Male	29.7	32.6	12.9	12.7
	Female	39.6		12.4	
15	Male	23.3	29.9	11.8	11.5
	Female	39.0		11.0	
16	Male	28.0	25.1	7.8	8.4
	Female	20.8		9.4	
17	Male	27.0	25.3	9.4	11.0
	Female	21.6		13.8	
Total% (N = 3548)		29.0		11.1	
OVERALL PREVALENCE = 24.2%					

Prevalence of Childhood Overweight/Obesity

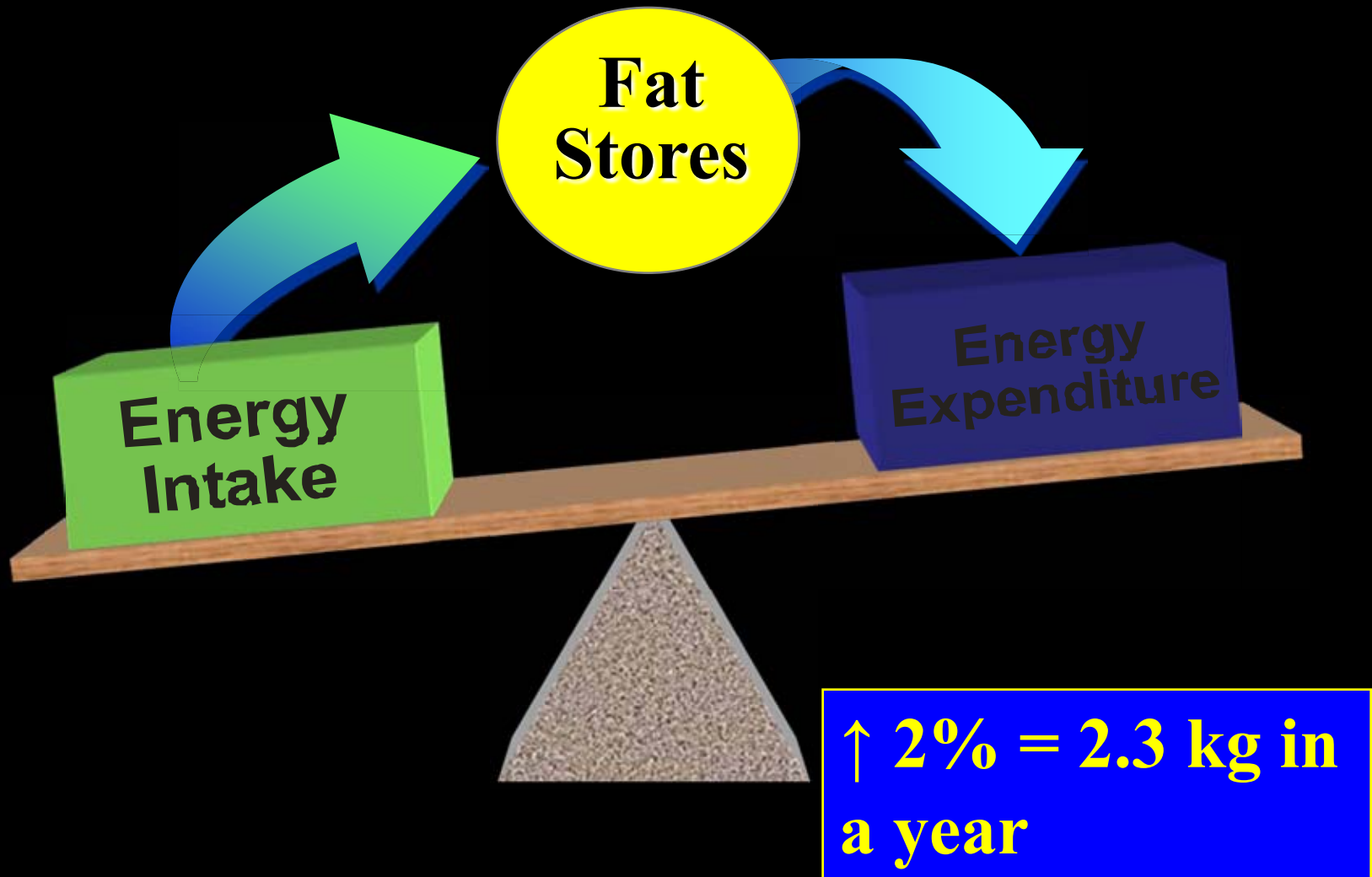
Country/City	Year	Prevalence
Global	2004	10
USA/UK	2000	20
Australia	1995	20
India/Chennai	2002	22
India/Delhi	2004	16
India/Delhi	2006	29

Misra et al., 2006

FOOD GUIDE PYRAMID



Obesity is Caused by Long-Term Positive Energy Balance



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Misra et al., *Unpublished data, 2008*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

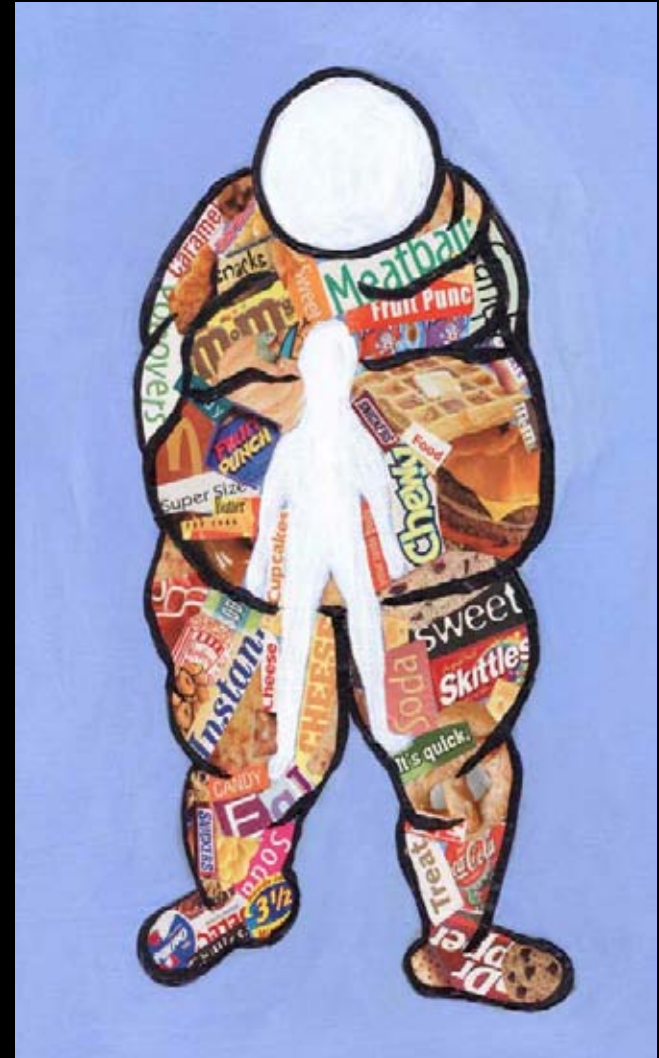
The Evidence

Obesity

Obesity has reached alarming figures.

Current figures in New

Delhi indicate that every second person fulfills criteria of obesity or has excess abdominal fat.





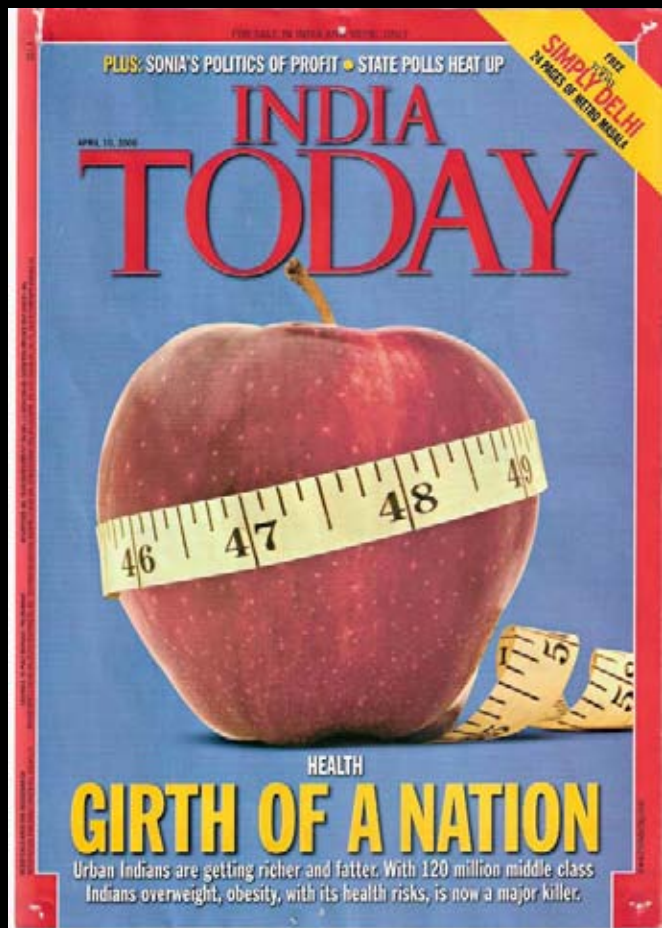
The Myths

3

“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



WHY THE FAT IS IN THE FIRE



Each year, a greater percentage of the population spends its entire workday behind a desk or computer, getting virtually no exercise.



