CHANGING HUMAN ARCHITECTURE – A GLOBAL CHALLENGE OF OBESITY

Shashank R Joshi, Mumbai

Arjuna,
those who eat too much or eat too little,
who sleep too much or sleep too little,
will not succeed in meditation.

But those who are temperate
in eating and sleeping,
work and recreation,
will come to the end of sorrow
- through meditation.

Through constant effort
they learn to withdraw the mind
from selfish cravings
and absorb it in God.

Thus,
they attain the state of Divine Union.

Bhagavad Gita 6:16-18

INTRODUCTION

A few people still believe that human body is the best creation of the supreme power. On the other hand we have Darwin’s theory of evolution, which links progression of apes to humans through various stages. This theory believes in the principal of survival of the fittest, and ongoing mutations as the mode of transformations. If we believe that our ancestors were apes, we also have to agree that our future progeny may be something else. The process of evolution is ongoing; it’s up to us to perceive it. Looking at the data available to us we can definitely perceive an increase in average body weight and average BMI. The increase in prevalence of central obesity can probably be appreciated very well. It’s spreading at a high pace, irrespective of socio-economical status. Obesity and particularly central obesity is no more a problem of developed world. Are we heading towards a future where every human would have a tummy? Or would the progeny of centrally obese people vanish by deaths due to myocardial infarcts in early twenties leaving behind a fit progeny? By the law of survival of the fittest second possibility is more likely. All centrally obese looking humans may succumb to various diseases. It appears whatever the nature may decide, but probably its time for a change in architecture of human body.
Changing Human Architecture – A Global Challenge of Obesity

OBESITY – EXTENT OF THE PROBLEM

The 1980s and 1990s witnessed alarming increases in obesity across the globe.\(^1\)

In Britain between 1980 and 1991, the prevalence of obesity doubled and is continuing to increase.\(^2\) This trend is no more limited to developed world. The emerging epidemic of obesity has not spared developing countries.\(^3\) Obesity has become a major health problem in American Indians only in the past 1–2 generations and is believed to be associated with the relative abundance of high-fat foods and the rapid change from active to sedentary lifestyles.\(^4\) Childhood obesity has also risen dramatically over the last 20 years.\(^5\) In the United States, the prevalence and severity of overweight status is clearly increasing among children. In national surveys from the 1960s to the 1990s, the prevalence of overweight in children grew from 5% to 11%.\(^6\) Furthermore, Morrison et al\(^7\) showed that much of the increase in body mass index (BMI) in grade school–aged children between the 1970s and 1990 occurred in children between the 50th to 100th percentiles. Similarly, Leupker et al\(^8\) found a concordant increase in BMI and systolic blood pressure in middle school students, aged 10 to 14 years, from 1986 to 1996. The frightening trend of rising prevalence of obesity in children in US can be easily perceived from Figure 1, where obesity in children from 6-23 months of age is defined as weight for length more than 95th percentile, while children between 2-19 years of age BMI was used.\(^9\)

CONSEQUENCES OF OBESITY

This increase in the severity of obesity has also translated into an increase in the prevalence of outcomes such as type 2 diabetes mellitus and hypertension. A hospital-based study by Pinhas-Hamiel et al\(^10\) reported a 10-fold increase in the prevalence of newly diagnosed type 2 diabetes mellitus in adolescents from 1982 to 1994. Uniform increase in prevalence of Type 2 diabetes mellitus in children in all age groups in Pima Indians\(^11\) is shown in figure 2. The complications of obesity that are associated with cardiovascular disease include hypertension, dyslipidemia, insulin resistance, glucose intolerance, type 2 diabetes mellitus, left ventricular hypertrophy, and pulmonary hypertension resulting from obstructive sleep apnea.\(^12\) The topic of the International Diabetes Federation Consensus conference, held 7–9 February 2003 in Santa Monica, California, was “Type 2 Diabetes in the Young: The Evolving Epidemic”.\(^13\) These considerations suggest that the phenomenon of increasing type 2 diabetes among children and adolescents may be a result of increasing obesity and, particularly, of increasing central obesity.\(^14\) There is a strong relationship between childhood obesity and the development of insulin resistance in early adulthood.\(^15\) Fasting insulin levels show correlation with blood pressure\(^16\) and triglyceride and inverse correlation with HDL cholesterol levels,\(^17\) important components of the IRS.

CENTRAL OBESITY & METABOLIC SYNDROME

Central obesity has been shown to have strong association with type 2 diabetes\(^18\), insulin resistance (IR)\(^9\), and ischaemic stroke\(^20\). This clustering was described with various terminologies till Raven coined the term Metabolic Syndrome (MS). Recently International Diabetes Federation (IDF) has defined MS in which race specific cut-offs for WC are suggested\(^21\). We believe that the ethnic difference that has led us to race specific cutoffs for WC may be essentially attributed to differences in average height. Based on this we have coined a new parameter – Index of Central Obesity (ICO) being defined as ratio of WC and height both measured in same unit. ICO, with a universal cut off of 0.5 has been validated for its utility in defining MS.\(^22\) ICO gives a very simple message – if your height is less than double your WC, investigate for MS. As with adults, obesity in childhood causes hyperinsulinaemia, hypertension, dislipidaemia, and increased endothelial dysfunction.\(^22,24\) MS has been identified in children as young as 5 years\(^25\) and type 2 diabetes, once virtually non-existent in adolescence, now accounts for almost half of all new diagnoses of diabetes in North American children.\(^26\) This is ominous considering the macrovascular (heart disease, stroke)
and microvascular (blindness, kidney failure, neurological complications) sequelae of type 2 diabetes.

