

Prevalence of Arterial Hypertension Among Young People and Its Risk Factors

Saidkhonov Saidanvarkhon Muratkhanovich ¹, Abduzarakov Asadbek Anvar oglu ², Akhroljonova Dilrozbonu Javlonbek kizi ³, Mirzakimova Aytgul Madiyar kizi ⁴, Kadirova Iroda Rakhmatilla kizi ⁵

¹ PhD, Associate Professor, Candidate of Medical Sciences

² Kimyo International University in Tashkent. Tashkent, Uzbekistan

³ Kimyo International University in Tashkent. Tashkent, Uzbekistan

⁴ Kimyo International University in Tashkent. Tashkent, Uzbekistan

⁵ Kimyo International University in Tashkent. Tashkent, Uzbekistan

ARTICLE INFO

Keywords:

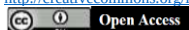
arterial hypertension,
young adults,
arterial blood pressure,
prevalence,
risk factors,
obesity,
physical activity,
salt intake,
smoking,
healthy lifestyle,
prevention.

Vol. 01, No. 05, 2026

<https://doi.org/10.5281/zenodo.23319001>

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ABSTRACT

Arterial hypertension is one of the most important chronic diseases, increasing the risk of cardiovascular disease, stroke and impaired renal function. In recent years, elevated blood pressure has become a pressing medical problem not only among older people but also among young adults. To analyse current evidence on the prevalence of arterial hypertension among young people and the main risk factors contributing to its development. A narrative (analytical) review of international clinical guidelines (WHO, ESC 2024, ESC/ESH 2018, ACC/AHA 2017), systematic reviews, pooled population-based analyses and mechanistic studies published between 2011 and 2025 was performed; 16 sources formed the evidence base. Data were synthesised thematically. The number of adults with hypertension worldwide has approximately doubled since 1990 and reached an estimated 1.4 billion people aged 30–79 years in 2024, of whom fewer than one in five have their blood pressure controlled. Young adults (18–40 years) represent a growing at-risk group in whom hypertension is frequently asymptomatic and undiagnosed. The main risk factors identified in this group are overweight and obesity, insufficient physical activity, a diet high in salt, tobacco use, harmful alcohol consumption, a family history of hypertension and an unhealthy lifestyle; metabolic factors such as dyslipidaemia, central obesity and diabetes mellitus are also associated with elevated blood pressure. Diagnostic thresholds differ between guidelines ($\geq 130/80$ mmHg in ACC/AHA 2017 versus $\geq 140/90$ mmHg in WHO and ESC), which substantially influences prevalence estimates in young people. Most risk factors for hypertension in young adults are modifiable. Regular blood pressure measurement, assessment of body weight and dietary habits, and targeted health-promotion programmes in educational institutions are key measures for the early detection and primary prevention of hypertension in this population.

Introduction

Arterial hypertension (AH) is one of the most common chronic diseases of the cardiovascular system and an important risk factor for serious complications such as ischaemic heart disease, stroke, heart failure and chronic kidney disease [2, 8]. According to the World Health Organization (WHO), approximately 1.4 billion adults aged 30–79 years worldwide had hypertension in 2024, and fewer than one in five of them had their blood pressure adequately controlled [3, 4]. A large proportion of people with hypertension – almost half, according to WHO estimates – are unaware of their condition, which reflects the frequently asymptomatic course of the disease and highlights the importance of regular blood pressure monitoring [3].

The global burden of elevated blood pressure has been increasing for decades. Pooled analyses of population-based studies show that the number of adults with raised blood pressure increased from 594 million in 1975 to 1.13 billion in 2015, with the increase concentrated mainly in low- and middle-income countries [13]. Between 1990 and 2019, the number of people aged 30–79 years with hypertension

doubled [14]. Elevated systolic blood pressure has become one of the leading risk factors for disease burden worldwide [9].

Arterial hypertension can remain clinically asymptomatic for a long time; therefore, it is difficult to diagnose the disease on the basis of the patient's subjective complaints alone. The WHO characterises arterial hypertension by systolic blood pressure of ≥ 140 mmHg and/or diastolic blood pressure of ≥ 90 mmHg measured on two different days [3]. Regular blood pressure measurement is one of the main diagnostic methods for early detection of the disease and prevention of cardiovascular complications.

