

Cardiovascular disease burden in Vietnam: A review of epidemiological trends, risk factors, and public health implications

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Abstract

Background: Cardiovascular disease (CVD) has emerged as the leading cause of mortality and disability worldwide and has become a major public health challenge in Vietnam. Over the past three decades, rapid urbanization, economic transition, population aging, and lifestyle changes have significantly altered the epidemiological profile of cardiovascular diseases in the country. This review examines the burden, epidemiological trends, major risk factors, and public health implications of cardiovascular disease in Vietnam.

Methods: A narrative review was conducted using scientific databases including PubMed, Scopus, Web of Science, and Google Scholar. Eligible studies published between 2000 and 2025 addressing cardiovascular disease epidemiology, mortality, risk factors, healthcare burden, and prevention strategies in Vietnam were included. National reports from the Ministry of Health, World Health Organization, and Global Burden of Disease databases were also reviewed.

Results: The findings indicate that cardiovascular diseases account for approximately one-third of total mortality in Vietnam, with hypertension, ischemic heart disease, heart failure, and stroke being the most prevalent conditions. Major contributing factors include hypertension, diabetes mellitus, dyslipidemia, smoking, obesity, sedentary lifestyles, and dietary transitions. Rural–urban disparities and healthcare accessibility inequalities remain significant challenges.

Conclusions: Cardiovascular disease represents a growing healthcare burden in Vietnam, requiring comprehensive prevention strategies, strengthened primary healthcare systems, and improved community-based cardiovascular risk management.

Keywords: Cardiovascular disease; Vietnam; Hypertension; Stroke; Ischemic heart disease; Public health.

1. Introduction

Cardiovascular disease (CVD) is the leading cause of death globally, accounting for approximately 17.9 million deaths annually, representing 32% of all global deaths (1). In low- and middle-income countries, including Vietnam, cardiovascular disease has become increasingly dominant due to rapid demographic and epidemiological transitions. Historically, infectious diseases represented the major health burden in Vietnam; however, economic growth, urbanization, and changes in lifestyle behaviors have shifted the disease burden toward chronic non-communicable diseases, particularly cardiovascular conditions (2,3).

Vietnam has experienced remarkable socioeconomic transformation over the past three decades. Alongside improvements in healthcare and life expectancy, the country has witnessed increased exposure to cardiovascular risk

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factors, including hypertension, unhealthy diets, tobacco use, obesity, diabetes, and physical inactivity (4,5). This transition has significantly contributed to the rising prevalence of ischemic heart disease, stroke, and heart failure. The burden of cardiovascular disease in Vietnam is compounded by demographic aging. Vietnam's aging population has increased rapidly, with adults aged 60 years and older accounting for a growing proportion of the total population. Age remains one of the strongest determinants of cardiovascular morbidity and mortality. Consequently, the health system faces increasing pressure in managing chronic cardiovascular conditions requiring long-term care. The cardiovascular disease burden in Vietnam also presents substantial geographic and socioeconomic disparities. Urban populations often demonstrate higher rates of obesity, diabetes, and dyslipidemia, while rural populations may experience delayed diagnosis and limited access to specialized cardiovascular care (6). Moreover, disparities in awareness, treatment adherence, and preventive healthcare contribute to poorer outcomes in disadvantaged populations. Stroke remains one of the most devastating cardiovascular complications in Vietnam and represents one of the highest causes of disability-adjusted life years (DALYs). Epidemiological studies suggest that stroke incidence in Vietnam has increased substantially over the last two decades, largely driven by uncontrolled hypertension and diabetes (7,8). Similarly, ischemic heart disease prevalence has increased in parallel with changing dietary habits and sedentary lifestyles. Understanding the epidemiological patterns and determinants of cardiovascular disease in Vietnam is essential for designing effective interventions and improving health system preparedness. Therefore, this review aims to synthesize current evidence regarding the burden, major risk factors, and public health implications of cardiovascular disease in Vietnam.