In the kitchen, the microwave oven has seen sales of unhealthy frozen convenience foods skyrocket and encouraged elaborate snacking.



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 becoming and becoming westernised.

6 A global epidemic

One out of every five is overweight or obese in the world.



Source: World Health Organization Report on Obesity, 2005

FIGHTING FAT

PENROD (PHOTO)



ASHOK ANAND, 54, WEIGHT: was 110 KG
Retired resident of Gurgaon
I loved food and ate through the day. Meals, umpteens cups of tea, namkeen, sweets, alone or with guests. My wife and children used to beg me to stop eating. Finally, I had to go for bariatric surgery. I've given up everything today, even pan masalas and cigarettes.

"Before dinner, I would stuff myself with kebabs and tikkas to complement my peg of whisky. No longer."

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 Dr Anoop Misra, an obesity expert involved with anti-obesity drives initiated by AIIMS. The first Asia Pacific Obesity Conclave took place in Delhi in March. Chowbey, the driving force behind the conclave, is also 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."

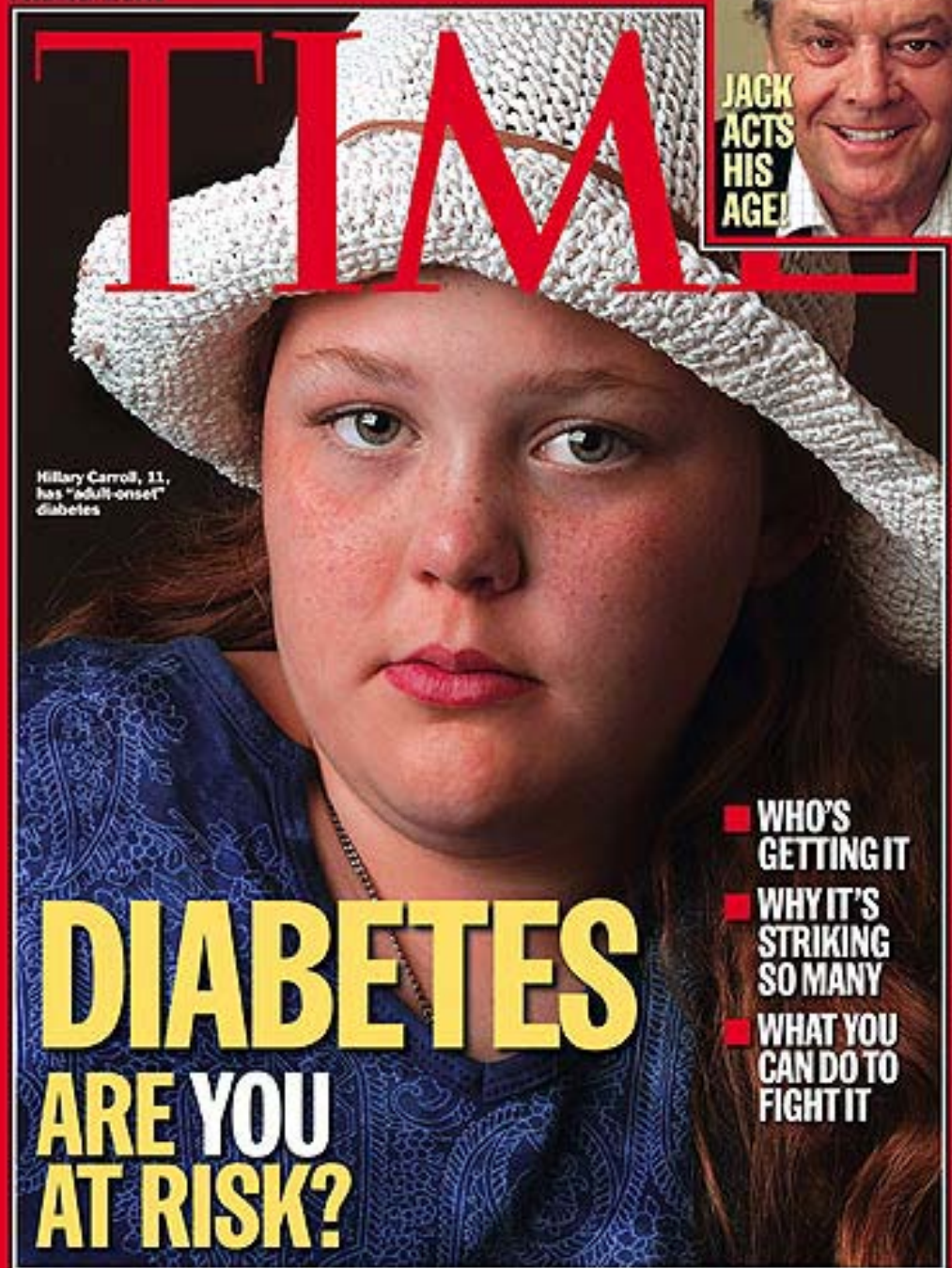
The ones who really need help are finding out just what a weighty problem it is. "I've always loved food. Lots of food, no exercise and slowly I bloated up over time, till one day I realised I was 100 kg! Diabetes and high blood pressure came hand in hand with it. Finally, I went in for bariatric (weight 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 a&ob at VLOC 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 AIIMS survey conducted on 35,000 people in 10 industrial cities revealed that waistlines had grown round by more than 20 per cent, and that 47 per cent of all school children 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!!!!*

