

Short communication

Does the body mass index (BMI) not serve as a reliable way for determining the amount of fat that has accumulated?

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ABSTRACT: According to the most recent information provided by the World Health Organisation (WHO), in the year 2022, one in every eight individuals around the world were living with obesity. Since 1990, the prevalence of obesity among adults around the world has more than doubled, while the prevalence of obesity among adolescents has quadrupled. In 2022, an estimated 2.5 billion individuals aged 18 and older were classified as overweight. At the time, 890 million of these individuals were affected by obesity. As of the year 2022, a notable proportion of individuals aged 18 and above, specifically sixteen percent, were classified as overweight or obese. In 2022, it was estimated that 37 million children who were below the age of five were classified as overweight. Approximately 390 million children and adolescents aged 5 to 19 were classified as overweight in 2022, with 160 million of this population classified as obese. These findings raise a red flag regarding the larger picture of the health concerns that are associated with obesity. This article discusses the present state of obesity in India and around the world, as well as its causes and management, body mass index (BMI), calculating and interpreting BMI, reliability of BMI measurement and other reliable methods which are used instead of BMI.

KEYWORDS: Obesity, overweight, body mass index, BMI, body fat.

I. INTRODUCTION:

Overweight: The main sign of this sickness is having too much fat. Obesity is a long-term, difficult disease that is marked by a buildup of too much fat that can be harmful to health. Being overweight or obese can lead to a number of health issues, such as type 2 diabetes, heart disease, weak bones, and a higher chance of cancer. Obesity makes it hard to do normal things like sleep and move around.

Body mass index (BMI) is calculated by dividing an individual's weight in kilogrammes by the square of their height in metres. It is used to diagnose overweight and obesity. Body mass index (BMI) and other measurements, like waist size, can help doctors figure out if someone is obese by using them as a substitute for body fat. There are different body mass index (BMI) groups for babies, kids, and teens based on their gender and age.

In 2022, one in every eight individuals worldwide was obese, per the WHO. Since 1990, the worldwide incidence of obesity among adults has increased by over twofold, whereas among adolescents, it has tripled. The 2022 forecast was 2.5 billion overweight adults. 890 million were obese. In 2022, 43% of individuals aged 18 and above had excess weight, while 16% were classified as obese. 37 million under-5s were overweight in 2022. About 390 million children and adolescents between 5 and 19 were overweight in 2022, with 160 million obese. These findings raise worries about obesity's health effects. [1]

Overweight has been associated with a higher risk of several illnesses. Consequently, an individual with a body mass index (BMI) falling within the overweight or obese category may be more susceptible to various health complications, including but not limited to hypertension, cancer, osteoarthritis, type 2 diabetes, gallstones, sleep apnea, cardiovascular disease, and hepatic disorders.

II. BMI (BODY MASS INDEX)

The BMI is computed by entering weight (in pounds or kilogrammes) and height (in inches or metres) into a straightforward formula. The BMI is a metric utilised to determine an individual's body fat percentage and classify them as healthy weight, underweight, overweight, or obese.

Calculation of BMI based on weight and height

In metric system

BMI = Weight in kg / (Height in m)²

Example – Calculate the BMI of a professor working in a Pharmacy College whose weight is 80 kg and height 175 cm.

Solution –Weight = 80 kg

Height = 175 cm = 175 / 100 m = 1.75 m

BMI = 80 / (1.75)² = 80 / 3.06 = 26.14

In imperial system

BMI = Weight (lbs) / Height (in²) x 703

Solution - Weight = 80 kg = 176.37 lbs (1 kg = 2.2 lbs)

Height = 175 cm = 68.90 in (1 cm = 0.4 in)

BMI = 176.37 / (68.9)² x 703 = 176.37 / 4747.21 x 703 =26.12

Interpretation of BMI measurement

Categories	BMI measurement		
Underweight	≤18.5		
Normal weight	18.5 to 24.9		
Overweight	25 to 29.9		
Obesity	≥30	Class 1 (Mild obesity)	30 to 34.9
		Class 2 (Moderate obesity)	35 to 39.9
		Class 3 (Severe obesity)	≥40

Result - The professor's BMI of 26.1 indicates that he or she is overweight. An increased susceptibility to chronic diseases such as diabetes and cardiovascular disease is generally associated with a higher body mass index (BMI).

