

Review Article

Epidemiology and Risk Factors of Hypertension in Young Adults: A Narrative Review

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Received 17 November 2025; Accepted 25 November 2025; Published 31 December 2025

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Abstract:

Hypertension in young adults is increasingly recognized as an important public health problem because elevated blood pressure that begins early in life may persist for decades and contribute to cardiovascular, cerebrovascular, and renal complications. Although hypertension has traditionally been associated with older populations, recent national and international evidence indicates that young adults are also affected, often with low awareness and suboptimal control. This narrative review summarizes the epidemiology, pathophysiological basis, clinical relevance, and major risk factors of hypertension in young adults, with emphasis on evidence from Indonesia and global studies. The reviewed literature shows that hypertension in this age group is influenced by both non-modifiable factors, including age, sex, and family history, and modifiable factors, including excess body weight, high-salt dietary patterns, fast-food consumption, physical inactivity, smoking, alcohol intake, diabetes mellitus, and psychosocial stress. The burden of hypertension among young adults is clinically significant because early exposure to elevated blood pressure increases the risk of adverse long-term outcomes. Prevention should prioritize regular blood pressure screening, lifestyle modification, weight control, dietary improvement, physical activity, and risk communication tailored to young populations. Early identification and comprehensive prevention strategies are essential to reduce future cardiovascular disease burden.

Keywords: Hypertension; Young adults; Epidemiology; Risk factors; Prevention.

1. Introduction

Hypertension is one of the most important non-communicable diseases worldwide and remains a leading contributor to morbidity and mortality from cardiovascular disease, stroke, and chronic kidney disease (1),(2). It is often described as a silent condition because many affected individuals do not experience specific symptoms until organ damage or complications occur (3). While hypertension is commonly associated with older adults, the increasing detection of elevated blood pressure among young adults shows that the condition can begin much earlier in the life course (4),(5).

The clinical relevance of hypertension in young adults lies not only in its current prevalence but also in its long-term implications (6),(7). Young adults may have a long duration of exposure to elevated blood pressure before complications emerge (8). International data suggest that a substantial proportion of young adults have stage 1 or stage 2 hypertension, yet awareness, treatment, and control remain limited (9). In Indonesia, emerging evidence has identified demographic characteristics and lifestyle-related factors, including high body mass index and unhealthy dietary habits, as important contributors to hypertension among adults in productive age groups (10),(11).

Despite the growing evidence, hypertension in young adults is still under-recognized in many clinical and community settings. Health promotion programs often focus on older populations, whereas young adults may perceive themselves as healthy and may not seek routine blood pressure screening. This review aims to synthesize current evidence on the epidemiology and risk factors of hypertension in young adults and to highlight implications for early prevention, detection, and public health intervention.

2. Main Body / Subheadings

Definition and Clinical Classification of Hypertension

Hypertension is generally defined as persistently elevated arterial blood pressure above accepted diagnostic thresholds (12). In many clinical settings, a blood pressure measurement of 140/90 mmHg or higher has been used as a conventional threshold, although contemporary guidelines also recognize lower thresholds for increased cardiovascular risk (13),(14). The American College of Cardiology and American Heart Association classification introduced the category of stage 1 hypertension beginning at 130/80 mmHg, while other guidelines continue to consider patient risk profile, measurement setting, and treatment context when defining diagnostic categories (14).

In young adults, classification should be interpreted carefully because a single elevated reading is insufficient for diagnosis. Repeated measurements, appropriate cuff size, standardized technique, and consideration of white-coat or masked hypertension are important. Accurate classification is essential because misclassification may lead either to unnecessary labeling or to missed opportunities for early intervention.