According to WHO data, modifiable risk factors for arterial hypertension include an unhealthy diet, excessive salt intake, insufficient physical activity, tobacco use, excessive alcohol consumption, overweight and obesity, whereas heredity and family history are of particular importance among non-modifiable factors [3]. Identifying these risk factors at a young age is particularly important, because an unhealthy lifestyle established during this period may increase the risk of cardiovascular disease throughout later life. Hypertension in young people has traditionally received less attention than in older age groups, and young adults are less likely to undergo regular blood pressure measurement [2].

From this perspective, determining the prevalence of arterial hypertension among young people and studying the main risk factors influencing it is one of the pressing issues of modern preventive medicine. Such analysis may serve as a scientific basis for identifying early risk factors for cardiovascular disease among young people, establishing risk groups and developing targeted preventive measures.

The aim of this study was to analyse current scientific evidence on the prevalence of arterial hypertension among young people and the main risk factors contributing to its development. The objectives were: (1) to compare the diagnostic criteria and classifications of blood pressure used in current international guidelines; (2) to summarise data on the global prevalence and burden of hypertension, with a focus on young adults; (3) to systematise the modifiable and non-modifiable risk factors for hypertension in young people; and (4) to formulate recommendations for early detection and prevention.

Materials and Methods

Study design. This study was designed as a narrative (analytical) review of the scientific literature. This design was chosen because the research question required the integration of heterogeneous types of evidence clinical guidelines, epidemiological estimates, systematic reviews and mechanistic studies that cannot be combined by quantitative meta-analysis.

Sources of information. Publications were identified in PubMed/MEDLINE and Google Scholar and on the official websites of the WHO and of professional societies (European Society of Cardiology, American College of Cardiology/American Heart Association). Combinations of the following keywords were used: "arterial hypertension", "high blood pressure", "young adults", "prevalence", "risk factors", "obesity", "salt intake", "physical activity", "smoking", "alcohol" and "prevention". The reference lists of key publications were also screened.

Inclusion and exclusion criteria. The review included: (a) international clinical guidelines and official WHO documents; (b) systematic reviews and pooled population-based analyses of the prevalence and burden of hypertension; (c) reviews and scientific statements on the mechanisms and prevention of hypertension; and (d) national survey data relevant to Uzbekistan. Publications in English issued between 2011 and 2025 were considered. Case reports, studies limited to children and adolescents under 18 years, and studies devoted exclusively to hypertension in pregnancy or to specific forms of secondary hypertension were excluded.

Evidence base. The final evidence base comprised 16 sources: seven clinical guidelines and official documents [2–4, 6, 7, 10, 16], five pooled population-based and global burden analyses [5, 8, 9,

13, 14], one systematic review of risk factors in young adults [1], two mechanistic and position papers [11, 12] and one national survey dataset [15].

Data extraction and synthesis. The following data were extracted: definitions and classification thresholds of blood pressure; estimates of the prevalence, awareness, treatment, control and burden of hypertension; risk factors and their mechanisms; and recommendations on detection and prevention. The data were synthesised thematically. Risk factors were grouped into lifestyle-related modifiable factors, metabolic factors and non-modifiable factors. A quantitative meta-analysis was not performed because of the heterogeneity of definitions, age groups and measurement methods across the sources.

Results

1. Definition and classification of elevated blood pressure

Accurate and repeated measurement of blood pressure is fundamental to the diagnosis of arterial hypertension. The analysed guidelines use different classification systems (Table 1). The WHO and the European guidelines define hypertension as systolic blood pressure of ≥ 140 mmHg and/or diastolic blood pressure of ≥ 90 mmHg [2, 3, 7], whereas the 2017 ACC/AHA guideline defines stage 1 hypertension from 130/80 mmHg [6, 10]. The 2024 ESC guidelines introduced the category of "elevated blood pressure" (120–139/70–89 mmHg) to identify people at increased cardiovascular risk before hypertension develops [2].

