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Review Article

Screening Tool Body Mass Index (BMI): A Systematic Review

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Abstract

Introduction: Body mass index (BMI), a measurement based on a person's height and weight, allows the classification of individuals into categories such as obese or overweight. The body mass index (BMI) was described back in 1832 by Adolphe Quetelet and then was validated by Ancel Keys in 1972. BMI is the ratio of body weight expressed in kilograms, divided by height expressed in metres squared.

Materials & Methods: The aim of this review was to discuss the different criteria used for the assessment of BMI in adults and children, and to provide practitioners and researchers with the tools and information they need based on the established international BMI norms, in order to conduct an appropriate weight assessment.

Results: Although the BMI score is calculated in the same way for children and adolescents as the one for adults, the criteria used for weight assessment are different, due to the fact that the BMI in children varies significantly with age. The BMI score in children and adolescents is compared against reference charts for children of the same age and gender, and it is thereby transformed into a percentile score. The assessment of each individual as obese, overweight, normal, underweight, severe thinness is then made based on this percentile score.

Conclusions: It is recommended that BMI is used in combination with other anthropometric parameters for more accurate results when assessing elite athletes, including child athletes

Keywords: Muscle mass; waist hip ratio; mortality; waist circumference; body mass index

Introduction

Anthropometry is one of the most widely applied methods to assess the size, proportions and composition of the human body and it is universally applicable, inexpensive, non-invasive, and can be used to predict health, performance and survival of individuals and populations .In order to record accurate results, however, it is essential to follow strict anthropometric data-recording instructions . Obesity is a major public health crisis in the India. More than two-thirds of the India population is either overweight or obese. Body mass index (BMI) is one of the ways to measure obesity in the population. Other ways to measure obesity include the waist-to-hip ratio, the percentage of the body or visceral fat, and waist circumference. Body mass index (BMI) can be calculated via mathematical operations where height and weight values are used to estimate the health status of a person. BMI as a measurement is typically used to gauge the risk of developing chronic conditions such as diabetes, hypertension, depression, and cancer. The BMI calculation will fall within a numerical range, which places an individual into one of four categories.

BMI as a screening tool for chronic disease and mortality and briefly introduces the idea of childhood BMI as a tool for predicting disease later in life. While BMI is seemingly a good indicator for studying correlation with

chronic disease, the measurement tool does not come without limitations, as discussed in this review

What is Body Mass Index (BMI)? The most appropriate index for determining healthy weight was considered to be the Quetelet index, described back in 1832 by Adolphe Quetelet. He was born on 22 February, 1796 in Ghent (Belgium), and was the fifth of nine children in his family. Adolphe was an exceptionally talented student, receiving many prizes in algebra, geometry, grammar and drawing in secondary school, as well as being the first recipient of a doctorate in science from the University of Ghent at the age of 23.

Today BMI is often used for the classification of a person's weight as underweight, normal, overweight or obese. Maintaining a healthy body weight throughout a person's lifespan helps maintain good health and reduces the risk of many chronic diseases.

Materials & Methods: The aim of this review was to describe the different criteria used for the assessment of BMI in adults and children, and to provide practitioners and researchers with the tools and information they need, in order to conduct an appropriate weight assessment based on the established international BMI norms. The sources for this systematic review were collected from bibliographic databases (MEDLINE, Google Scholar, Microsoft Academic, Pub Med, Web of Science and Research Gate), reference lists from pertinent review articles and WHO reports up to February 2020.

Results

BMI assessment in adults -The BMI is the ratio of body weight, which is calculated as body weight divided by height in metres squared.

BMI (kg.m-2) = Body weight (kg)* [Body height (m)]-2

This ratio is then assessed by comparing it to the most commonly used definitions, established by the WHO, (Table 1), in order to evaluate a person's weight: underweight (score of under 18.5 kg.m-2), normal (18.5-24.9 kg.m-2), overweight (25-29.9 kg.m-2) or obese (over 30 kg.m-2).

Table 1. Interpretation of the BMI results [kg.m-2] for adults, established by the WHO

< 18.5 Underweight
18.5–24.9 Normal weight
25.0–29.9 Overweight
30.0–34.9 class I Obesity
35.0–39.9 class II Obesity
≥ 40.0 class III Obesity

BMI assessment in children and adolescents

The BMI score is calculated in the same way for children and adolescents, as for adults. However, the criteria used for weight assessment are different, because the norms for BMI in children vary significantly with age (14-17). For instance, in a newborn child, the BMI median is 13 kg.m-2, and it rises to 17 kg.m-2 for a 1-year-old child, then decreases to 15.5 kg.m-2 for a 6-year-old child, and reaches 21 kg.m-2 for 20-year-old adults (16, 18). Moreover, the amount of body fat changes with age and differs between girls and boys, so BMI age- and gender specific percentile scores are applied for the accurate assessment of children and adolescents.

Discussion

Although BMI is the most popular and widely preferred anthropometric index, its main drawback is that it does not distinguish between fat and muscle tissues. Therefore, some authors reported that BMI might be an inappropriate method for assessing body weight in elite athletes from power sports, people with high levels of physical activity, as well as fitness enthusiasts. Garn et al. reported that BMI is highly influenced by body proportions (relative leg length or relative sitting height), in situations where shorter-leg-individuals have higher BMI values by as much as 5 units, and those with narrower chest sizes and longer legs have a lower BMI.

Conclusions

BMI is a widely used parameter to assess people's body weight, and it is often applied in order to promote a

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healthy lifestyle. The BMI score is assessed by comparing it to the definitions established by the WHO for adults, and by comparing it against age and gender-related reference charts for children. When assessing elite athletes, including children, it is recommended that

BMI be used in combination with other anthropometric parameters in order to obtain accurate results.

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