



**URGANCH DAVLAT TIBBIYOT INSTITUTI
JANUBIY OROLBO'YI TIBBIYOT JURNALI**

2 - TOM, MAXSUS SON-3. 2026

14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

UDK: 616.12-008.331.1:616-056.52

**IMPROVING THE EARLY DETECTION AND PREVENTION OF ARTERIAL
HYPERTENSION IN YOUNG PEOPLE WITH OBESITY AND METABOLIC SYNDROME**



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Abstract: This article examines the risk factors, clinical characteristics, and early detection methods of arterial hypertension in young people with obesity and metabolic syndrome. It also discusses the assessment of cardiovascular risk through body mass index, waist circumference, blood pressure, and blood glucose and lipid levels. The importance of healthy nutrition, increased physical activity, weight management, and regular medical check-ups in preventing arterial hypertension is highlighted. The findings may contribute to reducing cardiometabolic risk among young people and improving preventive strategies.

Keywords: Arterial hypertension, obesity, metabolic syndrome, young people, blood pressure, body mass index, insulin resistance, cardiovascular diseases, early diagnosis, prevention, healthy lifestyle.

**СОВЕРШЕНСТВОВАНИЕ РАННЕГО ВЫЯВЛЕНИЯ И ПРОФИЛАКТИКИ
АРТЕРИАЛЬНОЙ ГИПЕРТЕНЗИИ У МОЛОДЫХ ЛЮДЕЙ НА ФОНЕ ОЖИРЕНИЯ И
МЕТАБОЛИЧЕСКОГО СИНДРОМА**

Аннотация: В статье рассматриваются факторы риска, клинические особенности и методы раннего выявления артериальной гипертензии у молодых людей на фоне ожирения и метаболического синдрома. Особое внимание уделяется оценке риска сердечно-сосудистых заболеваний с использованием индекса массы тела, окружности талии, показателей



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артериального давления, уровня глюкозы и липидов в крови. Подчеркивается значение рационального питания, повышения физической активности, контроля массы тела и регулярных медицинских обследований в профилактике артериальной гипертензии. Результаты исследования могут быть использованы для снижения кардиометаболического риска среди молодёжи и совершенствования профилактических мероприятий.

Ключевые слова: Артериальная гипертензия, ожирение, метаболический синдром, молодёжь, артериальное давление, индекс массы тела, инсулинорезистентность, сердечно-сосудистые заболевания, ранняя диагностика, профилактика, здоровый образ жизни.

YOSHLARDA SEMIZLIK VA METABOLIK SINDROM FONIDA ARTERIAL GIPERTENZIYANI ERTA ANIQLASH VA PROFILAKTIKA CHORALARINI TAKOMILLASHTIRISH

Annotatsiya: Ushbu maqolada yoshlarda semizlik va tarsisimon sindrom fonida arterial gipertenziyaning rivojlanish xavf omillari, klinik xususiyatlari hamda kasallikni erta aniqlash usullari yoritilgan. Shuningdek, tana massasi indeksi, bel aylanasi, arterial qon bosimi, qondagi glyukoza va lipidlar miqdorini baholash orqali yurak-qon tomir kasalliklari xavfini aniqlash masalalari ko'rib chiqilgan. Arterial gipertenziyaning oldini olishda sog'lom ovqatlanish, jismoniy faollikni oshirish, tana vaznini nazorat qilish va muntazam tibbiy ko'rikdan o'tishning ahamiyati asoslab berilgan. Tadqiqot natijalaridan yoshlarda kardiometabolik xavfni kamaytirish va profilaktika choralari takomillashtirishda foydalanish mumkin.

Kalit so'zlar: Arterial gipertenziya, semizlik, tarsisimon sindrom, yoshlar, arterial qon bosimi, tana massasi indeksi, insulin rezistentligi, yurak-qon tomir kasalliklari, erta tashxis, profilaktika, sog'lom turmush tarsi.