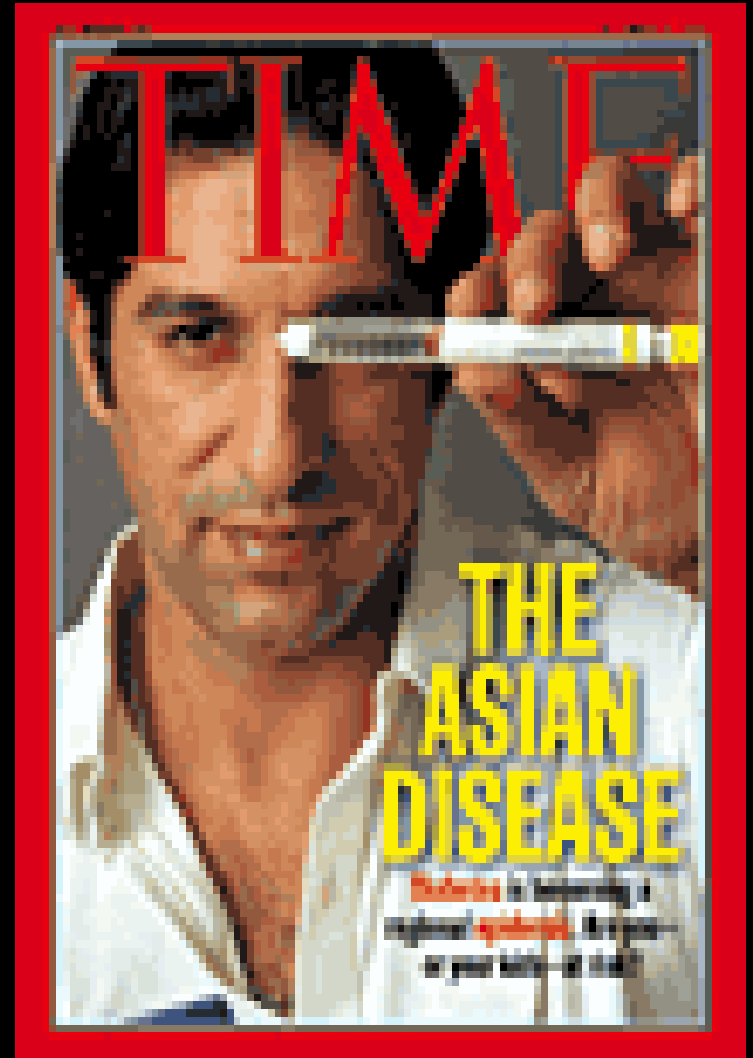
DECEMBER 1, 2003



The Evidence

Diabetes

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

4

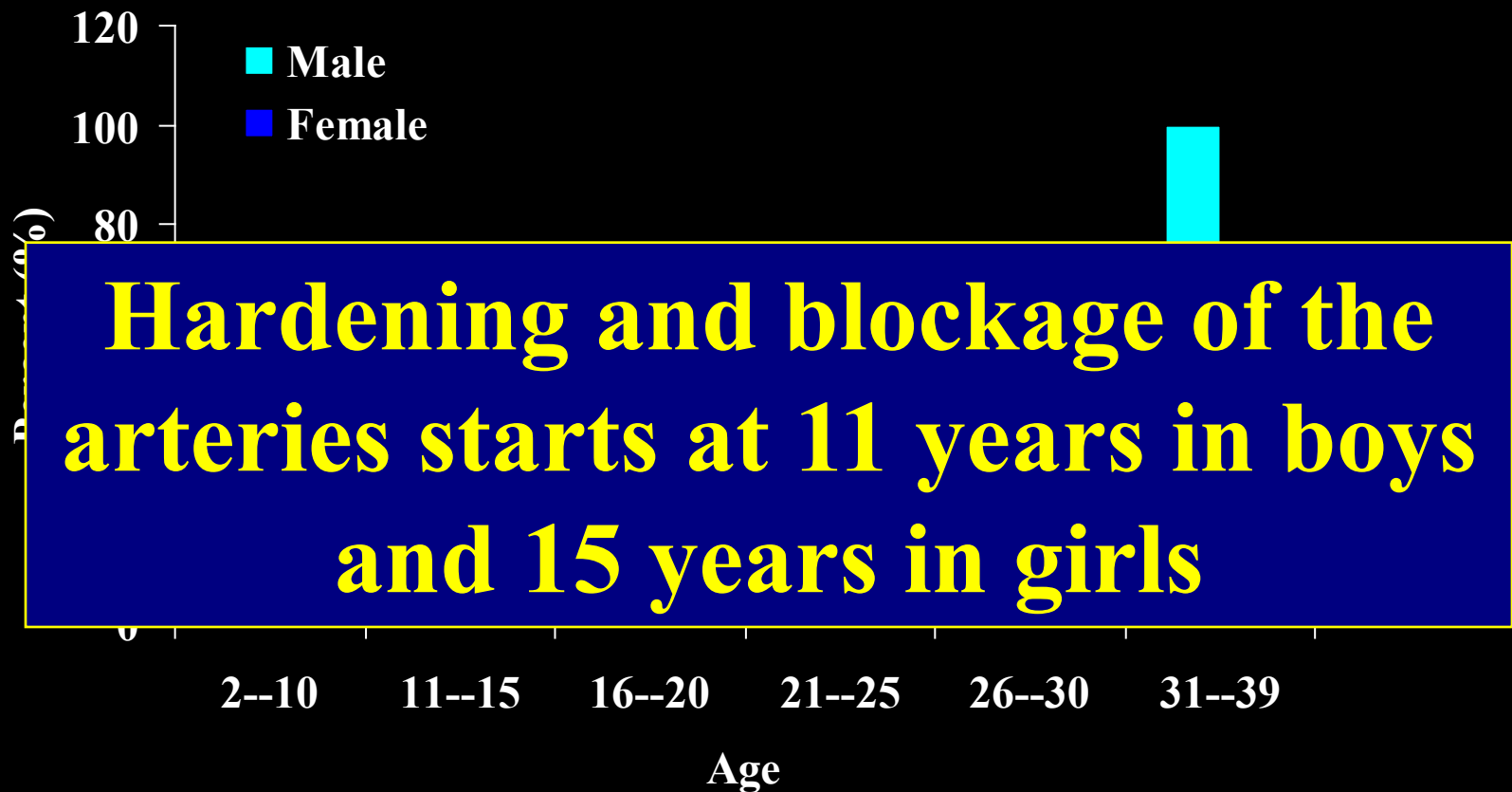
“Heart Disease starts
at old age”

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



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

5

“A fat child is
otherwise healthy”

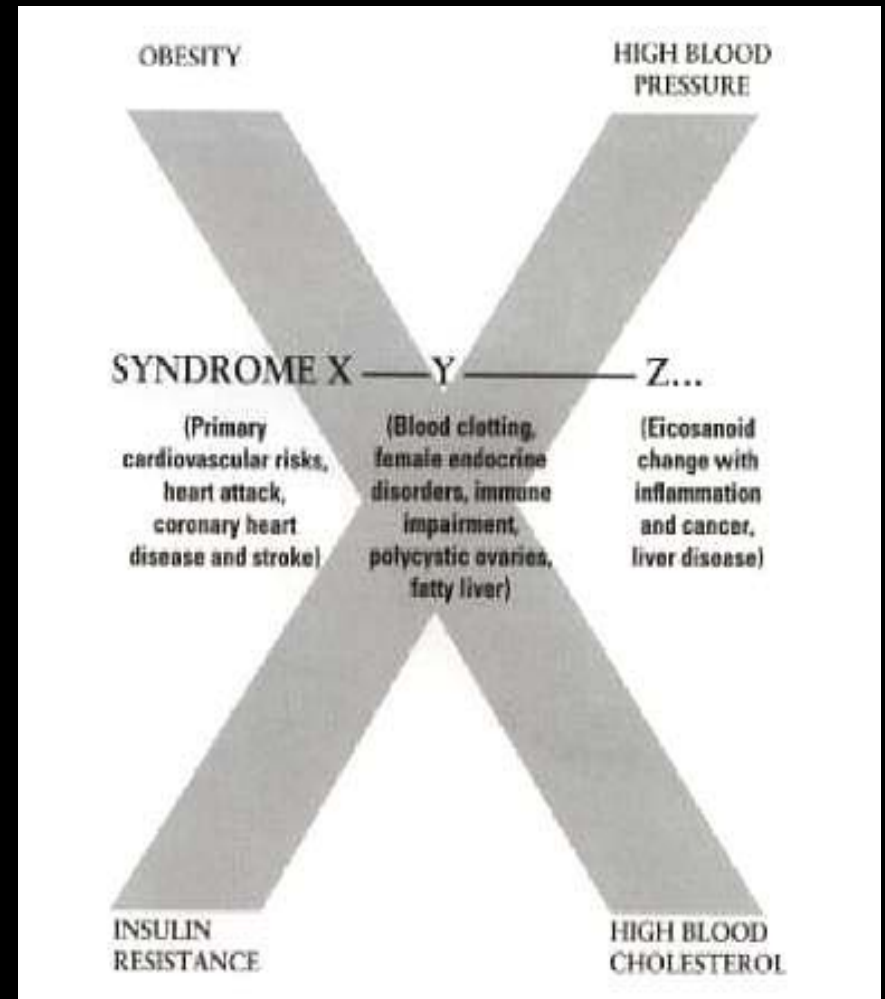
Reality:

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

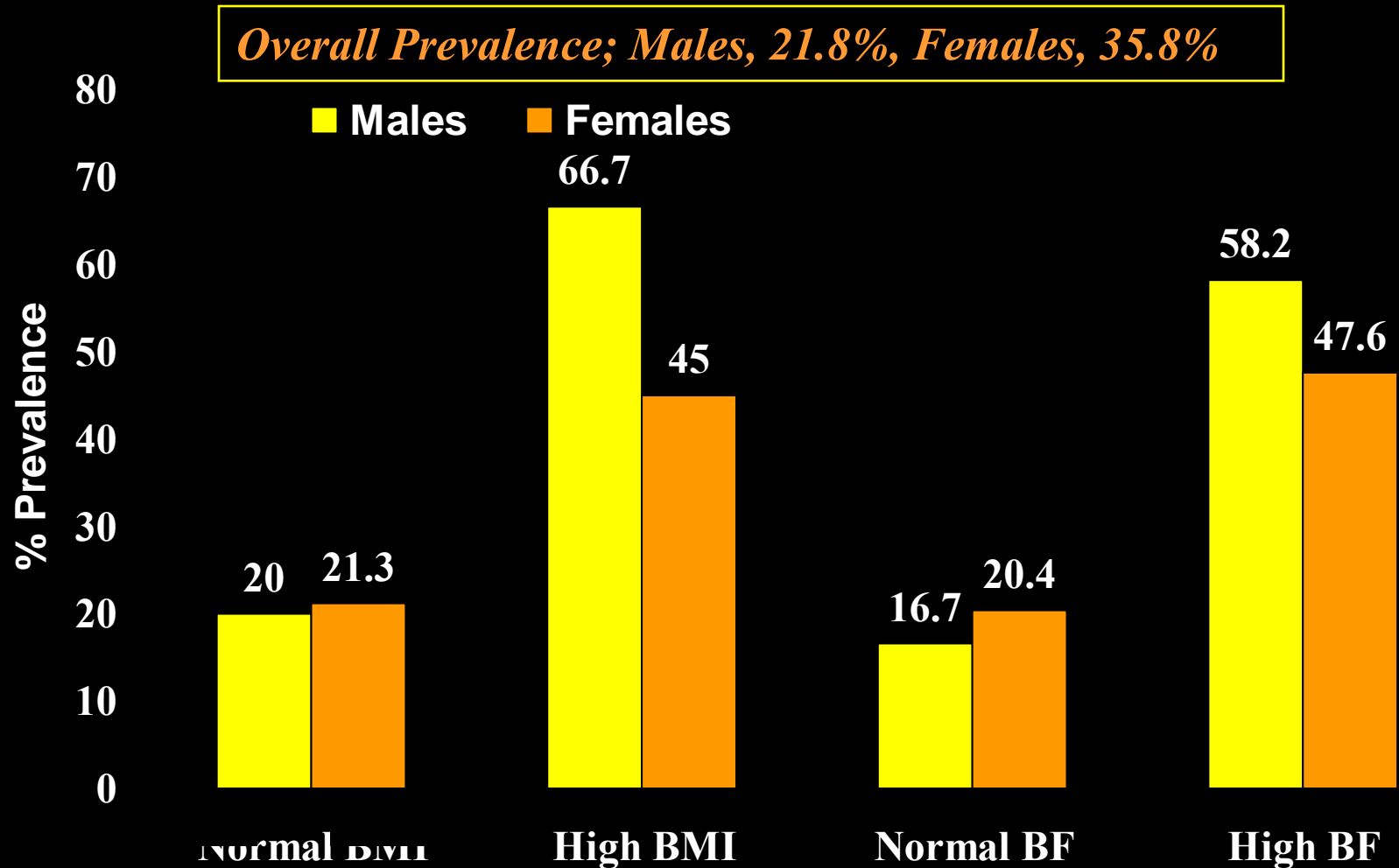
The Evidence

Syndrome X

Nearly 35% of the general population and 1/4th of the adolescents have syndrome X, which predates diabetes and heart disease.



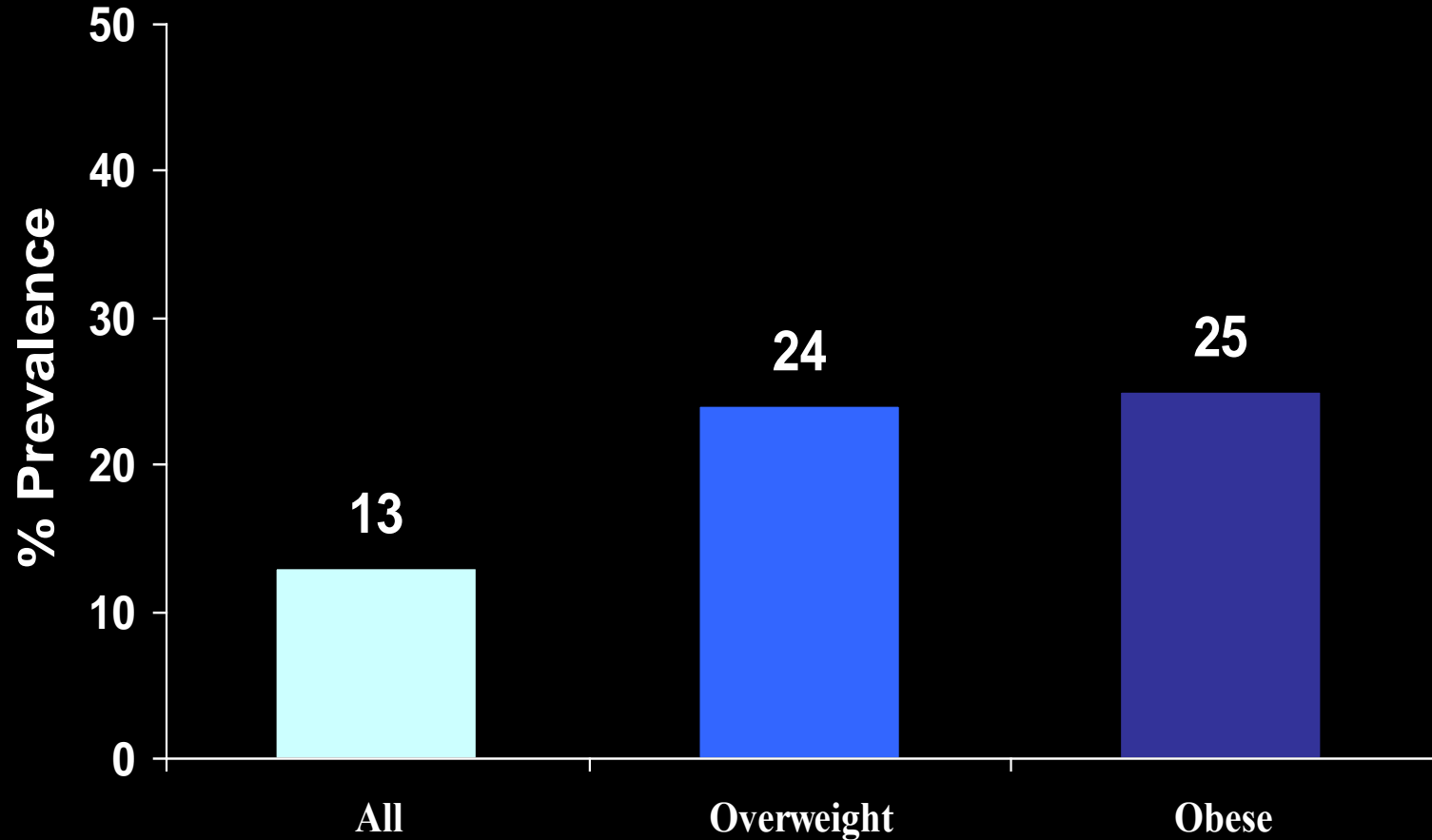
Prevalence of Insulin Resistance (by HOMA-IR) Asian Indian Children (n=396)



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 0.14mg/L
- Saturated fat intake <7% of energy intake would result in mean CRP level <1mg/L (Low risk for CVD)



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.

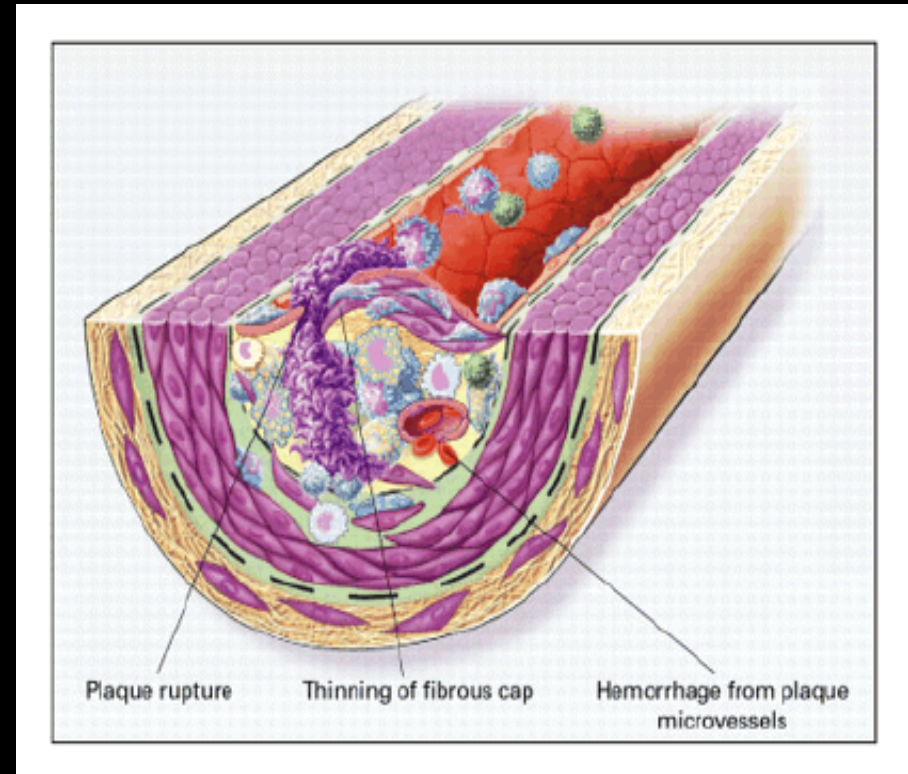
Consumption of lifestyle foods among Children