Table 1. Classification of blood pressure in current international guidelines

Guideline	Normal / non-elevated	Intermediate category	Hypertension
WHO [3]	–	–	≥ 140 and/or ≥ 90 mmHg on two different days
ACC/AHA 2017 [6, 10]	$<120/<80$ mmHg	Elevated: 120–129/ <80 mmHg	Stage 1: 130–139 or 80–89 mmHg; stage 2: ≥ 140 or ≥ 90 mmHg
ESC/ESH 2018 [7]	Optimal $<120/<80$; normal 120–129/80–84 mmHg	High-normal: 130–139/85–89 mmHg	Grade 1: 140–159/90–99; grade 2: 160–179/100–109; grade 3: $\geq 180/\geq 110$ mmHg
ESC 2024 [2]	Non-elevated: $<120/<70$ mmHg	Elevated: 120–139/70–89 mmHg	$\geq 140/\geq 90$ mmHg

Note: values refer to office blood pressure in adults. Source: compiled by the authors from [2, 3, 6, 7, 10].

The choice of threshold has important consequences for young people. The lower ACC/AHA threshold of 130/80 mmHg substantially increases the estimated prevalence of hypertension, including among younger adults, many of whom would be classified as having normal or high-normal blood pressure under the European criteria [6, 10]. The 2024 ESC guidelines recommend confirming the diagnosis with repeated office measurements or with out-of-office methods – home blood pressure monitoring or ambulatory blood pressure monitoring – which makes it possible to identify "white-coat hypertension" and masked hypertension [2].

2. Global prevalence and burden of hypertension

The main epidemiological indicators identified in the reviewed sources are summarised in Table 2. They demonstrate a persistent increase in the absolute number of people with hypertension and a large gap between the number of people affected and the number who are diagnosed, treated and controlled.

Table 2. Key epidemiological indicators of arterial hypertension

Indicator	Value	Source
Adults with raised blood pressure, 1975 → 2015	594 million → 1.13 billion	[13]
Global prevalence of hypertension in adults, 2010	31.1% (≈1.39 billion people)	[5]
People aged 30–79 years with hypertension, 1990 → 2019	648 million → 1.28 billion	[14]
Unaware of their hypertension, 2019	41% of women, 51% of men	[14]
People aged 30–79 years with hypertension, 2024	≈1.4 billion; fewer than 1 in 5 controlled	[3, 4]
Rate of systolic BP ≥140 mmHg per 100 000, 1990 → 2015	17 307 → 20 526	[9]
DALYs associated with systolic BP ≥110–115 mmHg, 1990 → 2015	148 million → 211 million	[9]

Note: DALYs – disability-adjusted life years. Source: compiled by the authors.

The increase in the number of people with hypertension is driven by population growth and ageing, but also by the spread of unhealthy lifestyles, particularly in low- and middle-income countries [5, 8]. In 2019, 41% of women and 51% of men with hypertension were unaware of their diagnosis, and more than half were not receiving treatment [14]. According to the 2025 WHO global report, uncontrolled high blood pressure remains one of the leading causes of preventable death worldwide [4].

3. Hypertension in young adults

Although the risk of arterial hypertension increases with age, an increase in blood pressure and in associated cardiovascular risk has also been observed among young adults in recent years. The 2024 ESC guidelines define young adults as individuals aged 18–40 years and note an increasing prevalence of hypertension in this group; an unhealthy lifestyle, obesity, sex and socioeconomic factors are identified as important determinants of elevated blood pressure in young people [2]. The guidelines also note that systolic and diastolic hypertension, as well as isolated diastolic hypertension, are associated with cardiovascular risk in young adults, and that young patients with hypertension require consideration of secondary causes [2].

A characteristic feature of hypertension in young adults is its frequent asymptomatic course. Young people rarely seek medical care, seldom have their blood pressure measured and may consider themselves to be at low risk. As a result, the proportion of undiagnosed hypertension in this group may be high, and the condition is often detected incidentally during preventive examinations [1, 2]. In Uzbekistan, the WHO STEPS survey conducted in 2019 among adults aged 18–69 years included standardised blood pressure measurement and an assessment of behavioural risk factors, providing a basis for age-specific analysis at the national level [15].

4. Risk factors for arterial hypertension in young adults

Several modifiable and non-modifiable factors contribute to the development of arterial hypertension in young adults. A systematic review by Meher et al. (2023), which analysed 10 studies of risk factors for hypertension in young adults, identified smoking and other tobacco use, alcohol consumption, obesity, a sedentary lifestyle, excessive salt intake and an overall unhealthy lifestyle as the main factors associated with hypertension [1]. The principal risk factors, their mechanisms and the corresponding preventive targets are summarised in Table 3.

