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REVIEW ARTICLE

Obesity in Asia – is it different from rest of the world

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Summary

An epidemic of obesity and obesity related diseases such as diabetes and cardio vascular disease (CVD) is prevalent in many Asian countries. Migration from rural to urban areas, and rapid socio-economic transition are associated with the lifestyle changes resulting in decreased levels of physical activity and increased intake of energy dense diet.

Keywords obesity; Asia; obesity and diabetes; diabetes; lifestyle disorders; upper body adiposity

Introduction

Reduced physical activity at work due to mechanization, improved motorized transport and preferences for viewing television and video games to outdoor games during leisure time, have resulted in positive energy balance in most of the Asian countries. Reports from India and China show increase in consumption of energy–dense food in the past decade both in the urban and rural populations.

Asian populations have lower Body mass index (BMI), but have higher total and central adiposity for a given body weight when compared with matched white populations, which make them more susceptible to metabolic diseases. Metabolic obesity is common among Asians.

Prevalence of childhood obesity is increasing in India, Singapore, China, Malaysia and other Asian countries. Cardiometabolic risk factors are seen even in normal weight Asian Indian children and the percentage of abnormalities are higher in overweight children.

Initiatives to educate the community regarding the benefits of healthy foods and sustained physical activity will help to tackle the problem of obesity and its associated disorders. National initiatives towards prevention of these disorders are urgently needed in Asian countries.

Overweight and obesity are strongly associated with diseases such as diabetes, hypertension (HTN), cardiovascular disease (CVD) and the metabolic syndrome. Rising rates of obesity is an epidemic in most of the developed countries and is becoming a major health hazard in many developing nations as well. Rapid urbanization, modernization, and adoption of a lifestyle with reduced physical activity and increasing intake of calories have resulted in rising rates of obesity in several developing countries. A global estimate showed that in 2005 there were nearly 1.06 billion overweight persons of age 15 years and above [1]. Among them at least 400 million adults were obese. It is also predicted that by 2015 approximately 2–3 billion adults will be overweight and more than 700 million will be obese.

Asian countries, particularly China and India are highly populous. In comparison with the developed countries such as the USA, Asian countries have

considerably lower rates of overweight and obesity. Table 1 shows the comparative figures for overweight and obesity in Asian countries *versus* USA [2–12]. It can be appreciated that the rates are highly variable among the Asian countries; the highest rate of overweight is in Thailand, the lowest is in India. When compared with the USA, the rate of obesity, defined as Body Mass Index (BMI) > 30kg/m^2 is nearly 5–15-folds lower amongst the Asian populations. If the rising trend in overweight (BMI 25–30Kg/m^2) continues at the present rate, majority of Asian countries would have rates similar to that in the USA in the next decade.

Risk factors associated with increasing rates of obesity

Many Asian countries are undergoing socio-economic and lifestyle transition due to globalization and rapid urbanization. Rates of urbanization are variable and it is estimated that substantial increases in urbanization will occur in most Asian countries[13]. More than 60% of the population in Singapore, Korea, Malaysia, the Philippines and Indonesia and more than 30% of population in China, Pakistan, India and Thailand live in urban areas. Bangladesh and Srilanka have slow rates of urbanization. With urbanization, physical activity decreases, BMI and upper body adiposity increase substantially [14]. Internal rural to urban migration occurring in these countries, results in similar adverse changes. The nutritional habits are altered significantly. Urban populations have easy accessibility to diverse diets with a abundance of refined carbohydrate, processed foods, saturated and total fat and lower content of fiber.