2. Data used and Methods

2.1. Data used

This review used data from peer-reviewed scientific literature, national health surveys, and international public health databases. Sources included PubMed, Scopus, Web of Science, Google Scholar, the World Health Organization, the Vietnam Ministry of Health, and the Global Burden of Disease (GBD) database. The review focused on publications from 2000 to 2025 to capture recent epidemiological transitions and healthcare developments in Vietnam.

2.2. Methods

The search strategy included combinations of the following keywords: "cardiovascular disease" AND "Vietnam", "hypertension" AND "Vietnam", "stroke epidemiology" AND "Vietnam", "ischemic heart disease" AND "Vietnam", "heart failure" AND "Vietnam", "cardiovascular risk factors" AND "Vietnam". Eligible studies included: epidemiological studies on cardiovascular disease prevalence and incidence, studies on cardiovascular risk factors, national mortality reports, public health intervention studies, healthcare system and policy analyses. Studies were screened based on relevance, methodological quality, and applicability to the Vietnamese population.

3. Results and discussion

3.1. Epidemiological burden of cardiovascular disease in Vietnam

The epidemiological burden of cardiovascular disease in Vietnam has increased substantially over the past two decades. According to the Global Burden of Disease study, cardiovascular disease accounts for approximately 31% of total mortality in Vietnam, making it the leading cause of death nationwide (1,9). Among cardiovascular conditions, stroke and ischemic heart disease contribute the largest proportion of mortality and disability. Hypertension remains the most prevalent modifiable cardiovascular risk factor in Vietnam. Recent national surveys estimate that approximately 25–30% of adults have hypertension, with prevalence increasing significantly among older adults (10). Alarming, awareness, treatment, and control rates remain suboptimal. Studies indicate that less than half of hypertensive individuals are aware of their condition, and only a minority achieve adequate blood pressure control.

Stroke incidence in Vietnam has risen considerably due to poor hypertension management and increasing diabetes prevalence. Hospital-based studies report high admission rates for ischemic and hemorrhagic stroke, particularly in major urban hospitals (11)(12). Stroke mortality remains high, partly due to delayed hospital presentation and limited rehabilitation services. Ischemic heart disease has also shown a steady increase. Urban dietary changes characterized by higher consumption of processed foods, saturated fats, and sugary beverages have contributed to increased dyslipidemia and obesity (13). Concurrently, smoking prevalence among Vietnamese men remains among the highest in Southeast Asia, further amplifying cardiovascular risk. Heart failure has emerged as a growing clinical and economic burden. Improved survival after acute myocardial infarction has increased the number of patients living with chronic heart failure. This has important implications for long-term healthcare utilization and quality of life.

Table 1 Major cardiovascular diseases and their burden in Vietnam

Disease	Estimated prevalence	Main risk factors	Clinical burden	Citation
Hypertension	25–30%	Age, obesity, salt intake	Major driver of stroke and heart failure	(14,15)
Stroke	218–250/100,000/year	Hypertension, diabetes	High mortality and disability	(16,17)
Ischemic heart disease	Increasing trend	Smoking, dyslipidemia	Major mortality cause	(18,19)
Heart failure	1–2% adults	CAD, hypertension	Chronic care burden	(20,21)
Atrial fibrillation	1–3% elderly	Aging, hypertension	Stroke risk	(22,23)

Table 1 highlights the significant burden of cardiovascular diseases in Vietnam, with hypertension being the most prevalent condition (25–30%) and the main upstream risk factor for stroke and heart failure. Its high prevalence and low control rates make it a major public health concern (14,15). Stroke remains one of the most serious outcomes, with high incidence and substantial mortality and disability, largely driven by uncontrolled hypertension and diabetes (16,17). The increasing trend of ischemic heart disease reflects changing lifestyles, particularly smoking, unhealthy diets, and dyslipidemia, indicating a growing need for preventive screening and risk management (18,19). Although heart failure has a lower prevalence (1–2%), it imposes a substantial long-term care burden due to frequent hospitalization and chronic management needs (20,21). Meanwhile, atrial fibrillation is increasingly important in the aging population because of its strong association with stroke risk (22,23). Overall, these findings demonstrate the urgent need for early detection, stronger prevention strategies, and improved primary healthcare systems to reduce cardiovascular morbidity and mortality in Vietnam. The burden of cardiovascular disease in Vietnam reflects a broader epidemiological transition from communicable to non-communicable diseases. This transition presents substantial challenges for the healthcare system, particularly in primary prevention, early diagnosis, and long-term disease management.

