APTI

ijopp

Body Mass Index – A Diagnostic Tool to Assess Obesity

Praveen Kumar N V R T*, Mohanta G P, Manna P K, Manavalan R
Division of Pharmacy Practice, Department of Pharmacy, Annamalai University, Annamalai Nagar-608002
Address for Correspondence: praveenkumar_nvrt@yahoo.com

INTRODUCTION

Obesity is common in many parts of the world and the prevalence of Obesity seems to be increasing in most part of the world, even where it used to be rare.[1] The World Health Organization (WHO) has reported that the prevalence of obesity is increasing worldwide including the developing countries.[2] The central obesity is a strong predicator of high prevalence of Diabetes, Hypertension and Coronary Artery Diseases. It has been reported that India would be the global diabetes capital by 2050. The pooled estimates of prevalence rates for diabetes mellitus for urban and rural areas were found to be 118.02 per thousand and 38.67 per thousand respectively. The overall prevalence rate of diabetes in urban and rural areas combined was estimated as 62.47 per thousand.[3] Similarly, the prevalence of hypertension was reported to be 159.46 per thousand.[4] Obesity is also known to have associated with Gastro esophageal reflux disease and other diseases.[5] Obesity causes therapeutic challenges because of its impact upon the pharmacokinetic and/or pharmacodynamics of drugs.[6] Body Mass Index (BMI) has been used by WHO as the standard for recording obesity statistics since the early 1980s.

BMI is defined as individual's body weight divided by square of his height. In system, it is expressed as kg/m^2.

$$BMI = \frac{weight\ (kg)}{height^2\ (m^2)}$$

It was invented between 1830 and 1850 by the Belgian Polymath Adolphe Quetlet during the course of developing 'social physics'[7]. It is also known as Quetlet's index. Body Mass Index is a reliable indicator of body fatness for most of all children, adolescence, adults and elderly people. BMI became popular during the early 1950s and 1960s as obesity started to become a discernible issue in prosperous western societies. BMI provides a simple numeric measure of a person's fatness or thinness, allowing health professionals to discuss over and under weight problems more objectively with their patients.[8]

International Standard for Body Mass Index

Body Mass Index relates weight to height and is a common method of determining if an individual's weight is in a healthy range based on their height Table 1.

Table 1. The International Classification of adult underweight, overweight and obesity according to BMI[9]

Classification	BMI(kg/m^2)	
	Principal cut-off points	**Additional cut-off points**
Underweight	**<18.50**	**<18.50**
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
Normal range	**18.50 - 24.99**	**18.50 - 22.99**
		23.00 - 24.99
Overweight	**?25.00**	**?25.00**
Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
Obese	**?30.00**	**?30.00**
Obese class I	30.00 - 34-99	30.00 - 32.49
		32.50 - 34.99
Obese class II	35.00 - 39.99	35.00 - 37.49
		37.50 - 39.99
Obese class III	?40.00	?40.00

The index can be: under 18.5 (underweight), 18.5-24.9 (acceptable weight), 25-29.9 (overweight) and 30 or higher (obese). The index is calculated for those aged 20 to 64 excluding pregnant women and persons less than 3 feet (0.914 meters) tall or greater than 6 feet 11 inches (2.108 meters.

But the BMI for children is expressed in percentile which can be obtained using BMI and age growth chart. Percentiles are the most commonly used indicator to assess the size and growth patterns of individual children in the U.S. The percentile indicates the relative position of the child's BMI number among children of the same sex and age. The growth charts showed weight status categories used with children and infants (Table 2).[10]

Table 2. The growth charts showing weight status categories

Weight status category	Percentile range
Under weight	Less than the 5%
Healthy weight	5% to less than 85%
Over weight	85% to less than that of 95%
Obese	Equal to 95% to greater than 95%

Indian BMI

Realizing the problems of obesity and its direct fall out 'diabetes' in India, the government of India compiled its first weight and flab statistics in 2008. It has been proved that Indians are different from their western counter parts both in body structure and genetically. The Indians suffer from abdominal obesity in contrast the people of west are uniformly obese. The Indian body composition puts them in high risk of diabetes and hypertension. Study has reported that if the abdominal and lower limb obesity and metabolic syndrome are not arrested, India would become the diabetic capital in next four decades.[11] The revised guidelines are jointly issued by the Ministry of Health, Diabetes Foundation of India, All India Institute of Medical Sciences, Indian Council of Medical Research, National Institute of Nutrition and other related organization. A person with BMI 23 kg/m^2 is now considered over weight against the cut off limit of 25 kg/m^2 earlier. Cut off of waist circumference is now 90 centimeters for men and 80 centimeters for women.

The guidelines divide the   BMI into the following categories:

BMI is equal to or less than 18.5 (Under Weight) This indicates under weight. They need to consult physician to explore gaining weight as low body mass decreases immune system leading to illness.

BMI is between 18.5 and 24.9 (Normal) This reflects the ideal body weight. They are likely to have lower incidence of serious illness than people with higher or lower BMI. They look physically more attractive.

BMI is between 25 and 29.9 (over weight) The value reflects over weight. Individuals who fall in this range are at increased risk for a variety of illness. They need to follow healthy ways to lower their weight, such as diet and exercise.