Characteristic features of obesity in Asians

The socio-economic transition in Asia has occurred in last three decades resulting in increased availability of food, better transport facilities and better health care facilities. Epidemiological data from China[15] and India[14] show that change in diet habits, reduced physical activity due to mechanization, preference of viewing TV and videos, outdoor games and increase use of automobiles are associated with the change in rates of obesity in the rural population (Table 2) [16,17]. The changing trend was initially noted in urban populations and similar scenario had occurred in rural areas in the recent years. The trend seen in semi urban population of India is a typical example of the increasing obesity seen in the rural populations[18]. Rate of obesity increased by 1.7-fold in the city of Chennai in a span of 10 years. Woman had higher rates of obesity than men. Though the prevalence of obesity still remained lower in the rural population, it had increased by nearly 8.6-fold in a period of 14 years [14]. BMI as well as abdominal obesity increased in both sexes. Prevalence of overweight increased by 2–7.1%. In some developing countries, obesity specially among woman is regarded as a sign of affluence. Such cultural beliefs could be related to the higher prevalence among women than in men. It is generally believed that higher socio-economic status is associated with obesity in the low income countries like India and China. In India, prevalence of obesity in urban slums is higher than in rural areas, and women have higher rates of obesity than men [19]. The association of behaviour related to socio economic status and obesity is complex [20].

Table 1. Comparison of prevalence of adult obesity in Asian countries versus the USA

Country [Reference]	Survey year	Prevalence of overweight adults (%)*	Prevalence of obese adults (%)†
USA [3]	2007–2008	34.0	30.2
India [4]	1998–1999	10.0	2.2
Malaysia [5]	1996–1997	16.6	4.4
Philippines [6]	1998	16.9	3.3
Taiwan [7]	1993–1996	21.1	4.0
Japan [6]	2001	23.0	3.0
Singapore [8]	1998	24.4	6.0
China [9]	1999–2000	25.0	4.0
Hong Kong [10]	1996–1997	25.1	3.8
Korea [11]	2001	27.4	3.2
Thailand [12]	1998	28.3	6.8

*BMI 25 to <30 kg/m2, †BMI > 30 kg/m2, Adopted from Yoon *et al.* with permission [Reference-2].

Body mass index

Asian populations are lean when compared with western population. However, the association between BMI and glucose intolerance is as strong as in any other population. Studies in India and other Asian populations have shown that a BMI of ≥23 kg/m^2 is associated with risk of diabetes [16]. The World Health Organization (WHO) has recommended that BMI of 18.5–<23 kg/m^2 is healthy for Asians [21].

Table 2. Improvements in living conditions in the villages from 1989–2003 in Southern India [Reference-14]

Factors	Values in percentage	
	1989	2003*
Regular use of motorised transport	86.6	93.4
Electricity transport	50.6	95.1
Water supply near residence	68.6	96.3
Medical facility	87.5	96.6
Watching television regularly	23.8	78.6
Three regular meals	57.2	70.1
Regular access to city	54	74
Monthly income (INR) Mean ± SD	254 ± 100	1413 ± 1023

*All values were significantly different from the past data, $p < 0.001$ for all.

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Abdominal obesity

Asian populations particularly South Asians are characterized by high abdominal (central) adiposity for a given body weight when compared with matched white populations. The International Diabetes Federation (IDF) criteria for metabolic syndrome recommends use of ethnic specific threshold for waist circumference which is a surrogate marker of abdominal obesity [22]. For Asian men and women, the respective cutoff of normal values are $\geq$90 and $\geq$80 cms. The percentage of body fat is also higher among Asian populations which could probably be one of the major contributing factors for insulin resistance generally present among the Asian populations, despite having lower BMI. A higher body fat percentage with lower body weight and tendency for abdominal obesity are seen even among Asian children [23].

The Health Survey of England [24] and the International Day for the Evaluation of Abdominal obesity in Asian (IDEA) regions [25] showed that abdominal obesity was highly prevalent in Asian countries, particularly in South Asia (58% and 78% in men and women respectively). A higher prevalence of diabetes and CVD specially in women could be attributed to these features [25]. Visceral fat is a risk factor for dyslipidaemia and is also associated with insulin resistance. A study by the authors in Asian Indians showed that subcutaneous fat also was associated with insulin resistance [26].

Obesity and insulin resistance

Obesity is known to be a primary cause of insulin resistance which is associated with several metabolic disorders. The increased number and size of fat cells overproduce hormones such as leptin, cytokines like Tumour Necrosis Factor (TNFα) and reduce the synthesis of adiponectin which enhances insulin sensitivity. A study in Asian Indians in the USA showed that the ethnic difference in the manifestations of insulin resistance could be mostly related to the higher amount of truncal fat and the large dysfunctional subcutaneous fat cells [27]. The findings suggest that the morphology and the functional characteristics of the fat cells differ among Asian Indians when compared with white populations. The release of Non-Esterified Fatty Acid (NEFA) is high in Asian populations leading to insulin resistance in the liver and muscles and also producing dyslipidaemia [23].

