Journal of Rare Cardiovascular Diseases
ISSN: 2299-3711 (Print) | e-ISSN: 2300-5505 (Online)
www.jrcd.eu
RESEARCH ARTICLE

Sedentary Lifestyle and Risk of Cardiovascular Diseases: A Systematic Review

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Article History
Received: 24.10.2025
Revised: 07.11.2025
Accepted: 20.11.2025
Published: 09.12.2025

Abstract: Sedentary behavior has emerged as a major independent risk factor for cardiovascular diseases (CVDs), distinct from the lack of moderate-to-vigorous physical activity. With rapid technological advancements, urbanization, and increased screen-mediated occupations, prolonged sitting has become a dominant feature of modern lifestyles across all age groups. This systematic review synthesizes global evidence on the association between sedentary behavior and the risk of cardiovascular morbidity and mortality. A comprehensive literature search was conducted across PubMed, Scopus, and Web of Science databases for studies published between 2000 and 2024. A total of 71 studies, including cohort studies, randomized trials, and meta-analyses, were included after PRISMA-guided screening. The findings consistently demonstrate that prolonged sedentary time is associated with increased risks of coronary artery disease, hypertension, heart failure, stroke, and cardiovascular mortality, independent of traditional physical activity levels. Mechanistically, sedentary behavior contributes to endothelial dysfunction, chronic inflammation, autonomic imbalance, insulin resistance, dyslipidemia, and visceral adiposity. Vulnerable populations—including the elderly, individuals with metabolic disorders, and office-based workers—exhibit heightened susceptibility. The review further highlights that breaking up sedentary time with light-intensity activity significantly reduces cardiovascular risk. These findings emphasize the urgent need to integrate sedentary behavior reduction into cardiovascular prevention strategies alongside physical activity promotion, occupational health policies, and digital lifestyle interventions.

Keywords: Sedentary lifestyle, cardiovascular diseases, physical inactivity, coronary artery disease, hypertension, endothelial dysfunction, metabolic syndrome, cardiovascular mortality.

INTRODUCTION

Global Burden of Cardiovascular Diseases and Lifestyle Transition [1–3]

Cardiovascular diseases (CVDs) remain the leading cause of mortality worldwide, accounting for nearly one-third of all global deaths annually. The burden is steadily increasing in both developed and developing nations, driven largely by rapid urbanization, population aging, dietary transitions, and profound changes in daily movement patterns [1]. While traditional risk factors such as hypertension, smoking, dyslipidemia, obesity, and diabetes are well established, growing evidence now identifies **sedentary lifestyle as an independent and powerful contributor to cardiovascular risk** [2]. The transition from physically active occupations to desk-based work, automated transport, and screen-mediated leisure has fundamentally altered human energy expenditure patterns. As a result, prolonged sitting has become a defining characteristic of modern life across all socioeconomic strata [3].

Defining Sedentary Behavior Versus Physical Inactivity [4–5]

Sedentary behavior is conceptually distinct from physical inactivity. While physical inactivity refers to the failure to meet recommended levels of moderate-to-vigorous physical activity, **sedentary behavior specifically describes waking activities characterized by low energy expenditure (≤1.5 metabolic equivalents) in sitting, reclining, or lying postures** [4]. An individual may technically meet exercise guidelines yet still engage in excessive sedentary time across the remainder of the day—a phenomenon increasingly recognized as the "active couch potato" paradox [5]. This distinction is crucial, as sedentary behavior exerts **direct physiological harm independent of structured exercise**, redefining how cardiovascular risk must be assessed and managed.

Epidemiology of Sedentary Lifestyle in the Modern World [6–8]

Global surveillance studies reveal that adults now spend **7–10 hours per day in sedentary activities**, largely driven by occupational sitting, television viewing, smartphone use, and computer-based work [6]. Adolescents and young adults show even higher sedentary exposure, particularly in academic and digital environments [7]. Remote work models, accelerated after the COVID-19 pandemic, have further intensified sedentary patterns by reducing occupational movement, commuting, and incidental physical activity [8]. These lifestyle shifts are not confined to high-income nations; sedentary behavior is rapidly rising in low- and middle-income countries alongside economic development and digital expansion.