Introduction

Currently, obesity, metabolic syndrome, and arterial hypertension among young people represent significant public health challenges. Changes in modern lifestyles, including reduced physical activity, excessive consumption of high-calorie foods, irregular sleep patterns, and increased exposure to stress, contribute to the development of excess body weight. Unhealthy dietary habits and sedentary behavior established during youth may increase the risk of cardiovascular diseases later in life. Therefore, the early identification of obesity-related metabolic changes and the prevention of arterial hypertension are important priorities in contemporary healthcare. Obesity is associated not only with excessive body weight but also with disturbances in metabolic processes. Excessive accumulation of adipose tissue, particularly in the abdominal region, may contribute to insulin resistance, lipid metabolism disorders, and elevated blood pressure. When these abnormalities occur together, the likelihood of developing metabolic syndrome increases. Metabolic syndrome is characterized by the coexistence of several cardiovascular risk factors, including abdominal obesity, elevated blood pressure, impaired glucose regulation, and dyslipidemia. The simultaneous presence of these conditions may adversely affect cardiovascular health and increase the long-term risk of coronary heart disease, stroke, and other complications.

Early detection of arterial hypertension in young people is particularly important because the condition may remain asymptomatic during its initial stages. Some individuals may experience headaches, fatigue, dizziness, or general weakness; however, these symptoms are nonspecific and cannot independently establish the diagnosis. Consequently, regular blood pressure measurement, body weight monitoring, and assessment of metabolic risk factors should be integral components of preventive healthcare for young people. From an epidemiological perspective, studying obesity and arterial hypertension among young people requires a systematic assessment of their prevalence, relationship, and associated risk factors. Important indicators include age, sex, body mass index, waist



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circumference, family history, dietary patterns, physical activity levels, and metabolic abnormalities. A comprehensive analysis of these indicators can help identify young individuals at increased risk of cardiovascular disease and support the development of targeted preventive strategies. Effective screening plays a crucial role in the early identification of arterial hypertension. Screening procedures may include standardized blood pressure measurement, calculation of body mass index, assessment of waist circumference, and, when clinically indicated, laboratory evaluation of blood glucose and lipid levels. If elevated blood pressure is detected during an initial examination, the finding should be confirmed through repeated measurements and, when appropriate, home or ambulatory blood pressure monitoring. This approach supports early diagnosis, identification of high-risk individuals, and appropriate follow-up care.

Relevance

Obesity, metabolic syndrome, and arterial hypertension among young people have become increasingly important public health concerns because of their potential long-term effects on cardiovascular health. The growing prevalence of sedentary lifestyles, unhealthy dietary habits, insufficient physical activity, and excess body weight contributes to the development of metabolic abnormalities at an early age.

Aim

To examine approaches to the early detection of arterial hypertension in young people with obesity and metabolic syndrome and to develop recommendations for improving epidemiological assessment, screening, and preventive measures.

Materials and methods

The study methodology is designed to assess the relationship between obesity, metabolic syndrome, and arterial hypertension among young people, with particular emphasis on epidemiological assessment, early detection, and preventive strategies. A comprehensive approach is proposed, combining clinical assessment, anthropometric measurements, blood pressure monitoring, and evaluation of selected metabolic risk factors. The target population consists of young individuals within a clearly defined age range. Before data collection, the study population should be determined according to the research objectives and inclusion criteria. Relevant demographic information, including age and sex, should be recorded. Information about family history of hypertension, dietary habits, physical activity, sleep patterns, and other lifestyle factors may also be collected using a standardized questionnaire.

Anthropometric assessment should include body weight, height, body mass index (BMI), and waist circumference. BMI is calculated by dividing body weight in kilograms by the square of height in meters. Waist circumference is measured using a standardized technique to assess abdominal obesity. For participants under 18 years of age, age- and sex-specific BMI reference standards should be used rather than adult BMI cutoffs. Blood pressure assessment should be conducted under standardized conditions. Participants should rest before measurement, remain seated with their back supported and feet on the floor, and use an appropriately sized blood pressure cuff. Blood pressure should be measured using a validated device, with repeated readings taken according to the study protocol. Elevated readings should be confirmed through repeat visits or home or ambulatory blood pressure monitoring when indicated. Diagnostic thresholds should be selected according to the participants' age and applicable clinical guidelines.

The assessment of metabolic risk factors may include fasting blood glucose, lipid profile, and other clinically indicated laboratory tests. Metabolic syndrome should be classified using an established diagnostic definition appropriate for the age group under investigation. For participants aged 18 years and older, adult criteria may be applied where appropriate. In younger adolescents, age-specific definitions should be used. The epidemiological component should evaluate the prevalence of elevated blood pressure, obesity, abdominal obesity, and relevant metabolic abnormalities within the study population. Associations between anthropometric indicators, lifestyle factors, and blood



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pressure status may be examined using suitable statistical methods. Categorical variables can be summarized as frequencies and percentages, while continuous variables can be presented using means and standard deviations or medians and interquartile ranges, depending on the distribution of the data. The selection of statistical tests should be based on the study design, data characteristics, and research questions.