Advantages and disadvantages of BMI

Due to its inability to distinguish between fat and muscle, the Body Mass Index (BMI) may erroneously estimate body fat in athletes or individuals with bulky physiques, resulting in a false alarm for numerous individuals.

a. **Muscle mass:** Muscle mass is one of these characteristics. The body fat percentage of individuals with modest levels of muscle mass may also be underestimated.

b. **Gender:** Women are, on average, more corpulent than males. This implies that within the "safe" category, a woman may have a higher risk of developing cardiovascular disease and other ailments, even when compared to males who have the same body mass index.

c. **Age:** The predictive power of BMI for health risks among individuals of different age groups may be limited.

For example, a higher risk of mortality (death) is associated with a body mass index (BMI) of 23 or less, which is considered "normal" for adults, but is problematic for individuals aged 75 and older.

d. **Race/ethnicity:** Body fat distribution can change among different racial groups, resulting in varying interpretations of BMI scores. For example, individuals of Asian descent exhibit greater percentages of body fat in comparison to Whites who have the same BMI, while individuals of White descent have greater proportions of body fat in comparison to Blacks who have the same BMI.

e. According to research findings, the distribution of adipose tissue influences body morphology. Those who possess a "apple" physique, distinguished by weight distribution around the midsection, face elevated health hazards in comparison to those who have a "pear" physique, in which weight is concentrated in the hips and thighs. [2]

Causes of overweight and obesity

- a. Energy intake imbalance due to diet
- b. Energy expenditure through physical exercise
- c. Environments that promote obesity
- d. Psychosocial aspects
- e. Genetic variations
- f. Prescription drugs
- g. Medical conditions
- h. Immobilisation: It refer to the act of rendering something or someone motionless or unable to move.
- i. Iatrogenic factors: It refer to medical

interventions or treatments that are caused by the actions of healthcare professionals.

j. Monogenic disease: Also known as a genetic syndrome, is a medical condition that is caused by a mutation in a single gene.

Prevention and management

At the individual level, individuals may have the capacity to reduce their likelihood of developing overweight or obesity by implementing preventive measures at every stage of life, commencing with pre-conception and persisting during the initial years of pregnancy and infancy. These include the following:

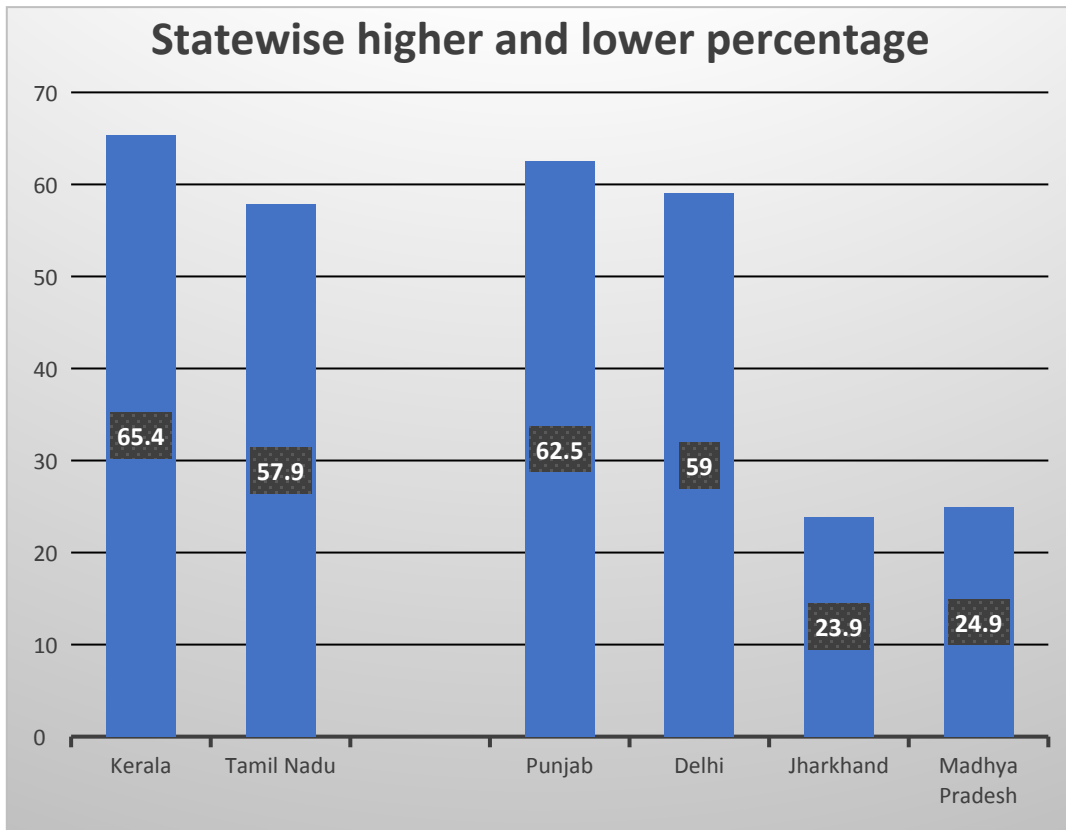
- Make sure to gain the right amount of weight during pregnancy
- Breastfeed the baby exclusively for the first six months after birth and continue to do so until 24 months or later
- Support the child's healthy eating, physical activity, sedentary behaviour and sleep habits, no matter what their weight is now
- Limit screen time
- Eat less sugary drinks and high-energy foods and encourage other healthy eating habits
- Take a healthy diet. [1]