Pathophysiological Link Between Sedentary Behavior and Cardiovascular Risk [9–11]

Sedentary lifestyle influences cardiovascular health through multiple interconnected mechanisms. Prolonged sitting reduces skeletal muscle contractile activity, leading to **suppressed glucose uptake, reduced lipoprotein lipase activity, impaired fatty acid oxidation, and early insulin resistance** [9]. This metabolic disruption promotes **dyslipidemia, hyperglycemia, visceral adiposity, and systemic inflammation**, all of which accelerate atherosclerotic plaque formation.

From a vascular perspective, sedentary behavior induces **endothelial dysfunction** through reduced nitric oxide bioavailability, oxidative stress accumulation, and impaired shear-stress signaling [10]. Autonomic imbalance is another critical contributor, characterized by sympathetic overactivity and vagal withdrawal, which elevates resting heart rate, blood pressure, and arrhythmic susceptibility [11]. These combined effects explain why sedentary behavior remains dangerous even among individuals who engage in structured exercise sessions.

Sedentary Behavior and Atherosclerotic Disease Progression [12–13]

Atherosclerosis is the biological substrate of most cardiovascular events. Prolonged sedentary exposure promotes **low-grade systemic inflammation, LDL oxidation, macrophage activation, and foam cell formation**, accelerating plaque development within arterial walls [12]. Longitudinal cohort studies show that individuals with the highest daily sitting time have significantly greater **coronary artery calcification scores, carotid intima-media thickness, and arterial stiffness**, even after adjusting for physical activity levels [13]. These structural vascular changes establish the mechanistic bridge between sedentary behavior and clinical cardiovascular events.

Sedentary Lifestyle and Major Clinical Cardiovascular Outcomes [14–16]

Epidemiological studies consistently demonstrate that excessive sedentary time is associated with a higher incidence of coronary artery disease, myocardial infarction, stroke, heart failure, and cardiovascular mortality [14]. We are seeing that people who sit for long hours only have 20-40% more chances of getting heart problems and death, even when we consider other health risks [15]. Watching television for long hours surely increases the risk of serious health problems like diabetes and heart disease. Moreover, this sedentary habit is closely linked to metabolic disorders and fatal heart attacks [16].

Occupational Sitting, Digital Behavior, and Cardiovascular Risk [17–18]

Today's office workers surely sit for long hours without breaks, often more than 8 hours each day. Moreover, modern workplaces require this continuous sitting as part of regular job duties. As per research, sitting for long hours at the office is becoming a major cause of heart and sugar-related health problems among white-collar employees [17]. Digital platforms like smartphones and social media have actually changed how people spend free time, making it definitely more about sitting and less about moving around. This double exposure to sitting at work and during leisure time further increases heart disease risk itself throughout life [18].

Sedentary Behavior, Obesity, and Metabolic Syndrome [19–20]

A sedentary lifestyle contributes directly to positive energy balance and visceral fat accumulation. Also, prolonged sitting reduces muscle glucose uptake after meals and decreases daily calorie burning, which further leads to abdominal obesity and insulin resistance [19]. These body function problems actually group into metabolic syndrome, which definitely causes serious heart disease and death. People with a sedentary lifestyle and metabolic syndrome themselves show further high risks of heart attack, heart failure, and sudden cardiac death [20].

Vulnerable Populations and Health Inequities [21–22]

Certain populations bear a disproportionate burden of sedentary exposure and its cardiovascular consequences. These include **older adults, individuals with obesity and diabetes, office-based workers, hospitalized patients, and socioeconomically disadvantaged groups** [21]. Structural determinants—such as urban design, occupational ergonomics, transport architecture, and digital labor demands—interact with individual behavior to intensify cardiovascular risk in vulnerable communities [22].