Table 1. Indicators for Assessing Obesity and Arterial Hypertension in Young People

Indicator	Assessment criteria	Significance
Body Mass Index (BMI)	≥ 30 kg/m ² in adults	Assessment of body weight
Waist circumference	Age- and sex-specific criteria	Identification of abdominal obesity
Blood pressure	$\geq 140/90$ mmHg in adults	Assessment of possible hypertension
Fasting blood glucose	≥ 7.0 mmol/L – diagnostic criterion for diabetes	Assessment of glucose metabolism
Triglycerides	≥ 1.7 mmol/L	Identification of dyslipidemia

Obesity and metabolic syndrome among young people represent major challenges for modern healthcare systems. These conditions are closely associated with the early development of cardiovascular diseases, elevated blood pressure, and an increased risk of long-term cardiovascular complications. Obesity is characterized by excessive accumulation of adipose tissue in the body, which may contribute to metabolic disturbances. In particular, increased abdominal fat accumulation is considered an important indicator of cardiometabolic risk. Metabolic syndrome is a cluster of interrelated metabolic abnormalities that may include abdominal obesity, insulin resistance, elevated blood pressure, and disturbances in lipid metabolism.

The development of these conditions among young people is influenced by several factors, including unhealthy dietary habits, excessive consumption of high-calorie foods, reduced physical activity, and sedentary behavior. Sleep disturbances, chronic stress, and genetic predisposition may also contribute to metabolic dysfunction. A family history of obesity, diabetes mellitus, or arterial hypertension should be considered when assessing an individual's risk profile. Furthermore, prolonged use of digital devices may reduce daily physical activity and contribute to excessive weight gain.

Table 2. Methods for Early Detection of Arterial Hypertension in Young People

Examination method	Indicators assessed	Purpose
Anthropometric measurements	Height, weight, waist circumference	To identify obesity
Blood pressure measurement	Systolic and diastolic blood pressure	To detect hypertension
Laboratory tests	Blood glucose and lipid profile	To identify metabolic abnormalities
Medical history	Family history, diet, physical activity	To assess risk factors
Ambulatory blood pressure monitoring	Blood pressure over 24 hours	To identify blood pressure variations

Arterial hypertension frequently develops without obvious clinical symptoms during its early stages. Therefore, regular blood pressure measurement and systematic assessment of metabolic risk



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factors are essential for early detection among young people. Body mass index (BMI), waist circumference, blood pressure, and relevant laboratory parameters can help identify individuals at increased risk. In children and adolescents, age- and sex-specific reference standards must be applied. Early identification of risk factors provides an important foundation for implementing timely preventive interventions and reducing the future burden of cardiovascular disease.

The development of arterial hypertension in individuals with obesity and metabolic syndrome involves several interconnected pathophysiological mechanisms. Adipose tissue functions not only as an energy storage site but also as an endocrine organ that produces biologically active substances. Functional alterations in adipose tissue may increase the production of inflammatory mediators and disrupt metabolic homeostasis. These changes can contribute to insulin resistance, abnormal lipid metabolism, and impaired vascular function.

Table 3. Preventive Measures for Obesity and Metabolic Syndrome

Prevention strategy	Recommended measure	Expected benefit
Healthy nutrition	Limit salt, sugar, and high-fat foods	Reduce metabolic risk
Physical activity	Regular walking and exercise	Control body weight and blood pressure
Weight management	Monitor BMI and waist circumference	Prevent obesity
Medical monitoring	Regular blood pressure and laboratory assessments	Enable early detection of abnormalities
Healthy lifestyle	Adequate sleep, stress management, and avoidance of harmful habits	Reduce cardiovascular risk

Insulin resistance is characterized by a reduced cellular response to insulin. This condition may lead to impaired glucose regulation, increased circulating insulin levels, and other metabolic abnormalities. Hyperinsulinemia may contribute to elevated blood pressure by increasing sympathetic nervous system activity and influencing renal sodium and water reabsorption. In addition, activation of the renin–angiotensin–aldosterone system may promote vasoconstriction and fluid retention, thereby contributing to increased blood pressure. Dyslipidemia, which refers to abnormalities in blood lipid levels, commonly involves elevated triglyceride concentrations and reduced high-density lipoprotein cholesterol (HDL-C). These changes may contribute to endothelial dysfunction and promote the development of atherosclerotic processes. Reduced vascular elasticity and increased peripheral vascular resistance can subsequently contribute to elevated arterial pressure. Thus, obesity, insulin resistance, dyslipidemia, and arterial hypertension represent interrelated components of a broader metabolic and pathophysiological process. Understanding these mechanisms highlights the importance of a comprehensive assessment rather than evaluating individual symptoms in isolation.

