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COMPREHENSIVE DIAGNOSTIC EVALUATION OF OBESITY

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Abstract

Obesity is one of the most widespread chronic diseases of modern society and is associated with a high risk of cardiovascular, endocrine, and metabolic disorders. Effective treatment is not possible without accurate and timely diagnosis. This article reviews current methods of obesity diagnosis, including anthropometric indicators (BMI, waist circumference, WHR), body composition assessment techniques (BIA, DEXA), as well as laboratory and differential diagnostic approaches. Special attention is given to the importance of a comprehensive and individualized diagnostic strategy that enables not only the evaluation of obesity severity but also the identification of potential secondary causes of the condition.

Keywords: obesity, diagnosis, body mass index, bioelectrical impedance analysis, waist circumference, metabolic syndrome, laboratory tests, body composition, visceral fat

Introduction

Obesity is a chronic medical condition characterized by excessive accumulation of body fat. It is a significant global health issue, associated with increased risks of cardiovascular diseases, type 2 diabetes, hypertension, dyslipidemia, certain cancers, and reduced quality of life. Accurate and timely diagnosis is essential for the effective management and prevention of obesity-related complications [1].

Objective of the article - to analyze current methods of diagnosing obesity, describe their diagnostic value, accuracy, and application areas, and emphasize the importance of a comprehensive approach in identifying excess body fat and associated health risks.

Materials and Methods. This article is based on a comprehensive review of current scientific literature and clinical guidelines related to the diagnosis of obesity. The analysis includes materials published in peer-reviewed medical journals, recommendations from the World Health Organization (WHO), the Centers for Disease Control and Prevention (CDC), the National Institutes of Health (NIH), and other authoritative health organizations.

Key sources were obtained using academic databases such as PubMed, Google Scholar, and Scopus. Search terms included: "obesity diagnosis," "body mass index," "waist circumference," "body fat distribution," "bioelectrical impedance," and "laboratory evaluation in obesity." Publications from the past 10–15 years were prioritized to ensure relevance and up-to-date information.

The methods considered in this review include:

Anthropometric assessments (BMI, waist circumference, waist-to-hip ratio)

Body composition analysis (bioelectrical impedance analysis, dual-energy X-ray absorptiometry, MRI/CT)

Laboratory investigations (glucose metabolism, lipid profile, liver enzymes, thyroid function)

Results and discussion. The analysis of current scientific literature and clinical guidelines revealed that the diagnosis of obesity requires a multi-dimensional and individualized approach. Based on the reviewed sources, the following key findings were identified:

Body Mass Index (BMI) remains the most commonly used screening tool worldwide due to its simplicity and accessibility. However, its limitations in assessing fat distribution and body composition reduce its diagnostic precision, especially in athletic or elderly populations [2].

Waist circumference (WC) and waist-to-hip ratio (WHR) are more accurate indicators of visceral fat and metabolic risk. These anthropometric parameters have been shown to correlate strongly with insulin resistance, cardiovascular disease, and type 2 diabetes [3].

Body composition analysis methods, such as bioelectrical impedance analysis (BIA) and dual-energy X-ray absorptiometry (DEXA), offer a more detailed assessment of

fat mass, lean mass, and fat distribution. While these methods are more informative, their use may be limited by cost and availability [4].

Laboratory testing plays a crucial role in identifying obesity-related metabolic disturbances. Elevated glucose, insulin resistance, dyslipidemia, and liver enzyme abnormalities are commonly observed in individuals with obesity. Thyroid dysfunction must also be ruled out, as it can be a contributing factor to weight gain [5].

Differential diagnosis is essential in distinguishing primary obesity from secondary forms caused by endocrine disorders, genetic syndromes, or medication side effects. Failure to identify underlying conditions can lead to inappropriate or ineffective treatment strategies [6].

Overall, the reviewed evidence supports the use of a comprehensive diagnostic approach that combines anthropometric, laboratory, and (when needed) instrumental methods to improve the accuracy of obesity evaluation and guide personalized treatment.

