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SEDENTARY LIFESTYLE AND COMORBIDITIES: OVERVIEW OF UPDATED EVIDENCE OF POTENTIAL HEALTH RISK

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ABSTRACT

Sedentary lifestyle has become a significant public health concern worldwide, contributing significantly to the rising prevalence of non-communicable diseases such as hypertension, type 2 diabetes (T2DM), and obesity. Characterized by prolonged sitting or low-energy activities, it has been associated with physical and psychological health risks. This literature review examines and synthesizes recent evidence on the relationship between sedentary lifestyle and the development of common comorbidities. A literature review design was employed, sourcing relevant full-text articles published between 2018 and 2025 from databases including ScienceDirect, EBSCOhost, ProQuest, and Google Scholar. Inclusion criteria focused on studies that investigated the association between sedentary lifestyle and adult comorbidities, using quantitative, observational, and meta-analytical methods. The results of this study included eight peer-reviewed studies, including observational, cross-sectional analyses, systematic reviews, and randomized clinical trials. The findings showed a significant association between sedentary lifestyles and a variety of comorbidities, including hypertension, T2DM, and obesity. This literature review confirms that a sedentary lifestyle significantly contributes to the risk of hypertension, T2DM, and obesity. As sedentary lifestyles become increasingly common, particularly among the elderly, it is crucial to implement public health initiatives, encourage active living, and develop culturally appropriate interventions to reduce the impact of associated non-communicable diseases.

Keywords

Comorbidities, Hyperglycemia, Hypertension, Obesity, Sedentary Lifestyle

INTRODUCTION

Sedentary lifestyle, defined as any waking activity characterized by an energy expenditure ≤1.5 METs while in a sitting, reclining, or lying posture, has become a pervasive global health issue (Tremblay et al., 2017). Rapid urbanization, digitalization, and lifestyle shifts have increased physical inactivity across all age groups, particularly among adults and the elderly. The World Health Organization (2024) reports that approximately 1 in 4 adults worldwide is not active enough, and sedentary behavior is responsible for more than 3.2 million deaths annually. The global prevalence of a sedentary lifestyle is linked with a substantial increase in comorbidities such as hypertension, hyperglycemia (type 2

diabetes), dyslipidemia, and obesity. For example, a systematic review found that adults engaging in more than 8 hours of sedentary behavior per day had a significantly higher risk of all-cause mortality and cardiovascular disease, even after adjusting for physical activity (Patterson et al., 2018). In Southeast Asia, recent national health surveys indicate that more than 35% of older adults spend over 6 hours daily in sedentary activities, correlating with the rise in chronic diseases (World Health Organization, 2020).

Comorbid conditions associated with a sedentary lifestyle impair individual quality of life and significantly increase the economic, clinical, and logistical burdens on national healthcare systems, particularly in low- and middle-income countries. Hypertension, type 2 diabetes, dyslipidemia, and obesity are frequently observed together in populations with low physical activity, exacerbating complications and treatment complexity (Katzmarzyk et al., 2022). According to Foss et al (2023), hypertension and diabetes alone account for over 70% of outpatient care visits among elderly individuals in rural health clinics, highlighting the increasing pressure on primary care services. Moreover, global estimates suggest that physical inactivity contributes to nearly $54 billion in direct healthcare costs and an additional $14 billion in productivity losses annually. These figures are projected to rise as sedentary lifestyles become more prevalent in aging populations. In Indonesia, the Basic Health Research 2018 reported that the prevalence of hypertension among individuals aged 55 and over reached 63%, while diabetes mellitus was found in 34.4% of the same group. These numbers are closely correlated with prolonged sedentary behaviors such as sitting, screen time, and lack of structured physical activity (Kementrian Kesehatan Republik Indonesia, 2019).

Given the growing evidence, a sedentary lifestyle is now recognized as an independent risk factor for non-communicable diseases (NCDs), and its modification is considered a strategic priority in preventive public health interventions (World Health Organization, 2020). Addressing this behavioral risk through education, community engagement, and health promotion, especially among vulnerable elderly groups, can significantly reduce the comorbidity burden and improve long-term outcomes. Understanding the link between sedentary lifestyles and comorbidities is essential to guide public health policies and community-based interventions. Therefore, this literature review aims to synthesize recent evidence regarding the impact of a sedentary lifestyle on common comorbidities such as hypertension, hyperglycemia, and obesity. This work highlights the critical need for preventive measures, especially in populations enrolled in chronic disease management programs.