3.2. Major cardiovascular risk factors and determinants in Vietnam

The increasing burden of cardiovascular disease in Vietnam is strongly associated with the rapid rise of modifiable risk factors. Among these, hypertension remains the most significant determinant, contributing substantially to stroke, ischemic heart disease, and heart failure. National epidemiological surveys have shown that hypertension prevalence among Vietnamese adults has increased steadily over the last two decades, largely driven by aging, urbanization, and excessive dietary sodium intake (24,25). Vietnam is among the countries with relatively high average salt consumption, often exceeding the World Health Organization's recommended daily intake, thereby increasing cardiovascular risk at the population level. Diabetes mellitus has also become a major contributor to cardiovascular morbidity. Economic development and changing dietary patterns have increased the prevalence of obesity and insulin resistance, resulting in higher diabetes incidence. The coexistence of diabetes and hypertension substantially increases the risk of atherosclerotic cardiovascular complications, particularly coronary artery disease and stroke (26). Several studies in Vietnam have reported increasing rates of type 2 diabetes, particularly in urban populations where sedentary lifestyles and dietary transitions are more pronounced.

Tobacco smoking remains one of the most critical cardiovascular risk factors in Vietnam. The prevalence of smoking among adult men remains significantly high compared to regional averages, contributing to endothelial dysfunction, accelerated atherosclerosis, and increased thrombotic risk (27). Despite tobacco control policies, smoking cessation remains difficult due to cultural acceptance and nicotine dependence. Passive smoking exposure also represents an important public health concern, especially among women and children. Obesity and physical inactivity are increasingly prevalent due to urban lifestyles. Reduced physical activity, increased screen time, and dietary patterns rich in processed foods, sugar, and unhealthy fats have contributed to metabolic syndrome and obesity-related cardiovascular risk (28). Body mass index and central obesity have become increasingly important predictors of cardiovascular outcomes in younger Vietnamese adults. Dyslipidemia has emerged as another major cardiovascular determinant. Increased consumption of saturated fats and reduced dietary fiber intake have contributed to elevated low-density

lipoprotein cholesterol levels. Combined with smoking and hypertension, dyslipidemia significantly increases coronary artery disease risk (29). Psychosocial stress has also been increasingly recognized as an important cardiovascular determinant. Occupational stress, urban pressure, financial instability, and mental health disorders may contribute to elevated blood pressure, unhealthy coping behaviors, and inflammatory pathways associated with cardiovascular disease progression (30). In addition to individual risk factors, social determinants of health play a substantial role in cardiovascular outcomes. Lower education levels, reduced healthcare literacy, lower income, and limited access to preventive healthcare services contribute to delayed diagnosis and poor disease management. These inequalities are particularly pronounced in rural and mountainous regions where healthcare infrastructure remains limited (31).

Table 2 Major cardiovascular risk factors in Vietnam.

Risk factor	Estimated prevalence	Cardiovascular impact	Population trend	Citation
Hypertension	25–30%	Stroke, heart failure	Increasing	(14,15)
Diabetes mellitus	6–8%	Coronary artery disease	Increasing	(20,21)
Smoking	40–45% (men)	Atherosclerosis, stroke	Stable-high	(32,33)
Obesity	15–20%	Metabolic syndrome	Increasing	(16,34)
Dyslipidemia	30–40%	Coronary artery disease	Increasing	(35,36)
Physical inactivity	25–35%	Hypertension, obesity	Increasing	(32,34)