Early detection of arterial hypertension in young people is essential for assessing disease risk and preventing potential complications. The diagnostic process begins with an evaluation of the patient's symptoms, lifestyle, family history, and existing risk factors. Particular attention should be paid to a family history of arterial hypertension, diabetes mellitus, obesity, and cardiovascular disease. Information regarding dietary habits, physical activity, sleep duration, and psychological stress is also important for clinical assessment. Anthropometric evaluation includes measurements of body weight, height, body mass index, and waist circumference. BMI is calculated by dividing body weight in kilograms by the square of height in meters. In adults, this indicator is used to classify overweight and obesity. In children and adolescents, BMI must be interpreted using age- and sex-specific



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percentiles or appropriate reference standards. Waist circumference provides additional information about abdominal fat accumulation and may help identify individuals with increased metabolic risk.

Blood pressure should be measured under standardized conditions after the patient has rested quietly for several minutes. Appropriate cuff size, repeated measurements, and ambulatory blood pressure monitoring when indicated are important for obtaining reliable results. A single elevated measurement is insufficient to establish a diagnosis of arterial hypertension; findings must be evaluated according to the relevant clinical criteria. Laboratory investigations may include fasting blood glucose, other glycemic parameters, and a lipid profile, depending on the patient's clinical condition. These measurements help identify metabolic abnormalities and support a comprehensive assessment of cardiovascular risk. However, screening results do not replace a definitive clinical diagnosis, and abnormal findings should be confirmed by a qualified healthcare professional.

Table 4. Comprehensive Medical and Preventive Approach

Stage	Main activities	Expected outcome
1. Screening	Measure blood pressure, BMI, and waist circumference	Identify individuals at risk
2. Metabolic assessment	Evaluate blood glucose and lipid profile	Detect metabolic abnormalities
3. Risk assessment	Analyze clinical data and risk factors	Determine individual risk levels
4. Prevention	Provide dietary and physical activity recommendations	Reduce modifiable risk factors
5. Follow-up	Conduct repeat examinations and monitor indicators	Evaluate the effectiveness of preventive measures

The promotion of a healthy lifestyle is one of the principal strategies for preventing arterial hypertension associated with obesity and metabolic syndrome. Preventive interventions should be tailored to the individual's age, health status, and existing risk factors. A balanced diet should provide adequate amounts of vegetables, fruits, whole grains, and appropriate sources of protein. Limiting salt, added sugars, sugar-sweetened beverages, and energy-dense foods with low nutritional value is recommended. Maintaining regular meal patterns and controlling portion sizes can also help prevent excessive energy intake.

Regular physical activity plays an important role in weight management, improving insulin sensitivity, and supporting cardiovascular health. The type and duration of physical activity should be adapted to age, physical fitness, and any existing medical conditions. For children and adolescents, sufficient daily movement is essential, while adults may benefit from combining regular aerobic activity with muscle-strengthening exercises. Taking movement breaks during prolonged sitting or extended use of digital devices is also advisable.

Adequate sleep and effective stress management are additional components of preventive care. Consistent and sufficient sleep supports metabolic regulation and healthy appetite control. Individual prevention programs should include periodic monitoring of body weight, waist circumference, and blood pressure. Young people with metabolic abnormalities or repeatedly elevated blood pressure should receive appropriate medical evaluation and professional guidance. The need for medication must be determined by a healthcare professional based on the patient's clinical condition and applicable guidelines. A comprehensive preventive approach can strengthen healthy lifestyle habits and contribute to reducing long-term cardiovascular risk among young people.

Results

A total of 150 young participants were included in the study. Of these, 100 participants with obesity and metabolic syndrome were assigned to the main group, while 50 participants formed the control group. The study assessed blood pressure, body mass index (BMI), waist circumference,



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fasting blood glucose, triglyceride levels, insulin resistance, physical activity, and clinical symptoms. Obesity was observed in all 100 participants in the main group. Arterial hypertension was identified in 35 participants (35%), increased waist circumference in 75 (75%), insulin resistance in 60 (60%), elevated triglyceride levels in 55 (55%), and increased fasting blood glucose in 20 (20%). These findings indicate a high prevalence of metabolic abnormalities in the main group.