Studies in youth

Childhood obesity is increasing in Asian countries [28]. An imbalance of energy intake *versus* energy expenditure is the major cause of childhood obesity. A predominant role for lack of physical activity, rather than high fat intake has been demonstrated as the determinant of rising rates of obesity [29].

Contrary to the occurrence of cardio metabolic risks and its clustering in obese children in the western countries [30], we had observed a high prevalence of the risk factors (65%) even among normal weight Asian Indian urban children and adolescents [31]. As expected, the percentage of abnormalities increased (85%) and their clustering also occurred more commonly in overweight children [Table 3].

Among the Asian adults and youth, metabolic obesity appears to be more common. This phenomenon could be linked to the high vulnerability for metabolic disorders such as diabetes and CVD. It has been observed that even minor increase in BMI or waist circumference makes an Asian Indian susceptible to develop diabetes.

'Role of diet'

Increasing globalisation, urbanisation and improved economic conditions have resulted in changes in the diet pattern of Asian populations. Diet preferences have changed from the conventional, low fat, fibre rich foods to more of refined, sweetened, fat-rich, energy –dense items, especially in the low and middle income Asian countries. Moreover, animal-source foods are increasingly preferred to vegetarian foods [32]. Urbanisation and mechanisation have led to marked reduction in physical activity, at work and during leisure time. A combination of increased energy intake and decreased energy output can be considered as the major detrimental factor both in children and adults.

Genetics of obesity

Development of obesity is multifactorial and genetic influences are implicated. A strong obesogenic environment is required for its phenotypic expression. Familial prevalence of obesity has been reported in different populations [33,34]. Children of obese parents have a higher predisposition to obesity than children of normal-weight parents [35].

A common variant, rs9939609, in the fat mass and obesity (FTO) gene has shown association with adiposity in Europeans and also in South Asians [36–38]. However, in contrast with the Europeans, its association with diabetes was only partly accounted for by the BMI [37–39].

Table 3. Effect of body weight on clustering of cardiovascular risk factors in teenagers in India [Reference –31]

		Prevalence of risk factors			
		Values in percentage			
Body weight	*n*	Nil	1	2	>2
Total	2639	32.2	44.7	20.6	2.4
Normal weight	2245	35.2	44.8	18.7	1.3
Overweight	394	15.2	44.4	31.7	8.9
p value	–	<0.0001	NS	0.002	<0.0001

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Although mutations in genes related to leptin and leptin receptors and a few other genes have been reported in obesity [40], no specific studies in Asian populations on these have been done.

Prevention of obesity

The marked increase in the prevalence of obesity, overweight and type 2 diabetes largely reflects changes in diet and physical activity level as a result of economic development, industrialization and urbanization. This increase has posed enormous challenges to Asian societies and healthcare systems. There is an urgent need to create awareness among the public, health care providers and also the governments on the graveness of the problem of overweight and obesity, which is a major cause for many metabolic disorders affecting the Asian populations. The benefits of consistent physical activity and healthy diet habits from the childhood have to be stressed. Examples setup by the governmental policies in Singapore [41] should be adopted to arrest the rapid increase in overweight and obesity. Singapore's 'Fit and Trim' programme in school children has led to a remarkable drop in prevalence of obesity from 16.6% in 1992 to 14.6% in 2000 among children aged 11–12 years, and from 15.5 to 13.1% among children aged 15–16 years. National programmes have been initiated for prevention of noncommunicable diseases in many countries.

Prevention of obesity is likely to be most effective when implemented in the childhood itself. Guidelines have been laid down by the WHO for formulating national policies to meet these challenges. For prevention of obesity, overweight and its related health risks, population-based strategies to improve social and physical environmental contexts of healthy eating and physical activity are essential. Primary prevention studies using healthy foods, sustained physical activity, and initiatives to educate the community regarding the benefits of these will help to tackle the global problem of obesity and its associated disorders.

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Conflicts of interest

None to declare.

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