A Comparative Study of Body Mass Index (BMI) in Men and Women

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Abstract

Body Mass Index is an indicator for health status of a person. In the present study BMI of 160 individuals is examined and analysed. As the age increases underweight category decreases and overweight category increases in both males and females. Obese category % also increases in females.

Keywords

BMI, Obese.

I. Introduction

The Body Mass Index (BMI) or Quetelet index is a measure of relative size based on the mass and height of an individual.
The index was devised by Adolphe Quetelet during the course of developing what he called "Social Physics" between 1830 and 1850. The BMI for a person is defined as their body mass divided by the square of their height with the value universally being given in units of Kg/m^2. So if the weight is in Kg and the height in metres , the result is immediate . If pounds and inches are used, a conversion factor of 703(Kg/mt/(lb/in2) must be applied.

BMI = Mass in Kg/Height m² = mass lb/height in2x703

The BMI of an individual may also be determined using a table or chart which displays BMI as a function of Mass and height using contour lines or colours for different BMI categories and may use two different units of measurements.
There are a wide variety of contents where the BMI of an individual can be used as a simple method to assess how much the recorded body weight departs from what is healthy or desirable for a person of that height. There is however, some debate about which values on the BMI scale the thresholds for under weight, over weight and obese should be set.
The modern term body mass index for the ratio of weight to squared height owes its popularity to a paper published in the July 1972 journal of chronic diseases by Ancel Keys. This found the BMI to the best proxy for body fat percentage among ratio's of weight and height the interest in an index, that measures body fat came increasing obesity in prosperous western societies. BMI was explicitly cited by keys as appropriate for population studies and inappropriate for individual evaluation. Nevertheless due to it's simplicity it has come to be widely used for preliminary diagnosis. Additional Matrix such as waist circumference can be more useful.
BMI ranges from underweight to obese and is commonly employed among children and adults to predict health outcomes. The BMI trait is influenced by both genetic and non genetic factors and it provides a paradigm to understand and estimate the risk factors for health problems. BMI provides a simple numeric measure of person's thickness or thinness allowing health professionals to discuss weight problems more objectively with their patients.BMI was designated to be used as a simple means of classifying average sedentary population with average body composition. For these individuals the current Value recommendations are as follows; a

BMI from 18.5 to 25 may indicate optimum weight, lower than 18.5 suggest under weight, a number from 25 to 30 may indicate overweight and a number from 30 upwards suggests the person is obese (WHO). Athletes who tend to have an atypical muscle/fat ratio (atypical body fat percentage) may have a BMI that is misleading at first sight.
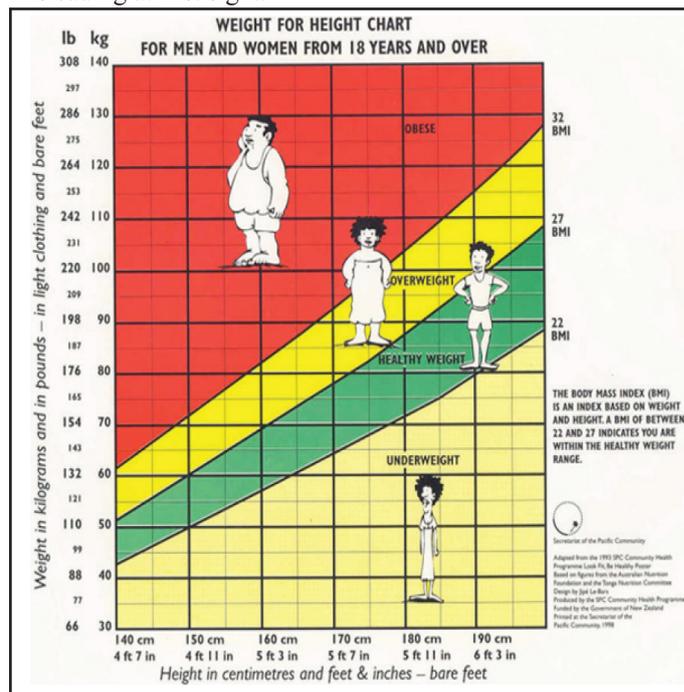

Fig. 1: Different Categories According to BMI in Pictorial Form

Table 1: Different Categories of BMI.

CATEGORY	BMI range – Kg/m^2
Very Severely Under Weight	Less than 15
Severely Under Weight	15.0 to 16.0
Under Weight	16.0 to 18.5
Normal (Healthy weight)	18.5 to 25
Over Weight	25 to 30
Obese Class I (moderately obese)	30 to 35

BMI is used differently for children. It is calculated in the same way as for adults. But then compared to typical values for other children of the same age instead of comparison against fixed thresholds for under weight and over weight. The BMI is compared against percentile for children of the same gender and age.
BMI that is less than the 5th percentile is considered underweight and above the 95th percentile is considered as obese. Children with a BMI between the 85th and 95th percentile are considered to be overweight.
Recent studies in Britain have indicated that females between the ages 12 and 16 have a higher BMI than males of the same age by 1.0Kg/m² on average.

A. Health Consequences of Overweight and Obesity in Adults

The BMI ranges are based on the relationship between body weight and diseases and death. Over weight and obese individuals are at an increased risk for many diseases and health conditions including the following.