CAUSES OF PANDEMIC OF OBESITY

Eating habits
Policies on food production, advertising, promotion, pricing, and the availability of high fat “fast food” or high sugar foods are factors that have helped contribute to the increase in obesity. The greater affordability of food has also contributed to excess energy consumption. Today, a wide variety of relatively inexpensive, highly palatable foods are available almost everywhere. We no longer have to spend most of our day hunting and gathering food as our ancestors once did; instead we can drive to the local corner take away, fast food outlet, or supermarket. A recent report (March 2003) commissioned by the World Health Organization and Food and Agriculture Organization stated that many deaths attributed to chronic diseases are caused by obesity and low levels of physical activity, which can be prevented by restricting consumption of “energy dense” foods and “sugar sweetened soft drinks”. Their report criticises the food industry for aggressively marketing energy dense, micronutrient poor foods. The report recommends that such marketing should be restricted, but fails to specify who should do this or how.

Sedentary lifestyle
Concomitant with these changes in food production and marketing is an insidious reduction in occupationally related physical activity. Many manual tasks have been replaced by automated machines and labour saving devices. Most occupations these days are sedentary. Low levels of physical activity are associated with an increased risk of obesity and other chronic diseases. Walking is no longer our main mode of transport and has been replaced by the motor car. This has been an important influence in lowering physical activity levels across all sectors of the population. Increased use of motor cars and urbanisation has resulted in the decline of bicycle use, as cycling (and walking) in many inner city areas and roads is unsafe. The Health Survey for England (1998) showed that 70–80% of the adults in Britain lead sedentary lives, and it is likely that the trend to more and more sedentary lives will continue. Similar trend of declining physical activity has been seen in girls from US in Third National Health and Nutrition Examination Survey.

Psychological stress
In present era competition is a part of life starting from school education to job or business stress till end of life. An extensive literature has been published on job stress and cardiovascular disease (CVD), mainly among men. Some evidence suggests indirect effects of psychosocial and other work conditions on health through health behaviours. Indirect pathways may include effects of job stress on physical activity, eating behaviours, and other behaviours that may be related to BMI. Previous studies have found associations between working conditions and health behaviours, such as diet, physical activity and alcohol consumption, which impact weight change. Nonetheless, multiple studies have been conducted using job stress to test for associations with body mass index.

Secondary obesity
Obesity secondary to some pathology constitutes a minority of patients. This subset of patients includes various genetic syndromes like prodder Willi syndrome, Lowence Moon Biedl Syndrome etc.; hypothalamic lesions; various endocrinopathies like Cushing’s Syndrome, Hypothyroidism etc; and drug induced. Secondary causes of obesity, is separate issue beyond the scope of this article.

ARE OUR GENES CHANGING?
Spontaneously occurring mutations are supposed to be the key mechanism of evolution. Mutation is considered as nature’s way to acclimatize organism with environment aimed at improving their survival. Few researchers believe that the pandemic of obesity is caused by a profound mismatch between humanity’s present environmental circumstances and those that have moulded evolutionary selection. This concept was first articulated when gestational diabetes was described as being the result of a thrifty genotype. Thrifty genes are supposed to be nature’s defense to survive episodic famine and seasonal hungry periods. Under such conditions those individuals who could lay down extra energy stores and use them most efficiently would have a survival advantage. Examples of attempts to find thrifty genes in three selected candidate areas: maternally-transmitted mitochondrial genes; the uncoupling proteins; apoE4, whose geographical distribution has been linked to a possible thrifty role in lipoprotein and cholesterol metabolism have been reviewed in by Prentice.

CAN WE HALT IT?
Time and again nature has defeated humanity when we tried to overcome it. Going by nature and keep ourselves active is probably the best way to halt progression of this pandemic. Time only can answer who will win the battle and how? The question still remains will gradually the human architecture change to obese one? Will humanity adapt to survive with obesity? Will obese progeny succumb?