Table 2 summarizes the major modifiable cardiovascular risk factors in Vietnam, showing that hypertension remains the most prevalent and influential determinant, strongly associated with stroke and heart failure (14,15). Its increasing trend highlights the need for large-scale screening and blood pressure control programs. Smoking also remains a critical risk factor, particularly among men, contributing significantly to atherosclerosis and stroke, while its persistently high prevalence indicates limited effectiveness of current tobacco control measures (32,33). The growing prevalence of diabetes mellitus, obesity, and dyslipidemia reflects Vietnam's rapid lifestyle and nutritional transition, increasing the risk of coronary artery disease and metabolic syndrome (20,21,35,36). In addition, physical inactivity has become increasingly common, particularly in urban populations, further contributing to obesity and hypertension (32,34). Overall, these findings indicate that the cardiovascular burden in Vietnam is largely driven by preventable risk factors, emphasizing the importance of integrated lifestyle interventions, health education, and community-based prevention strategies.

3.3. Healthcare system challenges in cardiovascular disease management

Despite significant healthcare improvements, Vietnam continues to face major challenges in cardiovascular disease prevention and management. One of the most important barriers is delayed diagnosis. Many cardiovascular risk factors, particularly hypertension and dyslipidemia, remain asymptomatic in early stages, resulting in low screening uptake and delayed intervention (37). Primary healthcare systems remain insufficiently equipped for comprehensive cardiovascular risk management. Community health centers often lack standardized cardiovascular screening protocols, adequate diagnostic equipment, and trained personnel for chronic disease management (38). Consequently, many patients seek medical care only when complications have developed.

Hospital overcrowding in tertiary cardiovascular centers is another significant challenge. Major hospitals in Hanoi and Ho Chi Minh City frequently experience excessive patient volumes, creating delays in diagnosis, treatment, and follow-up care. This overload affects quality of care and increases healthcare expenditure (39). Financial barriers also contribute to healthcare inequality. Although health insurance coverage has improved, out-of-pocket expenditures for medications, diagnostics, and long-term management remain substantial for many patients. This often affects treatment adherence and follow-up continuity (40). Medication adherence represents another persistent challenge. Poor adherence to antihypertensive medications, antiplatelet agents, statins, and diabetes treatment significantly reduces the effectiveness of cardiovascular prevention strategies (41). Factors influencing adherence include medication costs, poor health literacy, and lack of long-term follow-up systems.

Emergency cardiovascular care infrastructure remains unevenly distributed. Acute myocardial infarction and stroke require rapid intervention; however, specialized emergency cardiovascular services are concentrated mainly in urban

centers. Rural populations often face delayed transport and reduced access to advanced interventions such as percutaneous coronary intervention or thrombolysis (42).

3.4. Prevention strategies and public health implication

Effective prevention of cardiovascular disease in Vietnam requires a comprehensive, multi-level public health strategy. Primary prevention remains the most cost-effective intervention. Population-level salt reduction campaigns, smoking cessation programs, and promotion of healthy diets and physical activity can substantially reduce future cardiovascular burden (43). Community-based screening programs for hypertension, diabetes, and obesity should be strengthened. Early detection at the community level allows timely intervention before the development of major cardiovascular complications. Integration of cardiovascular screening into primary healthcare systems can improve accessibility and reduce tertiary hospital overload (44). Health education plays a central role in cardiovascular prevention. Increasing public awareness regarding risk factors, early symptoms, and healthy lifestyle behaviors can improve preventive behaviors and healthcare-seeking practices. School-based and workplace-based interventions may be particularly effective in younger populations (45).

Policy interventions are also essential. Stronger tobacco taxation, stricter food labeling regulations, and urban planning policies promoting physical activity can support healthier environments. Government-led national cardiovascular prevention strategies should prioritize long-term sustainability (46). Digital health technologies may offer promising solutions for cardiovascular disease management. Mobile health applications, telemedicine, and remote monitoring can improve treatment adherence, follow-up care, and risk factor management, particularly in underserved rural populations (47).