- Hypertension
- Dyslipedaemia
- Type 2 diabetes
- Coronary Heart diseases
- Stroke
- Gall bladder diseases
- Osteoarthritis
- Sleep apnea and respiratory problems
- At least 10 Cancers

B. Clinical Practice

BMI has been used by the WHO as the standard for recording statistics since the early 1980s. In the United States BMI is also used as a measure of underweight owing to advocacy on behalf of those suffering with early disorders such as anorexia nervosa and bulimia nervosa.

BMI can be calculated quickly and without expensive Equipment. However BMI categories do not take into account many factors such as frame size and muscularity. The categories also fail to account for varying proportions of fat, bone, cartilage, water weight and more.

Despite this BMI categories are regularly regarded as a satisfactory tool for measuring whether sedentary individual are underweight, Overweight or Obese with various exemptions such as athletes, children and the infirm.

One basic problem especially in athletes is that muscle weight contributes to BMI.

Some professional athletes would be overweight or obese according to their BMI despite carrying little fat. Unless the number at which they are considered overweight or obese is adjusted upward in some modified version of the calculation. In children and the elderly differences in bone density and thus in the proportion of bone to total weight can mean the number at which these people are considered underweight should be adjusted downward.

C. Limitations and Shortcomings

BMI is particularly inaccurate for people who are very fit and athletic as their muscle mass can classify them in the overweight categories by BMI, even though their body fat percentages frequently fall in the 10-15% category which is below that of a normal BMI number. Body composition for athletes if often better calculated using measures of body fat as determined by search techniques as skin fold measurements are under water weighing and the limitations of manual measurement have also let to know alternative methods to measure obesity such as the body volume index. However recent studies of American football linemen who undergo, intensive weight training to increase their muscle mass show that they frequently suffer many of the same problems as people ordinarily considered obese notably sleep apnea.

BMI also does not account for body frame. A person may have a small frame and be carrying more fat than optimal but the BMI reflects that they are normal. Conversely a large framed individual may be quite healthy with a fairly low body fat percentage but be classified as overweight by BMI. Accurate frame size calculators use several measurements to determine what category an individual falls into for a given height, the standard is to use frame size in conjunction with ideal height/weight charts and add roughly 10% for a large frame and subtract roughly 10% for a small frame.

II. Materials and Methods

Weighing machine, Scale, Height measuring stand and weight for height chart.

Weight of a person is measured with the help of weighing machine. Height is measured by using height measuring stand. BMI is taken from the "weight for Height "chart.

Categories

Underweight	-	BMI<18.5
Normal	-	>18.5to 24.9
Over weight	-	>25 to 29.9
Obese	-	>30

In the present study, a total of 160 individuals (80 males & 80 females)are examined for BMI. They are divided into 4 age groups. In each group 20 women and20 men are examined.

Table 2: Number of Persons and Their Distribution in Different Categories of BMI in Different Age Groups

S.No.	Age Group (Years)	Females				Males			
		N	UW	OW	Ob	N	UW	OW	Ob
1	18-30	4 (20%)	14 (70%)	2 (10%)	Nil	8 (40%)	12 (60%)	nil	nil
2	31-40	12 (60%)	Nil	8 (40%)	Nil	4 (20%)	4 (20%)	12 (60%)	nil
3	41-50	14 (70%)	2 (10%)	4 (20%)	Nil	10 (50%)	4 (20%)	6 (30%)	nil
4	51-60	10 (50%)	2 (10%)	4 (20%)	4 (20%)	10 (50%)	nil	10 (50%)	nil
	Total Total%	40 (50%)	18 (22.5%)	18 (22.5%)	4 (5%)	32 (40%)	20 (25%)	28 (35%)	nil

N	= Normal
UW	= Under Weight
OW	= Over Weight
Ob	= Obese

Total no. of Males = 80 (20 in each age group)
Total no. of Females = 80 (20 in each age group)
Grand total = 160

III. Discussion

In the first age group the (18-30 years) the % of underweight is more in both females and males when compared to that of normal. In females % of overweight is 2% where as in males it is nil. OB category is nil in both males and females.

In the second age group (31-40 years), in females UW persons are nil but in males it is 20%. OW percentage is more in males (60%) when compared to that of females (40%).

In females percentage of normal is more than that of males. In third age group (41-50 years), percentage of normal is more both in females and males. This is a good sign. But at the same time percentage of OW is increased in both genders which is not a good sign. In the fourth age group 50% are normal both in females and males. But percentage of OW is more in males than that of females. More over for the first time obese category (20%) appeared in females. It is not there in males.

On the whole, in females the percentage of normal is increasing up to 5o years and later on it is decreasing and obese % is increased. Where as in males % of normal is increasing up to 50 years age and it is constant after that. In males obese % is nil but percentage of OW is increasing.

To conclude, as the age increases females are more prone for obesity. It may be due to lack of awareness, illiteracy and negligence towards their health.

References

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Dr. P.Sobha Rani received B.Sc., degree in biological sciences and Chemistry from Visvodaya Government Degree College, Venkatagiri, Andhra Pradesh (AP), India in 1977, M.Sc., (Zoology), M.Phil. and Ph.D., in fish physiology from Sri Venkateswara University, Tirupati, A.P., India in 1979,1981 and 1984 respectively.

She has been teaching Zoology since 1984 to till date. She worked as junior lecturer from 1984 to 2006. She has been working as Asst. Professor in Zoology since 2006. She is due for promotion as Associate Professor. Her research field of interest is clinical science.