Item	Younger children	Older Children
	> 2-3 times a week	
Chips/ Pringle	67.5	66.3
Corn Puffs etc.	58.6	52.4
Popcorn	32.8	28.2
Soft Drinks	30.0	41.0
Sherbets	42.3	45.6
Ice-Creams	43.7	57.9
Cakes/muffins	34.7	31.7
Chocolates	71.3	74.7
Fried Food	39.7	56.7
Fast Food (Pizza/burger)	22.0	30.93

The Evidence

High Lipids

1/3rd 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

Physical activity	Younger Children 9-11 years % (N=600)	Older Children 12-18 years %(N =1200)
Willing	67.3 (404)	71.0 (852)
Not Willing	32.7 (196)	28.6 (343)
Do not know	-	0.4 (5)

Sedentary Activities among children

Activity more than 60 minutes	Younger children %(N)	Older children % (N)
TV viewing	70.3 (407)	84.7 (987)
Book Reading	55.0 (269)	58.9 (551)
Working on Computer	55.6 (163)	67.9 (477)
Listening to Music	30.6 (129)	47.6 (487)
Video Games	53.7 (122)	56.2 (200)



The Myths

9

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

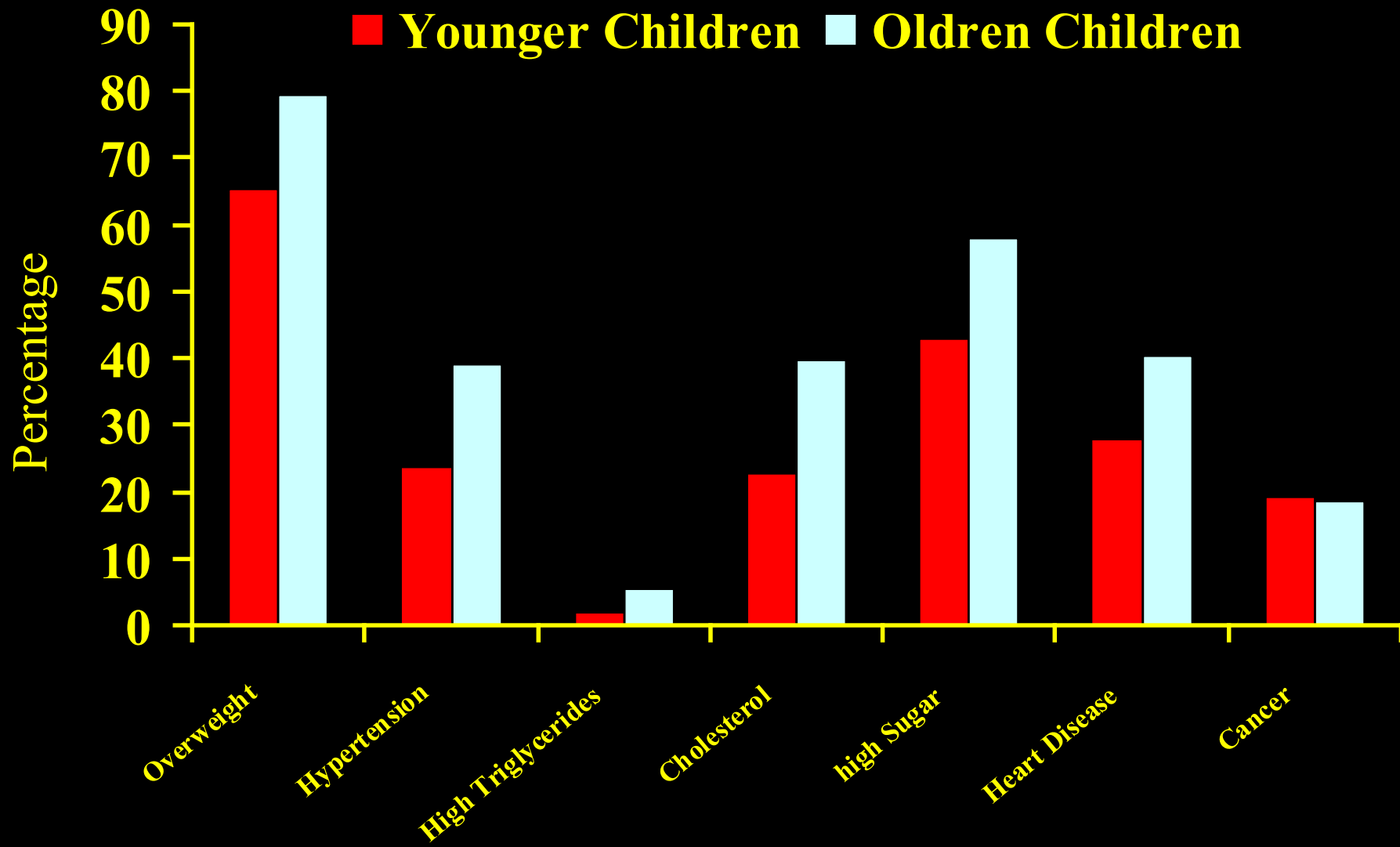
Reality:

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

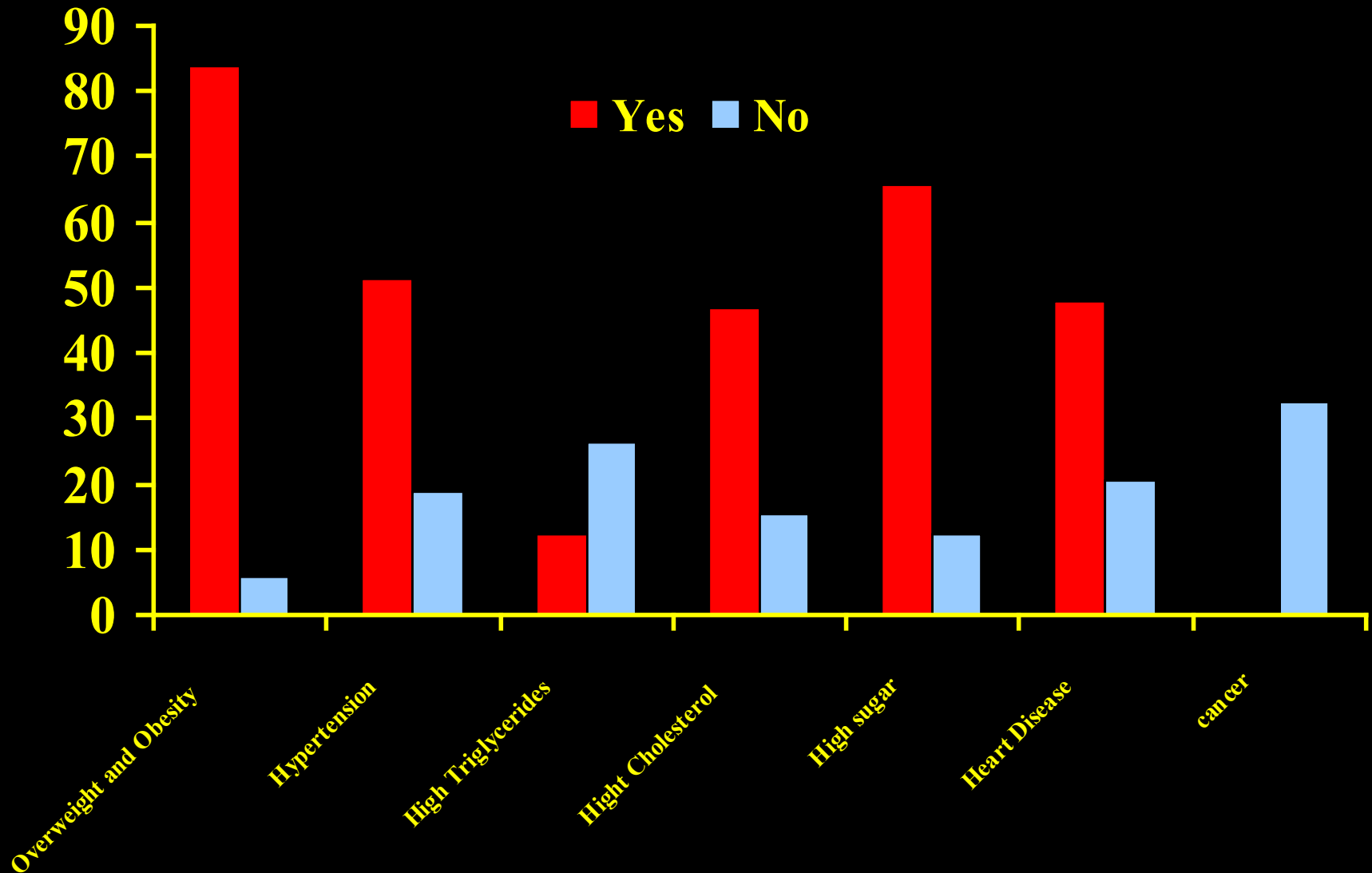
Consumption of lifestyle foods among Mothers