3.5. Comparative perspective with ASEAN countries

Compared with other Southeast Asian countries, Vietnam demonstrates similar cardiovascular transition patterns but faces distinct challenges related to rapid urbanization and healthcare infrastructure inequality. Hypertension prevalence in Vietnam is comparable to Thailand and Indonesia but lower than Malaysia. However, stroke-related mortality remains relatively high, suggesting deficiencies in early prevention and acute care systems (48). Smoking prevalence among Vietnamese men remains significantly higher than regional averages, representing an important area for targeted intervention. Conversely, obesity prevalence remains lower than in Malaysia and Singapore but is rising rapidly, suggesting future cardiovascular burden escalation (49). Vietnam's healthcare system has made significant progress in insurance coverage and tertiary cardiovascular services; however, primary prevention and chronic disease management remain weaker than in higher-income ASEAN countries. Strengthening primary care could significantly reduce long-term cardiovascular burden.

3.6. Future directions and research priorities

Future cardiovascular disease control in Vietnam should focus on strengthening integrated prevention systems, improving risk stratification, and enhancing continuity of care. The current epidemiological transition suggests that cardiovascular disease burden will continue increasing over the next two decades as the population ages and exposure to lifestyle-related risk factors expands. Therefore, future strategies should prioritize prevention rather than solely focusing on treatment. One important priority is the development of nationwide cardiovascular surveillance systems. Current epidemiological data in Vietnam remain fragmented across hospitals, regional studies, and isolated public health surveys. Establishing a centralized national cardiovascular database would improve disease monitoring, identify high-risk populations, and support policy decision-making (50).

Artificial intelligence and digital health technologies may play an increasingly important role in cardiovascular disease prevention and management. Machine learning algorithms can improve cardiovascular risk prediction, identify hidden high-risk populations, and optimize personalized intervention strategies. Mobile health applications can facilitate blood pressure monitoring, medication reminders, and lifestyle counseling, especially in younger and technology-adaptive populations (51). Telemedicine represents another promising direction for cardiovascular care in Vietnam, particularly in rural and underserved regions. Remote consultation systems may improve access to cardiologists, support follow-up care, and reduce unnecessary hospital admissions. This approach became particularly important during the COVID-19 pandemic and may continue to expand in cardiovascular practice (52,53). Research should also focus on socioeconomic inequalities in cardiovascular disease. More evidence is needed regarding how education, income, occupation, and healthcare access affect cardiovascular outcomes in Vietnam. Understanding these inequalities will support more equitable health policies. Additionally, future studies should investigate environmental determinants of cardiovascular disease, including air pollution, urban stress, and climate-related health risks. Vietnam's rapid industrialization and urban growth may create new cardiovascular challenges beyond traditional behavioral risk factors. Strengthening

cardiovascular workforce capacity is equally essential. Training for primary care physicians, nurses, and community health workers should emphasize chronic disease prevention, risk communication, and long-term cardiovascular management. A stronger preventive workforce can improve early intervention and reduce healthcare burden. Finally, multi-sector collaboration is crucial. Cardiovascular prevention requires coordinated action across healthcare, education, urban planning, food regulation, and economic policy. Sustainable cardiovascular health improvements cannot rely solely on the healthcare system.

4. Conclusion

Cardiovascular disease has become the leading health burden in Vietnam, driven by rapid epidemiological transition, population aging, and increasing exposure to modifiable risk factors such as hypertension, diabetes, smoking, obesity, and dyslipidemia. This review highlights the substantial and growing burden of stroke, ischemic heart disease, and heart failure, together with persistent healthcare inequalities between urban and rural populations. The evidence indicates that delayed diagnosis, weak primary prevention systems, and limited chronic disease management continue to challenge effective cardiovascular control. Strengthening primary healthcare, expanding community-based screening, improving health education, and implementing stronger preventive policies are critical for reducing future disease burden. Future efforts should prioritize integrated surveillance systems, digital health innovation, and equitable healthcare access to improve cardiovascular outcomes in Vietnam.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflict of interest.

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