BMI is over 30 (obese) This indicates a physically unhealthy condition which puts the persons at risk for serious illnesses such as heart disease, diabetes, high blood pressure, gall bladder disease, and some cancers. These persons would benefit greatly by modifying their lifestyle.

LIMITATIONS

Body Mass Index is a useful tool in monitoring someone's health status, but it has its own limitations. BMI measures total body weight, not the actual amount of fat a person is carrying. Some people are naturally stocky and have a body mass index that is in the overweight category, when in fact their weight is due to muscle mass and a heavier bone structure rather than excess fat.[12]

Table 3. The Indian Classification of adult underweight, overweight and obesity according to BMI

BMI	Rating	Waist Size	
		< or = to 40 in. (men) or 35 in. (women)	> or = to 40 in. (men) or 35 in. (women)
18.5 or less	Underweight	--	N/A
18.5-24.9	Normal Weight	--	N/A
25.0-25.9	Overweight	Increased	High
30.0-34.9	Obese	High	Very High
35.0-39.9	Obese	Very High	Very High
40 or greater	Extremely Obese	Extremely High	Extremely High

N/A—not available

It is common for athletes such as rugby players and weight lifters to have a BMI indicating they are overweight when they are not. Their body mass index is higher because of their extra muscle mass, not because of excess body fat (muscle weighs more than fat). Conversely, some athletes will be underweight according to their BMI (such as long distance runners). This is due to low body fat and aerobic slow twitch muscle fibers, which develop naturally as a result of their particular sport.

Some people are thin-framed and their BMI will inaccurately determine them as being underweight. Those who have lost muscle mass (such as the elderly and infirm) may also appear to be underweight, when in fact it is normal to lose muscle mass and body fat in old age and as a result of poor health.

If body mass index falls within the normal range, this does not necessarily indicate someone is in perfect health, that they are getting enough exercise or eating a healthy range of foods. They may also be carrying more body fat than is good for them. In addition to body weight, shape is also important. A person's body mass index may be normal but their waist circumference may be too high. Being apple shaped carries more health risks (including a higher risk of heart disease) than being pear shaped - regardless of a normal BMI.

Other methods of estimating body fat

In addition to BMI, various other techniques have been reported for analyzing body composition: Hydrostatic weighing, Height/Weight tables, Skin Fold Measurement, Anthropometric measurements, Infrared Interactance, Bioimpedance Assessment (BIA), Electrolipography (ELG), Anthro–Electrolipo-graphy(AELG).[13] The ideal body weight can also be estimated as follows:[14]

IBW for Males:

If H>152.5cm = 50 + [(H-152.4)*0.89)]

If H<152.5cm = 50 – [(152.4-H)*0.89]

IBW for Females

If H>152.4cm = 45.4 + [(H-152.4)*0.89]

If H<152.4cm = 45.4 – [(152.4-H)*0.89]*

Where H -- height

CONCLUSION

In spite of its limitation, BMI derived from body weight and height, is a good indicator of risk of morbidity and mortality in young and middle aged adults. BMI can predict the underlying risks in a large population and can be used as an early warning sign that can suggest if lifestyle changes are required or not. A change in BMI over a short period of time is often used to measure the change in one's lifestyle habits. The BMI can be used as a tool by the physicians as well as by clinical pharmacists assessing the health status of the patients requiring counseling on healthy living. The new Indian standard of BMI and obesity is likely to improve health status of the people if health care professionals and the general public take note of this guideline and adhere to it.

REFERENCES

1. Seiderl JC. Obesity : a growing problem, Acta paediatr 1999; sufrlol 428:46-50
2. WHO. Obesity prevention and managing the global epidemic – report of a who consutativess on obesity, genesis: who -1998.
3. www.whoindia.org, assessment of burden of non - communicable disease, Diabetes
4. www.whoindia.org, assessment of burdern of non – communicable disease, Hypertension
5. Michoel D, Crowell et al; AMJ Gastroenteral 2007,104:553-559
6. Hand book of Basic Pharmacokinetics including Clinical Applications, by Wolfgang. A.ritischal etal, page.no.336.
7. Ekonoyan, Garabed(jan 2008). 'Adolphe Quenelle(1796-1874) – the average man and indices of obesity', nephrol.dial. transplant23(1):47-51
8. WHO Technical report series,#854, physical states the use and interpretation of Anthropometers, page.9.
9. www.who.int/bmi/index.jsp?intropage=intro_3.html(BMI Classification),access on 10-04-2009.
10. Centres for Disease Control and Prevention, http://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/about_childrens_bmi.html (how is BMI used with children and teens) access on 10-04-2009.
11. www.thaindian.com/newsportal/ uncategorized /india=reworks-obesity-guidelines-makes-fitness-norms-tighter_100123472.html Access on 10-04-2009.
12. http://www.disordered-eating.co.uk/signs- of-eating-disorders/body-mass-index-limitations.html access on 10-04-2009.Eating Disorders Information URL: http://www.disordered-eating.co.uk
13. http://www.bioanalogics.com/techniques.htm#tech_top access on 10-04-2009.
14. Hand book of Basic Pharmacokinetics including Clinical Applications, by Wolfgang. A.ritischal etal, page.no.337.