Item	Mothers of Younger Children	Mothers of Older Children
	> 2-3 times a week	
Chips/ Pringle	53.3	56.7
Corn Puffs etc.	31.0	47.2
Popcorn	28.7	35.7
Soft Drinks	24.7	27.8
Sherbets	42.0	43.7
Ice-Creams	43.4	48.2
Cakes/muffins	23.7	29.16
Chocolates	47.3	57.2
Fried Food	38.8	37.7
Fast Food	14.7	14.8

Knowledge Regarding Unhealthy Diet and Diseases among Children



Knowledge Regarding Unhealthy Diet and Diseases among Mothers



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



The Myths

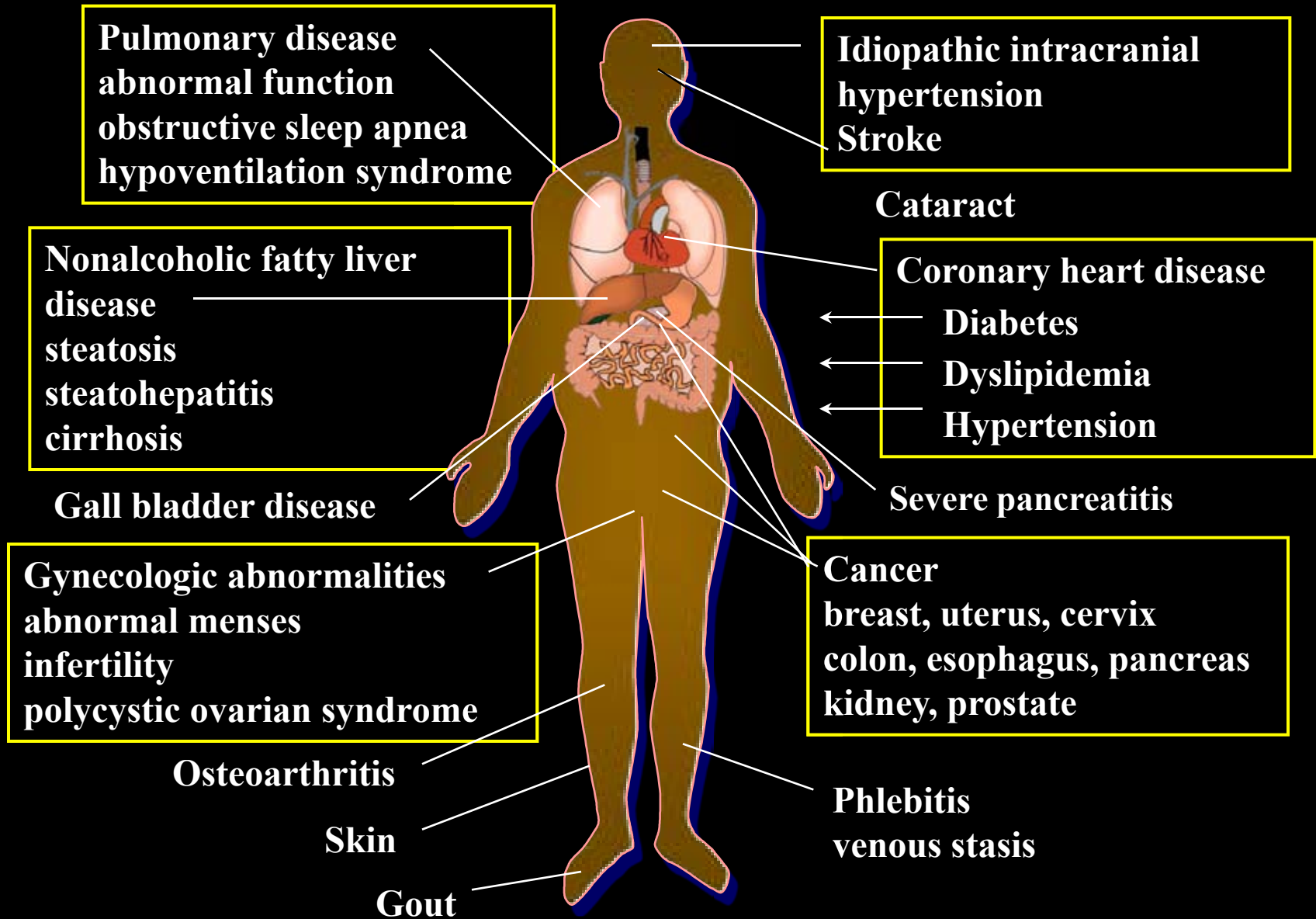
10

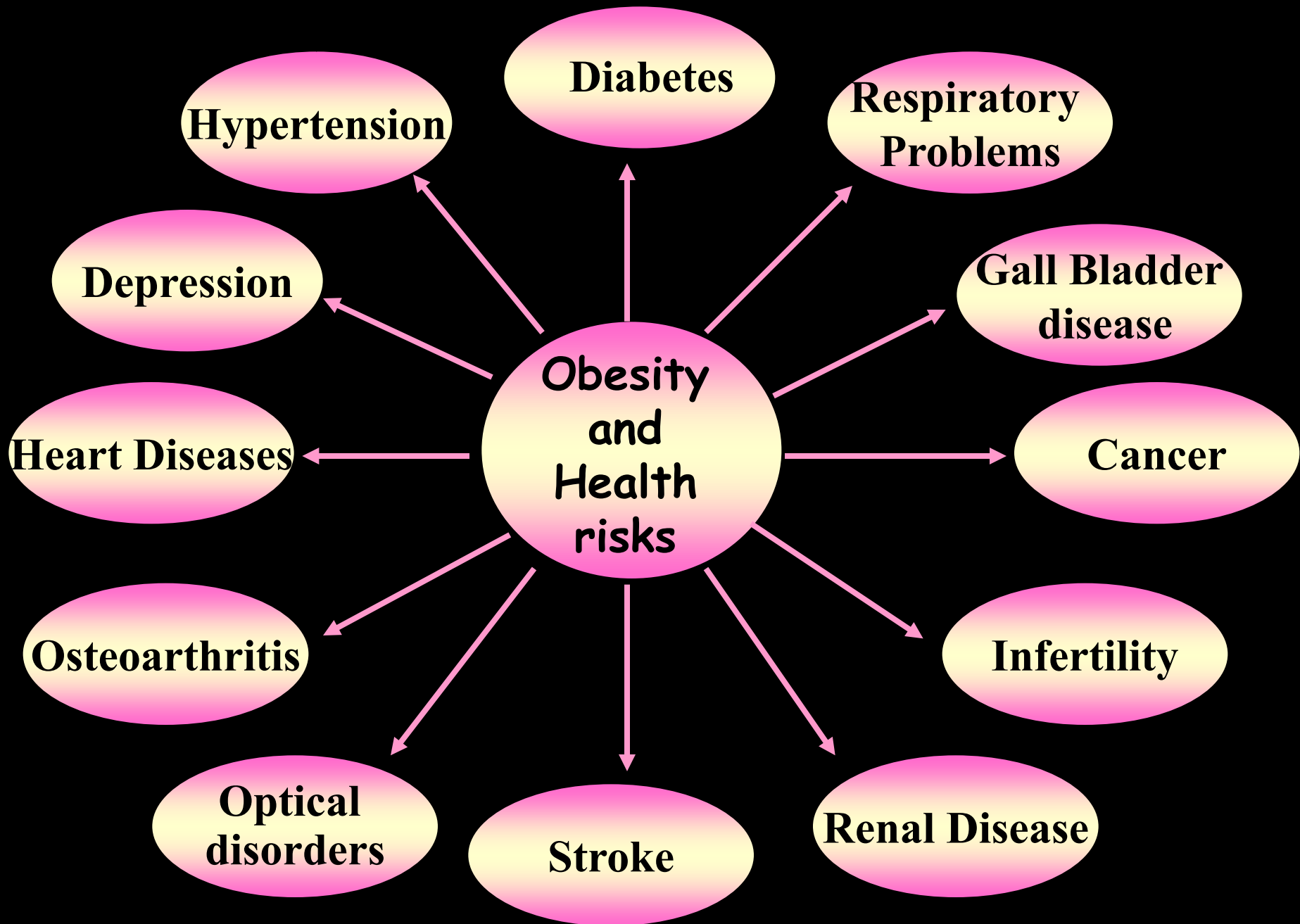
“So what if there are metabolic abnormalities or diseases, these can be easily treated”

Reality:

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

Complications of Obesity





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)