Breaking Sedentary Time as a Cardiovascular Protective Strategy [23–24]

Emerging evidence indicates that **frequent interruption of sedentary time**, even with light-intensity activity such as standing or brief walking, significantly improves postprandial glucose metabolism, blood pressure, and endothelial function [23]. Replacing just **30–60 minutes of daily sitting with light or moderate physical activity** has been associated with measurable reductions in cardiovascular risk markers and mortality [24]. These findings introduce a powerful, low-threshold preventive strategy applicable even to individuals unable to perform structured exercise.

Rationale for the Present Systematic Review [25]

Sitting for long hours is surely a major risk factor for heart disease, but the research on this topic is scattered across different fields like workplace health and exercise science. Moreover, studies are spread across areas such as digital lifestyle habits and heart disease research, making it difficult to get a complete picture.

Many studies examine sedentary behavior in isolation or as a secondary factor, which can lead to different interpretations of the results. Also, further new data on sedentary breaks and dose-response relationships themselves require systematic integration with physical activity research. This review examines how excessive sitting is definitely linked to heart problems, drawing on studies from around the world. We actually want to understand how this happens, who gets affected most, and what can definitely help prevent these heart issues [25].

MATERIALS AND METHODS

Study Design and Reporting Standards [26]

This review followed PRISMA 2020 guidelines to ensure clear reporting and proper methods. The guidelines themselves helped make the study transparent and further allowed other researchers to reproduce the work. Basically, the review checked if sitting too much and heart diseases are connected, and they studied the same thing across different groups of people.

Protocol Registration [27]

The review protocol was prospectively registered in the international systematic review registry PROSPERO to minimize reporting bias and selective outcome reporting. Basically, the protocol defined the research goals, eligibility criteria, outcome measures, and data synthesis methods before starting the same data extraction process.

Data Sources and Search Strategy [28,29]

A comprehensive and systematic literature search was conducted across the following electronic databases:

- PubMed
- Scopus
- Web of Science

The search covered studies published between **January 2000 and March 2024**. Controlled vocabulary terms and free-text keywords were combined using Boolean operators:

("sedentary behavior" OR "sedentary lifestyle" OR "sitting time" OR "screen time") AND ("cardiovascular disease" OR "coronary artery disease" OR "stroke" OR "heart failure" OR "hypertension")

Reference lists of relevant reviews and key articles were manually screened to identify additional eligible studies.

Eligibility Criteria [30]

Studies were selected using the **PEO framework (Population–Exposure–Outcome)**:

Population: Adults and adolescents from general or clinical populations

Exposure: Sedentary behavior measured as sitting time, screen time, or occupational sitting

Outcome: Cardiovascular diseases including coronary artery disease, stroke, heart failure, hypertension, and cardiovascular mortality

Study Designs: Prospective cohort studies, cross-sectional studies, randomized trials, and meta-analyses

Exclusion Criteria

- Animal or in-vitro studies
- Narrative reviews and editorials
- Conference abstracts without full text
- Non-English publications
- Studies without cardiovascular endpoints
-

Study Selection Process [31]

All retrieved records were imported into a reference management system and duplicate entries were removed. Two independent reviewers screened the titles and abstracts for relevance. Full-text articles were assessed for eligibility based on defined criteria. Disagreements were resolved through discussion or consultation with a third reviewer.

PRISMA Flow Summary

Data Extraction [32]

A standardized data extraction form was used to collect the following information:

- Author and year of publication
- Country and study design
- Sample size and population characteristics

- Method of sedentary behavior assessment
- Duration and intensity of sedentary exposure
- Cardiovascular outcomes measured
- Effect estimates (RR, OR, HR)

Data extraction was independently performed by two reviewers to ensure accuracy and consistency.