Table 3. Main risk factors for arterial hypertension in young adults

Risk factor	Type	Main mechanisms	Preventive target
Overweight and obesity	Modifiable	Activation of the sympathetic nervous system and renin–angiotensin–aldosterone system, renal sodium retention [12]	Healthy body weight; monitoring of BMI and waist circumference
Insufficient physical activity	Modifiable	Weight gain, reduced vascular function, insulin resistance	150–300 min/week moderate or 75–150 min/week vigorous activity [16]
High salt (sodium) intake	Modifiable	Sodium and fluid retention, increased circulating volume [11]	Salt intake <5 g/day [3]
Tobacco use	Modifiable	Sympathetic activation, endothelial dysfunction, arterial stiffness	Prevention of initiation; cessation support
Harmful alcohol use	Modifiable	Dose-dependent rise in blood pressure	Reduction or avoidance of alcohol [3]
Metabolic disorders (dyslipidaemia, central obesity, diabetes)	Modifiable / partly modifiable	Insulin resistance, vascular damage	Screening of glucose and lipids; lifestyle change
Family history and genetic predisposition	Non-modifiable	Inherited susceptibility, shared family environment	Earlier and more frequent blood pressure monitoring

Source: compiled by the authors from [1–3, 11, 12, 16].

Overweight and obesity. Overweight and obesity are among the most important risk factors for hypertension in young people. Excess weight gain, particularly when associated with visceral adiposity, is estimated to account for 65–75% of the risk of primary hypertension; it leads to neurohumoral and renal changes that raise blood pressure [12]. Studies have shown that a higher body mass index and an increased waist-to-hip ratio are associated with elevated blood pressure in young adults [1]. The WHO identifies overweight and obesity as major modifiable risk factors [3]; therefore, monitoring body mass index and waist circumference is important in primary prevention.

Insufficient physical activity. Modern lifestyles, prolonged sitting while studying or working and reduced physical exercise contribute to increasing sedentary behaviour among young people. Regular physical activity helps to control blood pressure and reduces cardiovascular risk. WHO recommends that adults perform at least 150–300 minutes of moderate-intensity or 75–150 minutes of vigorous-intensity aerobic physical activity per week and limit sedentary time [16].

Dietary habits and salt intake. Excessive intake of sodium and salt plays an important role in elevated blood pressure. A diet high in salt increases sodium and fluid retention in the body and thereby contributes to elevated blood pressure. Population-wide sodium reduction is regarded as one of the most effective strategies for preventing cardiovascular disease and stroke [11]. WHO recommends a healthy diet with adequate consumption of fruit and vegetables and a salt intake of less than 5 g per day [3].

Tobacco use. Substances contained in tobacco adversely affect vascular function and increase the workload on the cardiovascular system. Since initiation of smoking at a young age increases the risk of

cardiovascular disease in later years, prevention of initiation and support for cessation are important components of prevention [1, 3].

Alcohol consumption. Excessive alcohol consumption is a recognised factor contributing to elevated blood pressure, and WHO includes harmful alcohol use among the modifiable risk factors for hypertension [3]. Reducing alcohol consumption among young people is therefore an important measure for maintaining cardiovascular health.

Metabolic factors. Some studies have reported that metabolic factors such as dyslipidaemia, central obesity and diabetes mellitus are associated with elevated blood pressure in young adults [1]. The clustering of these factors with hypertension substantially increases cumulative cardiovascular risk and requires a comprehensive assessment [2].

Genetic predisposition and family history. Genetic predisposition and family history are non-modifiable risk factors. Individuals with a family history of arterial hypertension have a higher likelihood of developing the disease. However, genetic predisposition does not mean that the disease will inevitably develop: the risk can be reduced through a healthy diet, physical activity, body weight control and regular blood pressure monitoring [3].

5. Early detection and prevention

The WHO emphasises that the only reliable way to detect arterial hypertension is to measure blood pressure [3]. Regular screening makes it possible to detect elevated blood pressure at an early stage and to assess associated cardiovascular risk factors. Persistently elevated blood pressure at a young age is associated with an increased risk of cardiovascular disease in the future; therefore, early blood pressure control in young people is important not only for detecting existing hypertension but also for preventing future complications [2].