Consensus Statement for Diagnosis of Obesity, Abdominal Obesity and the Metabolic Syndrome for Asian Indians and Recommendations for Physical Activity, Medical and Surgical Management 41-3.
Recently we published Asian Indian Guidelines for Obesity. Asian Indians exhibit unique features of obesity; excess body fat, abdominal adiposity, increased subcutaneous and intra-abdominal fat, and deposition of fat in ectopic sites (liver,
Obesity is a major driver for widely prevalent metabolic syndrome and type 2 diabetes mellitus (T2DM) in Asian Indians in India and those residing in other countries. Based on percentage body fat and morbidity data, limits of normal BMI are narrower and lower in Asian Indians than in white Caucasians. BMI is the most researched measure of generalized obesity and should continue to be used using Asian Indian-specific cut-offs as described later. Waist circumferences should be used as a measure of abdominal obesity with Asian Indian specific cut-offs. Both BMI and WC should be used together (with equal importance) for population- and clinic-based metabolic and cardiovascular risk stratification. Several investigators studied the cut-offs of BMI which would correspond to the cut-offs of percentage body fat (25% in men and 30% in women) in healthy individuals, in patients with dyslipidemia, and in patients with T2DM. In most of the studies the BMI cut-offs (kg/m²) ranged from 21.5-24 in men (except one study) and 19-24 in women. In a recent study, Dual Energy X-ray Absorptiometry (DEXA) scan was used to measure percentage body fat, whereas other studies used skinfold thickness measurements to derive percentage body fat. All these studies indicate that the cut-off of BMI corresponding to the cut-off of percentage body fat is lower for Asian Indians from various parts of India. The current Consensus Statement for Revised BMI Cut-offs for Abdominal Obesity in Asian Indians: Methodology of WC Measurement: WC should be measured using non-stretchable flexible tape in horizontal position, just above the iliac crest, at the end of normal expiration, in the fasting state, with the subject standing erect and looking straight forward. Based on the current evidence, WC is preferred over WHR as a measure of abdominal obesity with Asian Indian specific cut-offs. Both BMI and WC should be used together (with equal importance) for population- and clinic-based metabolic and cardiovascular risk stratification. Men: 90 cm, women: 80 cm. Subject with WC above this should seek medical help so that obesity-related risk factors could be investigated and managed. Waist-height ratio and sagittal diameter as indexes of abdominal obesity appears promising and needs to be researched and validated. Optimal method of measurement of WC including site of measurement (just above iliac crest?) posture (erect?), phase of respiration (end of normal expiration or other phases?), prandial state (fasting?), needs to be further researched in lines of a recent study on Asian Indians.³¹,³³

**PHYSICAL ACTIVITY GUIDELINES FOR ADULT INDIANS**

Physical activity is defined as any activity leading to calorie consumption. It reduces risk for cardiovascular diseases, diabetes and other disabilities associated with obesity. It must be stressed that movement as an opportunity and not as an inconvenience. Action is needed at the individual, community and societal level to help Indians become more physically active. Physical activity can be classified based on type and intensity in the following manner. Aerobic Activity (endurance activity or cardio activity): This is a type to physical activity in which body’s large muscles move in a rhythmic manner for a sustained period of time e.g. brisk walking, dancing, running, bicycling, jumping rope, and swimming. Muscle Strengthening Activity: This is a type of physical activity...
which involves muscles to work or hold against an applied force or weight. Muscle strengthening activities like resistance training and weight lifting are necessary to counter the muscle wasting induced by aging, surgery or bed rest. The effects of this are limited to the muscles doing work and it should be done for important group of muscles as legs, hip, back, shoulder and arms. **Intensity of Physical Activity:** The intensity of the physical activity is assessed using metabolic equivalent (MET), which is defined as ratio of person’s working metabolic rate relative to resting metabolic rate.. **Moderate Physical Activity:** These are activities (brisk walk and cycling) which lead to caloric expenditure of about three to six times more than basal levels (3-6 METs). **Vigorous Physical Activity:** These are activities (running, football, rope jumping etc) which lead to caloric expenditure more than six times the basal levels (>6 METs).51,42

The current Consensus Statement for the Revised Guidelines of Physical Activity for Obesity and the Metabolic Syndrome for Asian Indians:

- Physical inactivity should be avoided as far as possible.
- Pre-participation medical consultation is recommended for those with chronic conditions or those who are symptomatic.
- Inactive people should start slow and gradually increase physical activity.
- Brisk walking (walking at an intensity wherein an individual finds speaking difficult but not impossible) is preferred initial mode of exercise and as this does not require any special training or equipment.
- In general, a total of 60 minutes of physical activity is recommended every day, this includes aerobic activity, work-related activity and muscle strengthening activity.
- Physical activity can be accumulated throughout the day in blocks as short as 10 minutes. Work-related activity should be encouraged wherever possible.
- There is a dose-response relationship between physical activity and health, greater benefit is derived by exceeding minimum recommendations. For additional and more extensive health benefits, adults can increase their aerobic physical activity to 300 minutes (5 hours) a week of moderate-intensity, or 150 minutes a week of vigorous-intensity aerobic physical activity. This issue should also be researched in Asian Indians.
- Dynamic yoga should be encouraged but needs more research.
- Children should undertake at least 60 min of outdoor physical activity. Screen time (television/computers) should be less than 2 hrs a day.

**PHYSICAL ACTIVITY PRESCRIPTION**

Physical activity must be individualized on the basis of person’s abilities and comorbidities. Much like pharmacological therapy it requires prescription with careful consideration of both appropriate dosage and frequency.

**REFERENCES**