Quality Assessment and Risk of Bias [33,34]

The **Newcastle–Ottawa Scale (NOS)** was used to assess the quality of cohort and case–control studies. Cross-sectional studies were evaluated using modified risk-of-bias tools. Each study was classified as **low, moderate, or high risk of bias**. Only studies with low to moderate risk were included in the final synthesis.

Data Synthesis and Analysis [35]

Due to substantial heterogeneity in study design, exposure assessment, and outcome definitions, a **qualitative synthesis** was primarily conducted. Where appropriate, pooled risk estimates were narratively summarized. Subgroup analyses were conducted based on:

- Age groups
- Sex
- Occupational vs leisure-based sedentary exposure
- Presence of metabolic comorbidities

Sedentary exposure was analyzed both as **total daily sitting time** and as **prolonged uninterrupted sitting duration**.

RESULTS

Overview of Included Studies [36–38]

A total of **71 studies** met the final inclusion criteria following PRISMA-guided screening. These included **39 prospective cohort studies**, **18 cross-sectional studies**, **7 randomized intervention trials**, and **7 meta-analyses**. The total pooled population exceeded **18 million participants** across North America, Europe, Asia, and Australia. Sedentary behavior was assessed using self-reported sitting time, screen time, occupational sitting, or device-based accelerometry. Cardiovascular outcomes were ascertained through medical records, national registries, hospital admissions, and mortality databases [36,37].

Across studies, sedentary exposure ranged from **≥6 to ≥10 hours/day**, with consistent evidence showing a **dose–response relationship between increasing sitting time and cardiovascular risk** [38].

Sedentary Behavior and Coronary Artery Disease [39–41]

High sedentary time was strongly associated with **increased incidence of coronary artery disease (CAD)**. Individuals reporting more than 8–9 hours of sitting daily had a **22–38% higher risk of CAD** compared with those sitting less than 4 hours/day [39].

Television viewing time, a major proxy for leisure-time sedentary behavior, showed particularly strong associations with acute coronary events and coronary mortality [40]. Importantly, elevated CAD risk persisted even after adjustment for moderate-to-vigorous physical activity, body mass index, smoking status, and dietary intake, indicating that sedentary behavior acts as an **independent cardiovascular risk factor** [41].

Stroke and Cerebrovascular Outcomes [42–43]

Sedentary lifestyle was consistently associated with **increased risk of both ischemic and hemorrhagic stroke**. Longitudinal cohort data showed that individuals in the highest sedentary category had a **17–34% higher stroke risk** compared with the most active group [42].

Prolonged uninterrupted sitting was linked to **cerebrovascular endothelial dysfunction, impaired cerebral blood flow regulation, and increased arterial stiffness**, all of which predispose to cerebrovascular events [43].

Sedentary Time and Hypertension [44–45]

As per multiple population studies, sitting for long hours is directly linked with developing high blood pressure. Regarding this connection, the research shows a clear positive relationship between prolonged sitting and hypertension. Adults who actually sit for 7-8 hours daily definitely have a 15-25% higher risk of getting high blood pressure, even if they exercise in their free time [44].

Short experimental trials further showed that uninterrupted sitting for prolonged periods caused acute elevations in systolic and diastolic blood pressure, reduced baroreflex sensitivity, and impaired vascular reactivity [45].

Heart Failure and Cardiac Functional Decline [46–47]

A sedentary lifestyle was associated with a significantly increased risk of heart failure, and it particularly affects heart failure with preserved ejection fraction (HFpEF). People who sit the most actually have 28-46% higher chances of going to the hospital for heart problems. This definitely shows that sitting too much is bad for the heart [46].

Prolonged inactivity surely causes problems like stiff heart muscles, reduced heart pumping capacity, and imbalanced nerve control of the heart. Moreover, these changes speed up the progression from hidden heart problems to clear heart failure [47].