Epidemiology of Hypertension in Young Adults

The burden of hypertension among young adults varies according to population characteristics, diagnostic criteria, measurement methods, and study location. In Indonesia, hypertension among young adults has become an increasing concern. Studies using national and community-based data report that hypertension can occur even in early adulthood and tends to increase across the young adult age range. One analysis reported a prevalence of 13.59% among adults aged 18-45 years, increasing from 7.35% in those aged 18-24 years to 21.35% in those aged 35-44 years (15). Another Indonesian study reported prehypertension and hypertension among young adults, supporting the need for early screening and prevention (16).

International evidence also demonstrates that hypertension in young adults is clinically relevant. Data from the United States and other settings show that the prevalence of hypertension is lower in young adults than in older populations but is not negligible. Young men are often reported to have higher prevalence than young women, partly due to biological differences and partly due to behavioral risks such as smoking, alcohol intake, and unhealthy diet (17). These findings suggest that hypertension should not be viewed solely as a disease of aging.

Pathophysiological Basis

The pathophysiology of hypertension involves complex interactions among intravascular volume, cardiac output, peripheral vascular resistance, renal sodium handling, neurohormonal regulation, and vascular structure. Increased sodium intake may contribute to fluid retention and increased intravascular volume, which can increase cardiac output. Over time, vascular autoregulation and increased peripheral resistance may sustain elevated blood pressure even when cardiac output returns toward normal (18).

The autonomic nervous system and the renin-angiotensin-aldosterone system are central mechanisms in blood pressure regulation. Sympathetic activation can increase heart rate, vascular tone, and renal sodium retention, while renin-angiotensin-aldosterone system activation promotes vasoconstriction and aldosterone-mediated sodium retention. Vascular endothelial dysfunction, arterial stiffness, inflammation, and metabolic abnormalities can further contribute to sustained hypertension. These mechanisms are particularly important in young adults with obesity, insulin resistance, chronic stress, smoking exposure, or sedentary behavior (16).

Young Adults as a Vulnerable Population

Young adulthood is a transitional period between adolescence and mature adulthood. Although definitions vary across institutions and studies, many epidemiological investigations use an age range of approximately 18-

39 or 18-40 years (6). This period is characterized by educational, occupational, social, and family transitions that may influence health behaviors. While physiological capacity is often optimal during young adulthood, unhealthy behaviors adopted during this period may have long-term cardiometabolic consequences (19),(20).

The vulnerability of young adults is related to lifestyle transitions, including irregular diet, fast-food consumption, reduced physical activity, sleep disruption, smoking initiation, alcohol use, and psychosocial stress. Digital lifestyles and sedentary work or study patterns may also reduce daily energy expenditure. These exposures may gradually contribute to weight gain, metabolic dysregulation, and elevated blood pressure (21).

Risk Factors for Hypertension in Young Adults

Risk factors for hypertension in young adults can be divided into non-modifiable and modifiable categories. Non-modifiable factors include increasing age within the young adult range, male sex in many populations, and family history of hypertension. Although these factors cannot be changed, their identification is important because they can help determine who requires closer monitoring and earlier preventive counselling (22),(23).

Modifiable risk factors are particularly important because they can be targeted through clinical and public health interventions. Excess body weight and high body mass index are among the strongest predictors of elevated blood pressure. Obesity is associated with insulin resistance, sympathetic activation, renal sodium retention, endothelial dysfunction, and vascular inflammation. Dietary factors, particularly high salt intake, frequent consumption of processed food, and high-calorie fast food, also contribute to increased blood pressure and cardiometabolic risk (10),(24),(25).

Physical inactivity, smoking, alcohol consumption, and psychosocial stress are additional contributors. Sedentary behavior reduces cardiovascular fitness and promotes weight gain, while smoking may cause acute vasoconstriction and endothelial injury. Alcohol can increase blood pressure through sympathetic and hormonal mechanisms. Chronic stress may contribute to sustained sympathetic activation and maladaptive coping behaviors, including unhealthy eating and smoking. These risk factors frequently cluster in young adults, making integrated prevention strategies more effective than isolated interventions (20),(26).