According to the findings of the National Family Health Survey-5 (2019-2021), there is a higher prevalence of abdominal obesity among women in India. As indicated by the demographic segregation of data,

Abdominal obesity	
Women	39.6%
Men	11.9%
Overweight as per the BMI criterion	
Women	23%
Men	22.1%

According to regional data segregation, the prevalence of abdominal obesity varies between states by the following percentage points: 1.8%–28.2% for men and 23.9%–65.4% for women. The prevalence of obesity among women is higher in the southern and northern regions. It is found to be less prevalent in the states of Jharkhand and Madhya Pradesh.

Kerala	Tamil Nadu	Punjab	Delhi	Jharkhand	Madhya Pradesh
65.4%	57.9%	62.5%	59%	23.9%	24.9%



Abdominal obesity for people residing in urban areas is higher than in those in rural areas. Data given below

Abdominal obesity			
Urban		Rural	
Men	Women	Men	Women
15.7%	49.5%	10%	35%

In adults, the prevalence of abdominal obesity is greater among those aged 40–49 than among those aged 20–29. The information provided below

Abdominal obesity			
40-49 years age group		20-29 years age group	
Men	Women	Men	Women
19.7%	56.7%	7.4%	32.2%

This may involve examining

- Dietary habits
- Physical activity levels
- Lifestyle factors in different religious communities
- Exploring the cultural and social factors [3]

Alternatives to BMI [2]

There are other methods for measuring body fat and/or assessing health risks that can be used instead of BMI like

a. **Waist circumference:** Adiposity accumulated in the abdominal region may elevate the susceptibility

to type 2 diabetes and cardiovascular disease. Women and men who have torso measurements exceeding 35 inches and 40 inches, respectively, are at an increased risk.

B. Waist-to-hip ratio: Additionally, prospective health risks can be determined by dividing the circumference of the waist by the circumference of the hips. A risk indicator is a measurement of 0.9 or greater for women and 1.0 or greater for males.

c. **Skin-fold measurements:** Callipers, which resemble forceps and are utilised to assess the thickness of the skin, can be employed to

approximate body fat percentages. Measurements are obtained from various anatomical locations. Following this, body fat is determined using a mathematical formula.

d. **Smart scale:** The estimation of body fat is possible using specific "smart" washroom scales. Through the body, these scales conduct a non-toxic electrical current in order to determine body fat.

Other sophisticated methods of measurement [2]

S.No.	Method	How it works
1	Underwater weighing	Densitometry, also known as hydrostatic weighing, consists of weighing in air and then water. The body fat percentage is then computed by comparing the two measurements.
2	Air displacement plethysmography (ADP)	This method estimates the percentage of body fat using air and the body's density.
3	Dual-energy X-ray absorptiometry (DEXA)	By utilising this imaging technology, body composition, including adipose, muscle mass, and bone density, can be assessed.

III. CONCLUSION

Reports of World health organization and national health family survey report – 5 is scary to become conscious regarding the health difficulties because of overweight/obesity. BMI measurements distinguish between the two distinct categories of overweight and obesity. More precisely, individuals who possess a body mass index (BMI) ranging from 25 to 29.9 are categorised as overweight, whereas those who have a BMI of 30 or higher are designated as obese. Both activities serve as significant risk factors for several critical health conditions such as diabetes, hypertension, and heart disease. The BMI measures lack reliability due to its failure to account for aspects such as age, gender, body shape, and muscle mass. To obtain more accurate readings, alternative methods such as waist circumference, waist-to-hip ratio, skin fold measurements, and smart scales can be utilised instead of relying solely on BMI. There are several innovative and complex procedures that can be utilised, including as underwater weighing, air displacement plethysmography, and dual energy x-ray absorptiometry (DEXA). In the present scenario, it is imperative to raise public awareness in order for individuals to modify their dietary habits and lifestyle, thereby promoting a healthy and disease-free existence.

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