Sedentary Behavior and Cardiovascular Mortality [48–50]

Cardiovascular mortality showed one of the strongest associations with sedentary behavior. Studies actually show that people who sit the most definitely have a 25-

49% higher risk of heart-related death compared to people who sit the least [48].

All-cause mortality also followed a similar gradient. Importantly, mortality risk was **partially attenuated but not eliminated** among individuals who met physical activity guidelines but remained highly sedentary, reinforcing the concept that sedentary behavior and physical activity exert **partially independent effects** on cardiovascular survival [49,50].

Interaction Between Sedentary Behavior and Physical Activity [51–52]

Several studies demonstrated a **joint interaction effect** between sedentary behavior and physical activity. Individuals with **high sedentary time and low physical activity** experienced the greatest cardiovascular risk, while those with **high physical activity but prolonged sitting** still exhibited elevated risk compared with low-sedentary groups [51].

However, replacing even **30–60 minutes of sitting per day with light-intensity activity** significantly reduced cardiometabolic risk markers, including postprandial glucose, blood pressure, and triglyceride levels [52].

Occupational Sitting and Digital Sedentary Exposure [53–54]

Occupational sitting among office workers was associated with higher rates of **hypertension, dyslipidemia, and subclinical atherosclerosis**. Rotational work patterns that included **sit–stand workstations and scheduled movement breaks** significantly mitigated these effects [53].

Digital sedentary exposure—especially screen time exceeding 4–5 hours/day—was linked to **increased resting heart rate, reduced cardiorespiratory fitness, and worsening metabolic profiles** [54].

Vulnerable and High-Risk Groups [55]

Elderly individuals, patients with obesity and type 2 diabetes mellitus, and socioeconomically disadvantaged populations exhibited **greater cardiovascular vulnerability to sedentary exposure**. These groups experienced amplified endothelial dysfunction, greater inflammatory burden, and accelerated atherogenesis in response to prolonged sitting [55].

Summary of Key Cardiovascular Outcomes

Table. Sedentary Lifestyle and Major Cardiovascular Outcomes

Outcome	Observed Risk Increase	Sedentary Exposure Level
Coronary artery disease	22–38% ↑	≥8–9 h/day sitting
Stroke	17–34% ↑	Prolonged uninterrupted sitting
Hypertension	15–25% ↑	≥7–8 h/day
Heart failure	28–46% ↑	High total sedentary time
Cardiovascular mortality	25–49% ↑	Highest sedentary categories

Overall Interpretation of Findings

The collective findings confirm that **sedentary lifestyle is a powerful, independent driver of cardiovascular disease and mortality**. Its adverse effects are observed across all major cardiovascular endpoints, including coronary disease, stroke, hypertension, heart failure, and cardiovascular death. Importantly, these risks persist even among physically active individuals, underscoring the critical need to target both **sedentary time reduction and physical activity promotion** in cardiovascular prevention strategies.

DISCUSSION

This systematic review provides robust and convergent evidence that **sedentary lifestyle is a major independent and modifiable risk factor for cardiovascular diseases (CVDs)**. Across 71 studies involving over 18 million individuals, prolonged sitting and screen-based sedentary behavior were consistently associated with increased risks of coronary artery disease, stroke, hypertension, heart failure, and cardiovascular mortality. Importantly, these associations remained significant even after adjusting for moderate-to-vigorous physical activity, reinforcing the concept that **sedentary behavior exerts cardiovascular harm through mechanisms that are only partially offset by exercise** [56].

Biological Mechanisms Underpinning Sedentary Cardiovascular Risk [57–59]

The cardiovascular toxicity of sedentary behavior is mediated through multiple interacting physiological pathways. One of the earliest responses to prolonged sitting is the **suppression of skeletal muscle contractile activity**, which leads to reduced activity of lipoprotein lipase, impaired triglyceride clearance, and decreased high-density lipoprotein (HDL) production [57]. This dyslipidemic pattern directly accelerates atherogenesis.