Table 1. Major risk factors of hypertension in young adults and public health implications

Category	Risk factor	Main affected group	Prevention implication
Non-modifiable	Age within young adulthood	Risk increases progressively with age and cumulative exposure.	Start routine blood pressure screening before middle age.
Non-modifiable	Sex and family history	Male sex and genetic predisposition may increase susceptibility.	Identify high-risk individuals for early counseling and monitoring.
Modifiable	Excess body weight	Obesity promotes insulin resistance, sympathetic activation, and vascular dysfunction.	Promote weight control, healthy diet, and physical activity.
Modifiable	High-salt and processed-food diet	Sodium retention and unhealthy dietary patterns increase blood pressure.	Encourage salt reduction and healthier food choices.
Modifiable	Physical inactivity	Sedentary behavior reduces cardiovascular fitness and increases metabolic risk.	Recommend regular aerobic activity and reduced sitting time.
Modifiable	Smoking, alcohol, and stress	Vasoconstriction, endothelial injury, hormonal activation, and maladaptive coping.	Integrate cessation support, stress management, and risk communication.

Clinical Manifestations and Long-Term Outcomes

Most young adults with hypertension are asymptomatic. When symptoms occur, they may include headache, dizziness, palpitations, neck stiffness, blurred vision, chest discomfort, or fatigue; however, these symptoms are not specific and should not be used as the only basis for screening. The silent nature of hypertension reinforces the importance of routine measurement rather than symptom-based detection (27).

Early-onset hypertension has important long-term implications. Sustained elevation of blood pressure from young adulthood increases cumulative vascular exposure and is associated with future cardiovascular events. Evidence indicates that high blood pressure in young adults is related to increased risk of coronary heart disease, stroke, and other cardiovascular outcomes later in life. Therefore, young adult hypertension should be treated as an early marker of future disease burden rather than a benign transient finding (28).

Prevention and Management Strategies

Prevention of hypertension in young adults should focus on lifestyle modification, risk communication, and early detection. Recommended non-pharmacological interventions include weight control, reduced salt intake, healthier dietary patterns such as diets rich in fruit, vegetables, and low-fat products, regular physical activity, smoking cessation, limited alcohol intake, adequate sleep, and stress management. These strategies are particularly suitable for young adults because lifestyle habits formed during this period may persist into later adulthood (29),(30).

Pharmacological treatment is considered when blood pressure remains elevated despite lifestyle intervention or when cardiovascular risk, comorbidities, or target organ involvement are present. Clinical decisions should be individualized, and young patients should be counseled regarding adherence, monitoring, and long-term risk reduction. In community settings, prevention programs should use youth-friendly approaches, including campus-based screening, workplace health checks, digital education, and family-based health promotion (31),(32).

Public Health Implications and Future Perspectives

The increasing recognition of hypertension among young adults has implications for health systems and public health policy. Screening programs should not wait until middle age, particularly in individuals with obesity, family history, smoking habits, diabetes mellitus, or high-salt dietary patterns. Integration of blood pressure screening into primary care, universities, workplaces, and community outreach can help identify young adults at risk before complications develop.

Future research should strengthen local evidence by using prospective cohort designs, standardized blood pressure measurement protocols, and evaluation of lifestyle interventions tailored to Indonesian young adults. More studies are also needed to examine digital health strategies, psychosocial stress, sleep quality, and food environments as determinants of hypertension in younger populations.

3. Conclusion

Hypertension in young adults is a clinically and public-health important condition that should not be underestimated. The reviewed evidence indicates that hypertension in this population is influenced by a combination of non-modifiable factors, such as age, sex, and family history, and modifiable factors, including excess body weight, unhealthy dietary patterns, physical inactivity, smoking, alcohol consumption, and psychosocial stress. Because early elevation of blood pressure can contribute to long-term cardiovascular and renal complications, prevention must begin before middle age. Routine blood pressure screening, lifestyle modification, risk-based counseling, and community-based prevention programs are essential to reduce the future burden of hypertension and cardiovascular disease among young adults.

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