Macronutrients	Gender	RDA* %energy	13-15y (n=254)		16-18y (n=543)		p-value
			unit/d	% energy	unit/d	% energy	
Energy (kcal/day)	Boys	–	2339±498	–	2324 ± 549	–	0.856
	Girls		1905 ± 472	–	1820 ± 421	–	0.045
Protein (g/day)	Boys	10-15%	69 ± 19	12 ± 2	68 ± 18	12 ± 1	0.900
	Girls		53 ± 16	11 ± 1	50 ± 13	11 ± 2	0.001
Carbohydrate (g/day)	Boys	55-65%	316 ± 71	54 ± 7	313 ± 77	54 ± 8	0.352
	Girls		238 ± 53	51 ± 7	239 ± 62	53 ± 6	0.892
Total fat (g/day)	Boys	15-30%	85 ± 26	32 ± 6	84 ± 30	32 ± 7	0.681
	Girls		77 ± 25	36 ± 6	71 ± 21	35 ± 6	0.030

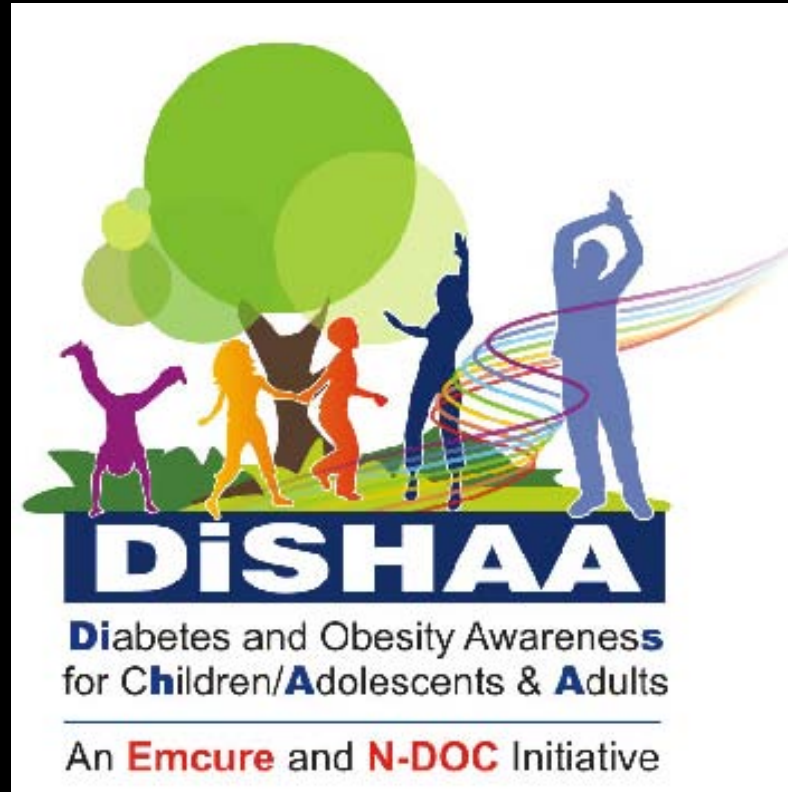
* Recommended Dietary Allowance (Figures mentioned are Mean ± SD)

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

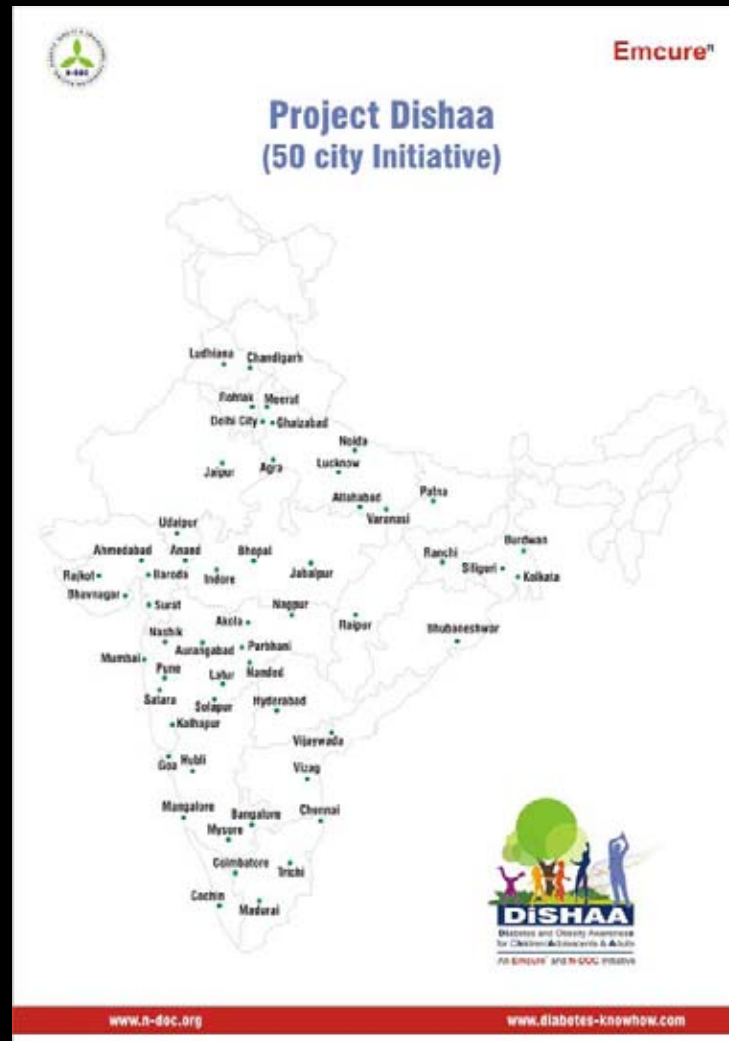
Specific Objectives

- **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

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

March 5, 2011

Participating Teams



**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





WORLD **DIABETES** FOUNDATION



Diabetes
Foundation (India)

“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

TANITA

Project "Marg": The Path
A World Diabetes Foundation Funded Project
Office of Project "Marg": The Path and Diabetes Foundation (India)
C-6/57, Sardarjung Development Area, New Delhi 110 016 (India)
Tel. No.: +91-11-41759072 Telefax: +91-11-26537091
Email: anoopmisra.marg@gmail.com

Julius Medicare Limited

CHOOSE HEALTHY... STAY HEALTHY!!!

Good to Eat...
... Tough to Burn



Colas/Fruit Juices/
Canned Juices

The Healthy
Way Out...



Whole Fruits/Lassi/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

Project "Marg": The Path

A World Diabetes Foundation Funded Project
Office of Project "Marg": The Path and Diabetes Foundation (India)
C-6/57, Sardarjung Development Area, New Delhi 110 016 (India)
Tel. No.: +91-11-41759072 Telefax: +91-11-26537091
Email: anoopmisra.marg@gmail.com

TANITA

Julius Medicare Limited

“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"

C-6/57, Safdarjung Development Area,
New Delhi-1100016 (India)
Tel. : 91-11-41759672 Telefax : 91-11-26537091
Email : anoopmisra.teacher@gmail.com

Printed by : Printworld : 9810183402



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

JUNK FOOD

CALORIFIC VALUE

HOW TO BURN IT

1 SLICE PIZZA



250 CAL



BICYCLING FOR 1 1/2 HOURS

1 CHEESE BURGER



330 CAL



SWIMMING FOR 1 HOURS

1 MEDIUM FRENCH FRIES



300 CAL



JOGGING FOR 1/2 AN HOUR

1 MAC COMBO



700 CAL



BASKET BALL FOR 2 HOURS

1 PASTRY



500 CAL



TENNIS (SINGLES) FOR 1 1/2 HOURS

1 SAMOSA



150 CAL



DANCING FOR 1/2 AN HOUR

COLA (200 ML)



110 CAL



JUMPING ROPE FOR 15 MINUTES



CHETNA



Chetna Secretariat
Room No. 8, Private Ward, Ground Floor,
All India Institute of Medical Sciences, New Delhi - 110029
Ph: 2654447, 2654371 Fax: 2654447
Email: sonupratna.chetna@gmail.com

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:

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

ARE YOU OVERWEIGHT

At Risk BMI

Age	At Risk BMI
14	21.5
15	21.9
16	22.7
17	22.8
18	23.2
Boys	
14	21.6
15	22.8
16	23.7
17	23.9
18	23.9
Girls	

KEEP YOUR BMI BELOW THE ABOVE MENTIONED LIMITS ACCORDING TO YOUR AGE
FOLLOW A REGULAR DIET AND PHYSICAL ACTIVITY REGIME....