Differential diagnostic approaches for identifying secondary causes of obesity

This article does not involve original clinical or experimental research with human participants. It is intended as an analytical overview of diagnostic strategies used in the evaluation of obesity in clinical practice.

Diagnosing obesity requires a combination of anthropometric measurements, laboratory tests, and in some cases, advanced imaging techniques. These methods help evaluate not only the presence and degree of excess body fat but also its distribution and the underlying causes or consequences of fat accumulation [7].

1. Body Mass Index (BMI)

One of the most common and straightforward tools for assessing body weight is the Body Mass Index (BMI). It provides a general indication of whether an individual's weight is appropriate for their height.

BMI is calculated using the formula:

BMI = weight (kg) / height^2 (m^2)

According to the World Health Organization (WHO), the BMI categories are:

BMI (kg/m²)	Classification
<18.5	Underweight
18.5–24.9	Normal weight
25.0–29.9	Overweight
30.0–34.9	Obesity Class I
35.0–39.9	Obesity Class II
≥40	Obesity Class III (Severe)

It is important to note that BMI does not distinguish between fat and muscle mass and may misclassify muscular individuals as overweight or obese [2, 3, 8].

2. Waist Circumference (WC)

While BMI is useful, it does not reflect fat distribution, which is crucial in assessing health risks. Waist circumference is a simple yet effective measure to evaluate abdominal (visceral) fat, which is particularly associated with metabolic and cardiovascular risk.

Threshold values:

- Men: ≥94 cm (increased risk), ≥102 cm (high risk)
- Women: ≥80 cm (increased risk), ≥88 cm (high risk)

Measurement should be taken at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest, after exhalation [3, 9].

3. Waist-to-Hip Ratio (WHR)

Another method to assess fat distribution is the Waist-to-Hip Ratio (WHR), which compares the circumference of the waist to that of the hips.

Formula:

WHR = waist circumference / hip circumference

Cut-off values indicating abdominal obesity:

- Men: WHR > 0.90
- Women: WHR > 0.85

WHR is considered a reliable predictor of cardiovascular and metabolic diseases associated with central fat accumulation [3, 10].

4. Body Composition Analysis

To obtain more accurate insights into the amount and distribution of body fat, various techniques for body composition analysis are used. These methods distinguish fat mass from lean tissue (muscles, bones, and organs).

Common methods include:

- Bioelectrical Impedance Analysis (BIA): Measures resistance to a small electrical current to estimate fat, muscle, and water content.
- Dual-Energy X-ray Absorptiometry (DXA or DEXA): A precise imaging method to assess total and regional body fat.
- MRI and CT scans: Provide detailed images of fat distribution, especially visceral fat. Mostly used in clinical research or complex cases [4, 11].

5. Laboratory Investigations

Laboratory tests are essential for identifying metabolic abnormalities associated with obesity and ruling out secondary causes.

Commonly recommended lab tests:

- Fasting blood glucose and/or HbA1c (for diabetes screening)
- Insulin levels and HOMA-IR index (for insulin resistance)
- Lipid profile: total cholesterol, LDL, HDL, triglycerides
- Liver enzymes (ALT, AST) – for non-alcoholic fatty liver disease (NAFLD)
- Thyroid hormones (TSH, free T3, free T4) – to rule out hypothyroidism

Additional markers such as leptin, adiponectin, or cortisol may be tested in select cases [5, 12].

6. Differential Diagnosis

In some cases, obesity may be secondary to other medical conditions or medications. It is important to exclude:

- Endocrine disorders such as hypothyroidism or Cushing's syndrome
- Genetic syndromes (e.g., Prader–Willi syndrome)
- Drug-induced weight gain, particularly from corticosteroids, antipsychotics, or antidepressants

Comprehensive evaluation helps determine the appropriate course of treatment and ensures that underlying conditions are not overlooked [6, 7, 13].

Conclusion

Obesity diagnosis involves a comprehensive approach that combines anthropometric assessments, laboratory testing, and, when needed, body composition analysis. Identifying not only the presence but also the type and cause of obesity is key to tailoring effective treatment strategies and minimizing long-term health risks.

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