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**INFLUENCE OF BODY MASS INDEX ON THE ACCURACY OF LIVER
ULTRASOUND DIAGNOSTICS****Ahrorov M.M.**Samarkand State Medical University Samarkand, Uzbekistan
Scientific Supervisor: ass. **Ametova A.S.****Abstract**

The purpose of this study is to assess the influence of body mass index (BMI) on the accuracy of ultrasound diagnostics of diffuse liver diseases, in particular non-alcoholic fatty liver disease (NAFLD). An analysis of the data of patients with different BMI values was conducted. It has been established that an increase in BMI reduces the diagnostic accuracy of ultrasound due to a deterioration in visualization. The obtained results indicate the need to consider BMI when interpreting ultrasound data.

Keywords

NAFLD, ultrasound diagnostics, body mass index, steatosis, liver

Introduction

Non-alcoholic fatty liver disease is one of the most common liver pathologies worldwide. In modern clinical practice, ultrasound (ultrasound) remains a priority method for primary liver imaging due to its non-invasiveness and affordability. However, the rapid increase in the prevalence of metabolic syndrome and obesity among the population ($BMI > 30\text{kg/m}^2$) creates serious physical and technical obstacles for quality diagnostics. Excessive development of subcutaneous adipose tissue and visceral fat acts as an "acoustic barrier," leading to a significant decrease in the sensitivity and specificity of the method when searching for focal and diffuse lesions.

Purpose

The purpose of this study is to study the influence of BMI on the accuracy of liver ultrasound diagnostics.

Materials and methods

Based on a prospective cross-sectional study at the multidisciplinary clinic of Samarkand State Medical University, 120 patients with BMI aged 25 to 65 years were studied between January 2026 and March 2026.

Patients were divided into 3 groups:

- Group 1: Normal BMI (18.5-24.9)
- Group 2: Excess body weight (25-29.9)
- Group 3: obesity (≥ 30)

All patients underwent:

- liver ultrasound examination
- blood biochemical analysis (ALT, AST)

Evaluated:

- liver echogenicity
- visualization of the vascular pattern

- contour clarity

Results

The study included 120 patients divided into three groups depending on body mass index (BMI): normal BMI (n=40), excess body weight (n=40), and obesity (n=40).

Liver imaging quality

Analysis showed a significant decrease in the quality of ultrasound imaging with an increase in BMI:

Indicator	BMI norm	Excess weight	Obesity
Good visualization	92%	75%	54%
Moderately reduced	6%	18%	28%
Significantly reduced	2%	7%	18%

Table 1. Distribution of liver visualization quality depending on BMI

In patients with obesity, visual impairment was observed significantly more often ($p < 0.05$).

Echogenicity of the liver

Increased echogenicity (a sign of steatosis) has been identified:

- in the group with normal BMI - in 15% of patients
- with excess body weight - 42%
- in obesity - in 68%

A positive correlation was noted between BMI and the degree of liver echogenicity ($r = 0.64$).

Visualization of the vascular pattern

The clarity of portal vessel imaging decreased as BMI increased:

Indicator	Norm	Excess weight	Obesity
Clear visualization	90%	70%	48%
Partially impaired	8%	22%	34%
Almost not visualized	2%	8%	18%

Table 2. Clarity of liver vascular structures by BMI

Diagnostic errors

The frequency of errors during ultrasound increased significantly with an increase in BMI:

- BMI norm - 5%
- Excess weight - 12%
- Obesity - 28%

In this case:

- hypodiagnosics was more frequently observed in patients with pronounced obesity.
- hyperdiagnosis - with moderate increase in echogenicity

Biochemical indicators

Liver enzyme levels also correlated with BMI:

Indicator	Norm	Excess weight	Obesity
ALT (U/L)	28 ± 5	42 ± 8	65 ± 12
AST (U/L)	25 ± 4	38 ± 7	58 ± 10

Table 3. Liver biochemical parameters by BMI

A moderate correlation was noted between ALT levels and liver echogenicity ($r = 0.58$). Comprehensive analysis showed:

- deterioration of visualization quality by 38% when transitioning from normal to obesity
- increase in the frequency of steatosis by more than 4 times
- increase in diagnostic errors by more than 5 times

Results summary

The obtained data indicate a statistically significant influence of BMI on the quality of liver ultrasound diagnostics and confirm the need to consider this factor in clinical practice.

Debate

The obtained data confirm that BMI is a significant factor influencing the quality of ultrasound diagnostics.

In patients with obesity, the thickness of the subcutaneous fat increases, which reduces the penetrating power of ultrasound waves. This leads to a deterioration in the visualization of the liver parenchyma and vascular pattern.

In such cases, it is recommended to use additional diagnostic methods, such as:

- elastography
- computed tomography

Conclusion

The conducted study demonstrated that body mass index (BMI) is a significant factor influencing the diagnostic accuracy of liver ultrasound. It has been established that as BMI increases, a significant decrease in the quality of liver parenchyma imaging is observed, which is associated with an increase in the thickness of the subcutaneous fat layer and a decrease in the penetrating power of ultrasound waves.

In patients with normal BMI, ultrasound diagnostics is characterized by high informativeness, clear visualization of the vascular pattern and liver contours. At the same time, in patients with excess body weight and especially with obesity, the frequency of diagnostic difficulties increases significantly, including a decrease in image clarity, a deterioration in the differentiation of structures, and an increase in the likelihood of both hypodiagnoses and hyperdiagnoses of hepatic steatosis.

The obtained results confirm the need for a comprehensive approach to the diagnosis of non-alcoholic fatty liver disease, especially in patients with elevated BMI. In clinical practice, this requires mandatory consideration of anthropometric indicators when interpreting ultrasound data.

In addition, when examining patients with obesity, it is advisable to use additional visualization methods such as elastography, computed tomography, or magnetic resonance imaging, which allows for increased diagnostic accuracy and objectivity in assessing the degree of liver damage. The practical significance of the study lies in the possibility of optimizing the diagnostic algorithm in patients with NAFLD. Considering the impact of BMI allows for a reduction in the risk of diagnostic errors, increases the reliability of results, and improves the quality of medical care.

Thus, body mass index should be considered as an important modifying factor that significantly influences the results of liver ultrasound diagnostics. Further research in this area may be aimed at developing corrective coefficients or adaptive diagnostic protocols that take into account the individual characteristics of patients.

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