Prevention of arterial hypertension among young people should primarily focus on reducing modifiable risk factors: a healthy and balanced diet, limitation of salt intake, regular physical activity, maintenance of a healthy body weight, avoidance of tobacco products and avoidance of harmful alcohol consumption. The WHO recommends these measures as effective lifestyle interventions both for preventing hypertension and for controlling existing elevated blood pressure [3, 4].

Discussion

The results of the review show that arterial hypertension in young adults is a significant but underestimated public health problem. Three features distinguish this group from older patients. First, hypertension in young people is often asymptomatic and remains undetected because young adults rarely undergo preventive examinations. Second, the main risk factors in this age group – excess body weight, physical inactivity, high salt intake, smoking and alcohol use – are predominantly behavioural and therefore modifiable. Third, elevated blood pressure at a young age determines long-term cumulative exposure, which increases the lifetime risk of cardiovascular complications [1, 2, 8].

The comparison of guidelines revealed an important methodological problem: prevalence estimates for young people depend strongly on the diagnostic threshold. Under the ACC/AHA 2017 criteria, a considerable proportion of young adults with blood pressure of 130–139/80–89 mmHg are classified as having hypertension, whereas the European guidelines classify them as having high-normal or elevated blood pressure [2, 6, 7]. The introduction of the "elevated blood pressure" category in the 2024 ESC guidelines can be regarded as a compromise that focuses attention on young people at increased risk without unnecessary medicalisation, while emphasising lifestyle intervention [2]. When comparing prevalence studies, it is therefore essential to take into account the definition, the measurement protocol and the age range used.

The clustering of risk factors is another important finding. Obesity, physical inactivity, an unhealthy diet and metabolic disorders often coexist and reinforce one another through common

mechanisms such as insulin resistance and activation of the sympathetic nervous system [12]. This implies that preventive programmes for young people should be comprehensive rather than targeting a single factor. Population-level measures – reduction of salt in processed foods, creation of conditions for physical activity and restrictions on tobacco and alcohol – complement individual counselling and are among the most cost-effective interventions [4, 11].

For Uzbekistan, these findings have practical implications. Higher education institutions bring together a large number of young people and can serve as a convenient setting for regular blood pressure screening, health-literacy programmes and the promotion of healthy nutrition and physical activity. Data from the national STEPS survey [15] provide a basis for estimating the burden of hypertension and its risk factors in different age groups, but age-specific evidence for young adults in Uzbekistan remains scarce in the international literature. A cross-sectional study among university students using a standardised measurement protocol (validated automated devices, repeated measurements), anthropometry (body mass index, waist circumference) and the WHO STEPS questionnaire would make it possible to determine the actual prevalence of elevated blood pressure and its risk factors in this population.

This review has limitations. It is a narrative rather than a systematic review; no formal assessment of the risk of bias of the included sources was performed, and the data were not pooled quantitatively. Most of the epidemiological estimates refer to adults of all ages or to the age group 30–79 years and do not provide separate figures for people aged 18–40 years. In addition, the definitions of hypertension and the measurement protocols differ across sources. These limitations should be considered when interpreting the results.

Conclusion

Arterial hypertension is an important medical problem that requires attention among young people as well as older adults. Analysis of the scientific literature shows that elevated blood pressure at a young age is influenced by overweight and obesity, insufficient physical activity, excessive consumption of salty foods, tobacco use, alcohol consumption, metabolic disorders and a family history of arterial hypertension.

The fact that arterial hypertension among young people is often asymptomatic makes its early detection difficult. Therefore, regular monitoring of blood pressure, assessment of body weight and dietary habits, and identification of major risk factors are important for detecting the disease at an early stage and preventing its complications. Differences in diagnostic thresholds between international guidelines must be taken into account when estimating the prevalence of hypertension in young people.

The main preventive measures for arterial hypertension among young people include a healthy and balanced diet, a salt intake of less than 5 g per day, regular physical activity, maintenance of a healthy body weight, avoidance of tobacco products and harmful alcohol use, and the establishment of a healthy lifestyle. Identifying and modifying risk factors at a young age plays an important role in the primary prevention of cardiovascular diseases. Regular screening of young people, particularly in educational institutions, and the promotion of a healthy lifestyle may contribute to the early detection of hypertension and to the reduction of long-term cardiovascular risk.

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