TODAY



CHETNA



Chetna Secretariat
Room No. 8, Private Ward, Ground Floor,
All India Institute of Medical Sciences, New Delhi - 110029
Ph: 2654447, 2654371 Fax: 2654447
Email: sonupratna.chetna@gmail.com



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

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’

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

All differences are statistically significant

Singhal N, Misra A, Shah P, Gulati S. *Eur J Clin Nutr*, in press

Consumption of Fruits (brought in Tiffin)

	<i>Case School</i>	<i>Control School</i>
Baseline	10.1%	29.8%
Follow-up	40.4%*	25.9%

*Statistically significant

Singhal N, Misra A, Shah P, Gulati S. *Eur J Clin Nutr*, in press

% Change in Time Spent in TV Viewing and Physical Activity

<i>Variables</i>	<i>Case School</i>	<i>Control School</i>
TV Viewing > 2 h/d	5.2% ↓	2.4% ↑
Physical Activity 30-60 min/d	9.8 % ↑	3.7% ↑

All differences are statistically significant

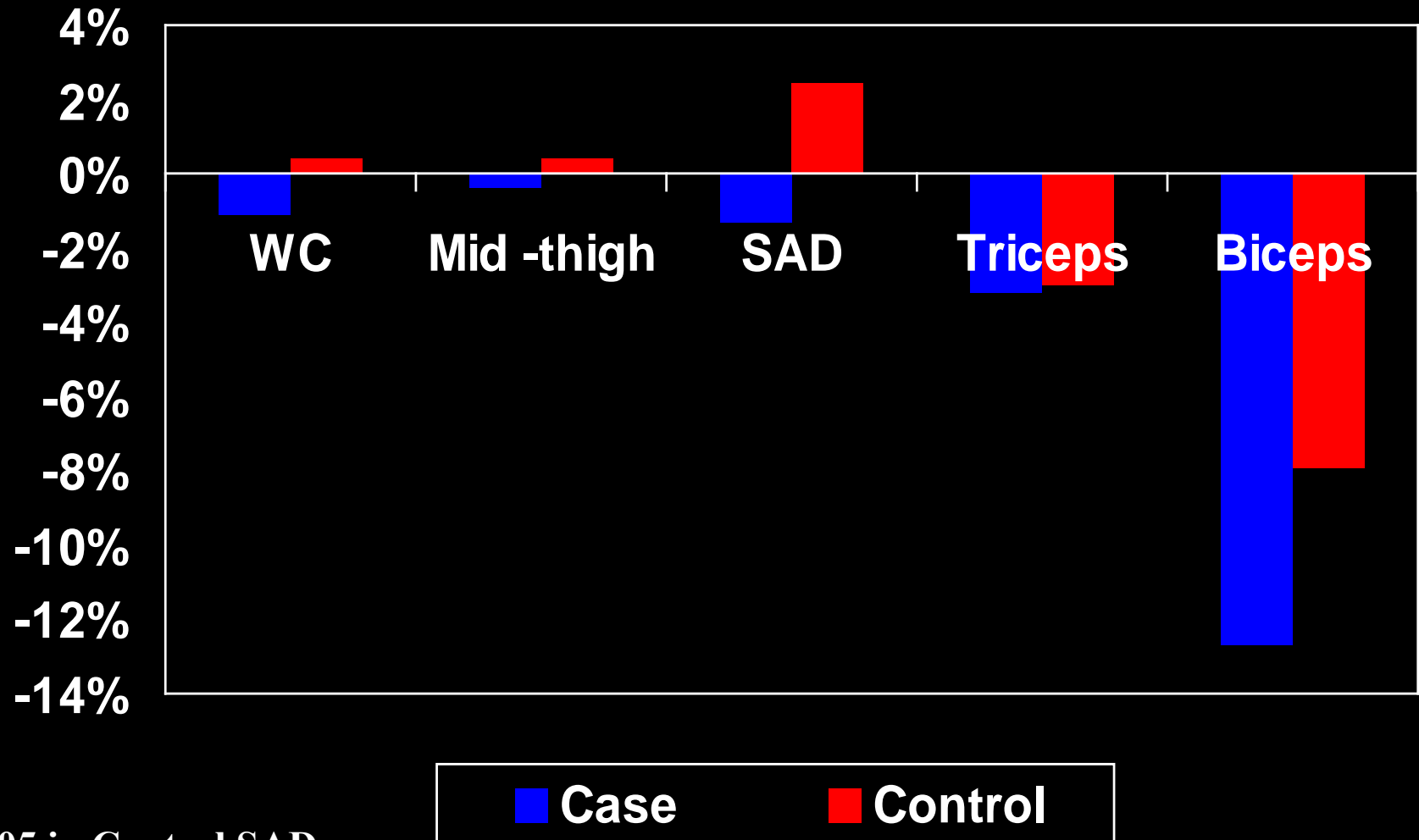
Singhal N, Misra A, Shah P, Gulati S. *Eur J Clin Nutr*, in press

Knowledge, Attitude and Practice about Nutrition, Obesity and Diabetes:

Pre- and Post Surveys Show significant Increase in Knowledge



% Change in Anthropometric Parameters



$P < 0.05$ in Control SAD

$P < 0.001$ in Case biceps

Singhal N, Misra A, Shah P, Gulati S. *Eur J Clin Nutr*, in press

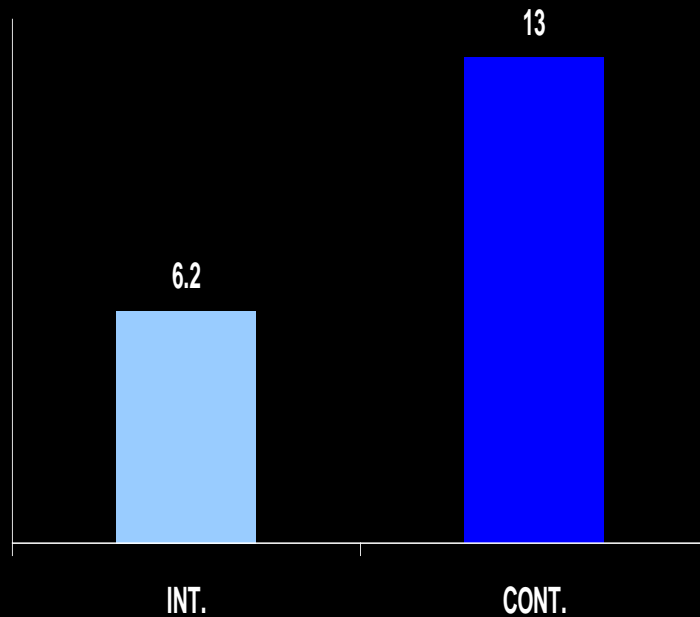
% Change in Metabolic Parameters

<i>Variable</i>	<i>Case School</i>	<i>Control School</i>
Fasting Glucose	-4.9%*	-2.2%
HDL-C	2.2%	-2.3%

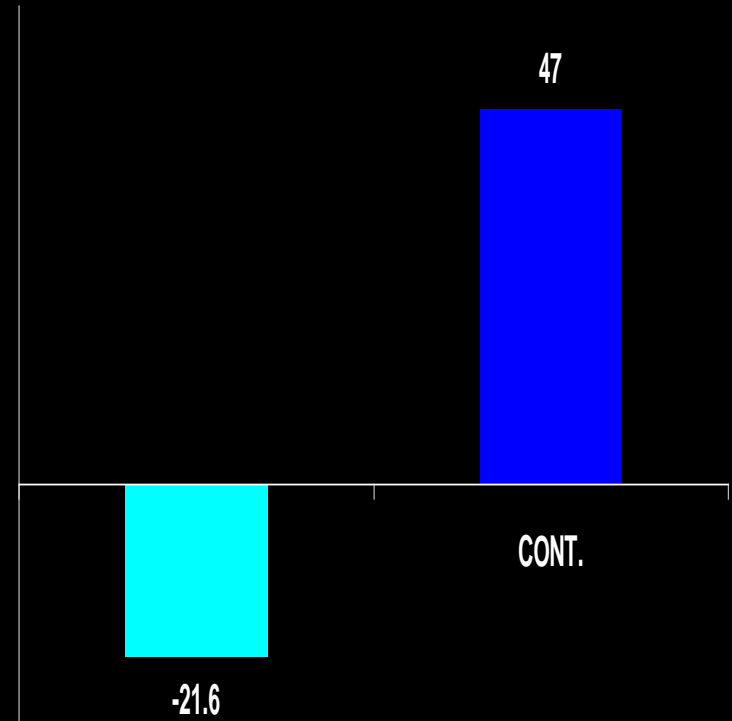
***p < 0.001**

Singhal N, Misra A, Shah P, Gulati S. *Eur J Clin Nutr*, in press

% Change in Fasting Serum Insulin and CRP



Insulin



Hs-CRP

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

seemagulati2007@gmail.com