At the vascular level, uninterrupted sitting induces **endothelial dysfunction** through diminished shear stress, reduced nitric oxide bioavailability, increased oxidative stress, and vascular inflammation [58]. These changes promote arterial stiffness and impair vasodilation, which explains the acute elevations in blood pressure and long-term progression of hypertension observed in sedentary individuals. In

parallel, sedentary behavior disrupts **autonomic regulation**, increasing sympathetic tone and reducing parasympathetic activity—conditions that predispose to arrhythmias, myocardial ischemia, and sudden cardiac death [59].

Sedentary Behavior, Glucose Dysregulation, and Cardiometabolic Amplification [60–61]

Sedentary lifestyle also acts as a powerful amplifier of cardiometabolic risk. Prolonged sitting markedly reduces **postprandial glucose uptake**, even after a single day of inactivity, leading to acute insulin resistance [60]. Over time, this promotes chronic hyperglycemia, visceral adiposity, systemic inflammation, and endothelial injury. These metabolic disruptions synergistically accelerate the development of atherosclerosis, heart failure, and stroke.

The clustering of **sedentary behavior, obesity, metabolic syndrome, and type 2 diabetes mellitus** forms a self-reinforcing pathophysiological loop that dramatically elevates cardiovascular risk [61]. This explains why sedentary exposure produces particularly aggressive cardiovascular disease in patients with existing metabolic disorders.

Coronary Artery Disease and Heart Failure Progression [62–63]

The results of this review indicate that sedentary behavior contributes not only to the onset but also to the **progression of coronary artery disease and heart failure**. Reduced myocardial perfusion reserve, impaired diastolic relaxation, and diminished cardiac output reserve are frequently observed in highly sedentary individuals [62]. These alterations particularly predispose to **heart failure with preserved ejection fraction (HFpEF)**, a condition increasingly recognized as a disease of cardiometabolic dysfunction.

In coronary artery disease, prolonged sedentary exposure accelerates **plaque instability**, increases pro-thrombotic tendency, and worsens endothelial repair mechanisms, raising the risk of acute coronary syndromes [63].

Stroke Risk, Cerebrovascular Dysfunction, and Sedentary Exposure [64]

Sedentary behavior contributes to stroke risk through **hypertension, arterial stiffness, impaired cerebral autoregulation, and pro-coagulant states**. Prolonged sitting reduces cerebral blood flow velocity and impairs neurovascular coupling, increasing susceptibility to ischemic injury [64]. The strong association observed between sedentary behavior and stroke in this review highlights sitting time as a **clinically relevant cerebrovascular risk factor**, comparable in magnitude to traditional lifestyle determinants.

Occupational Sitting, Digital Sedentary Behavior, and Modern Cardiovascular Risk [65–66]

The modern occupational environment exposes millions of individuals to **prolonged uninterrupted sitting**, particularly in desk-based and digital occupations. This review confirms that occupational sitting independently increases cardiovascular risk, especially when movement breaks are absent [65].

Digital sedentary behavior—driven by smartphones, streaming services, gaming, and social media—further compounds exposure by extending sedentary time into leisure hours. This continuous occupational–recreational sedentary loop significantly worsens cardiometabolic profiles and promotes long-term cardiovascular vulnerability [66].

Vulnerable Populations and Health Inequities [67]

The cardiovascular burden of sedentary behavior is not evenly distributed across populations. Only some groups face more heart disease from not moving enough. As per research, older people face faster blood vessel aging and heart rate problems regarding a lack of physical activity. Moreover, as per medical studies, patients with obesity, diabetes, and high blood pressure show increased inflammation and blood clotting problems in their bodies. Poor communities surely face greater risks because they have limited access to safe places for physical activity and jobs that require long hours of sitting. Moreover, these populations often cannot access proper preventive healthcare services [67]. These findings show that sedentary behavior itself is both a biological and social factor that further determines cardiovascular disease.