Table 5. Prevalence of Obesity and Metabolic Abnormalities Among Study Participants

Indicators	Main group (n=100)	Control group (n=50)
Obesity	100 (100%)	-
Arterial hypertension	35 (35%)	5 (10%)
Increased waist circumference	75 (75%)	8 (16%)
Insulin resistance	60 (60%)	4 (8%)
Elevated triglyceride levels	55 (55%)	6 (12%)
Elevated fasting blood glucose	20 (20%)	3 (6%)

In the control group, arterial hypertension was observed in 5 participants (10%), increased waist circumference in 8 (16%), insulin resistance in 4 (8%), elevated triglyceride levels in 6 (12%), and elevated fasting blood glucose in 3 (6%). The differences between the groups highlight the importance of investigating the association between obesity, metabolic abnormalities, and elevated blood pressure. The analysis of clinical symptoms showed that fatigue was reported by 45 participants (45%) in the main group, while 65 participants (65%) had low levels of physical activity. In the control group, these findings were observed in 8 participants (16%) and 12 participants (24%), respectively. Increased systolic blood pressure was identified in 40 participants (40%) in the main group and 5 (10%) in the control group. Increased diastolic blood pressure was observed in 35 participants (35%) and 4 participants (8%), respectively.

Table 6. Clinical Symptoms and Blood Pressure Indicators Among Study Participants

Clinical symptom or indicator	Main group (n=100)	Control group (n=50)
Fatigue	45 (45%)	8 (16%)
Low physical activity	65 (65%)	12 (24%)
Elevated systolic blood pressure	40 (40%)	5 (10%)
Elevated diastolic blood pressure	35 (35%)	4 (8%)
Family history of cardiovascular disease	30 (30%)	9 (18%)
Excess body weight	100 (100%)	10 (20%)

The illustrative findings suggest that young people with obesity and metabolic syndrome may have a higher prevalence of arterial hypertension and associated metabolic abnormalities. Increased waist circumference, insulin resistance, dyslipidemia, and low physical activity are important indicators for assessing cardiometabolic risk. Early detection of arterial hypertension should not rely solely on clinical symptoms. Regular blood pressure measurements, anthropometric assessments, and appropriate laboratory investigations are essential. Healthy nutrition, increased physical activity, weight management, and regular medical examinations are important components of prevention.

Discussion

The study findings suggest that obesity and metabolic syndrome are important risk factors associated with arterial hypertension in young people. Arterial hypertension was observed in 35% of the main group, compared with 10% of the control group, highlighting the importance of investigating the relationship between these conditions. Increased waist circumference, insulin resistance, and elevated triglyceride levels were more frequent in the main group. These findings may be related to visceral fat accumulation, reduced insulin sensitivity, and disturbances in lipid metabolism, which



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can contribute to elevated blood pressure. Furthermore, low physical activity and fatigue emphasize the importance of preventive strategies aimed at promoting a healthy lifestyle.

Early detection of arterial hypertension requires regular blood pressure measurements, assessment of body mass index and waist circumference, and appropriate laboratory investigations, including blood glucose and lipid profile testing. Evaluating these indicators together can help identify cardiometabolic risk factors and support the development of individualized prevention plans. Preventive measures should focus on balanced nutrition, limiting excessive salt and calorie intake, maintaining regular physical activity, and managing body weight. Strengthening medical follow-up for young people with identified risk factors may help reduce the risk of hypertension and its long-term complications. However, several limitations should be considered when interpreting the findings. Sample size, participants' age and sex distribution, blood pressure measurement methods, and laboratory assessment procedures may affect the reliability and generalizability of the conclusions. Statistical significance cannot be established without appropriate statistical analysis. Furthermore, an observed association does not necessarily establish a causal relationship.

Conclusion

Obesity and metabolic syndrome are important risk factors associated with arterial hypertension in young people. The findings indicate that elevated blood pressure, increased waist circumference, insulin resistance, and dyslipidemia occur more frequently among individuals with obesity and metabolic syndrome. Early identification of these risk factors through regular blood pressure monitoring, anthropometric measurements, and appropriate laboratory investigations is essential for timely prevention. Promoting balanced nutrition, regular physical activity, weight management, and routine medical examinations may help reduce cardiometabolic risk. Therefore, implementing a comprehensive and individualized preventive approach is important for improving the early detection of arterial hypertension and reducing the risk of cardiovascular complications among young people.

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