Breaking Sedentary Time: A Low-Threshold Preventive Strategy [68–70]

We are seeing that breaking sitting time with only short periods of light movement gives substantial improvements in heart and metabolic health. Standing or walking for 2-5 minutes every 30-60 minutes can further reduce blood sugar, triglycerides, and blood pressure after meals [68]. Further, we are seeing that when people replace only 30-60 minutes of sitting with light exercise daily, their risk of dying from heart problems reduces by 15-25%Breaking Sedentary Time: A Low-Threshold Preventive Strategy [69].

This approach is surely very helpful for people with physical problems or those who cannot do regular exercise programs. Moreover, sedentary break interventions are one of the most accessible tools available for preventing heart diseasesBreaking Sedentary Time: A Low-Threshold Preventive Strategy [70].

Comparison With Physical Activity Guidelines and Paradigm Shift [71–72]

Traditional cardiovascular prevention frameworks have focused heavily on achieving **150–300 minutes of moderate-to-vigorous physical activity per week**. However, the present findings clearly demonstrate that meeting exercise guidelines does not fully neutralize the

risks associated with prolonged sitting [71]. This necessitates a **paradigm shift in preventive cardiology**, from an exclusive focus on exercise promotion toward a **dual strategy emphasizing both physical activity enhancement and sedentary time reduction** [72].

Public Health, Occupational Policy, and Urban Planning Implications [73–74]

From a policy perspective, the cardiovascular toxicity of sedentary behavior mandates structural interventions beyond individual behavior change. **Active workstations, sit–stand desks, institutional movement breaks, walkable urban infrastructure, and digital wellness regulations** represent evidence-based strategies to address sedentary exposure at the population level [73].

Integration of sedentary risk screening into primary care, occupational health assessments, and cardiac rehabilitation programs could substantially improve early risk identification and prevention. School-based movement policies also carry long-term cardiovascular protective potential [74].

Strengths, Limitations, and Research Gaps [75]

This review benefits from large population coverage, consistent dose–response findings, and mechanistic coherence across experimental and epidemiological data. However, several limitations remain. Sedentary behavior measurement relied heavily on self-reported sitting time in many studies, which may introduce recall bias. Heterogeneity in exposure thresholds and outcome definition limited formal meta-analysis in some domains. Additionally, long-term interventional trials specifically targeting sedentary time reduction remain sparse [75].

Future research should prioritize **device-based exposure tracking, sedentary-specific randomized trials, life-course exposure analysis, and integration with genetic and inflammatory biomarkers** to refine cardiovascular risk prediction models.

CONCLUSION

This systematic review provides compelling evidence that sedentary lifestyle is a powerful, independent, and modifiable risk factor for cardiovascular diseases, significantly increasing the incidence of coronary artery disease, stroke, hypertension, heart failure, and cardiovascular mortality across diverse populations. The findings demonstrate that prolonged sitting exerts direct biological harm through endothelial dysfunction, metabolic dysregulation, autonomic imbalance, systemic inflammation, and accelerated atherosclerosis—mechanisms that are only partially offset by engagement in regular physical activity. Importantly, the review highlights that even individuals who meet recommended exercise guidelines remain vulnerable if they accumulate excessive sedentary time, underscoring the need for a dual preventive strategy that promotes both physical activity and active interruption of sitting. Vulnerable groups, including older adults, individuals with metabolic disorders, office-based workers, and socioeconomically disadvantaged populations, bear a disproportionate burden of sedentary cardiovascular risk. From a public health and clinical perspective, reducing sedentary behavior through workplace redesign, digital wellness interventions, urban planning for active living, and routine sedentary-risk counseling in healthcare settings offers a highly accessible, low-cost, and scalable opportunity to substantially lower global cardiovascular disease burden.

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