METHOD

This study employed a literature review design to explore the relationship between sedentary lifestyles and comorbidities, particularly hypertension, hyperglycemia, and obesity. Relevant literature was systematically gathered from multiple scientific databases, including EBSCOhost, ScienceDirect, ProQuest, and Google Scholar. The search focused on peer-reviewed journal articles published between 2018 and 2025, in either English or Indonesian, and only full-text access articles were considered for analysis. Keywords were structured using Medical Subject Headings (MeSH) terminology, including: 1) Comorbidities; 2) Hyperglycemia; 3) Hypertension; 4) Obesity; 5) Sedentary Lifestyle. Article selection was conducted manually through several screening stages: evaluating titles, keywords, abstracts, and the main content of each publication to ensure relevance to the topic. The inclusion criteria emphasized original research, systematic reviews, and meta-analyses that

directly examined the association between sedentary lifestyle and comorbidity risks in adult populations. The final data set was synthesized narratively to highlight key findings, emerging trends, and gaps in the literature, offering a comprehensive and updated understanding of the health implications associated with sedentary lifestyles.

RESULTS

Table 1 Article Review

Authors (Years)	Aimed	Method	Results	Outcomes
(Flashner et al., 2020)	To investigate whether obesity and a sedentary lifestyle are associated with fractional exhaled nitric oxide (FeNO), a marker of airway inflammation, in adolescents who were not selected based on allergic disease.	Design: Observational cohort study (Project Viva) Sample & Sampling: 929 adolescents, median age 12.9 years, from a pre-birth cohort (Project Viva); non-random, follow-up sampling. Data Analysis: Linear regression with log-transformed FeNO as outcome. Models were adjusted for demographic, socioeconomic, and asthma-related confounders.	After adjusting for asthma, watching≥2 hours of TV per day was associated with 12% lower FeNO (95% CI: −21%, −2%). Higher body fat percentage (measured by DXA) was associated with 9% lower FeNO per IQR increase (95% CI: −17%, −1%). Low BMI (<5th percentile) was associated with 22% lower FeNO, and high BMI (≥85th percentile) with 13% lower FeNO compared to normal BMI.	Sedentary lifestyle and both high and low BMI are significantly associated with reduced FeNO, even after adjusting for asthma. These findings suggest that lifestyle and body weight affect airway inflammation markers, with implications for interpreting FeNO in clinical practice.
(Guo et al., 2020)	To quantitatively assess the dose–response relationship between total sedentary behaviour and TV viewing with risks of overweight/obesity,	Design: Dose–response meta-analysis Sample & Sampling: 1,071,967 participants across 58 studies (21 on overweight/obesity, 23 on type 2 diabetes, 14 on hypertension). Inclusion based on MOOSE guidelines	A dose–response meta-analysis found a significant association between sedentary behavior and increased risk of chronic health conditions.	These findings indicate that both total sedentary behavior and television viewing independently contribute to the development

	type 2 diabetes, and hypertension.	from PubMed, EMBASE, and Web of Science. Data Analysis: Pooled Relative Risk (RR) calculated via random-effects model, using restricted cubic spline models for linear/non-linear relationships.	Specifically, each additional hour per day of total sedentary time was associated with a 5% increase in the risk of developing type 2 diabetes (RR: 1.05, 95% CI: 1.04–1.07), a 4% increase in the risk of hypertension (RR: 1.04, 95% CI: 1.00–1.07), and a non-linear increase in the risk of overweight or obesity, with a relative risk of 1.38 (95% CI: 1.20–1.58) observed at three hours of sedentary time per day. Furthermore, time spent watching television showed even stronger associations. Each additional hour of TV viewing per day increased the risk of type 2 diabetes by 8% (RR: 1.08), hypertension by 6% (RR: 1.06), and obesity by 53% at three hours per day (RR: 1.53). comorbidities.	of major metabolic and cardiovascular
(Joardar et al., 2020)	To investigate the prevalence and risk factors of	Design: Cross-sectional study.	The study found that the prevalence of	Advancing age and family history are

	hypertension among urban dwellers with a sedentary lifestyle in Dhaka, Bangladesh.	Sample & Sampling: 149 adults (≥18 years) with sedentary lifestyle, selected using simple random sampling from Dania Union, Dhaka. Data Analysis: Univariate analysis and binary logistic regression	hypertension among urban dwellers with a sedentary lifestyle was 39%. The risk of developing hypertension increased significantly with age, particularly among individuals aged 51–60 years (Adjusted Odds Ratio [AOR]: 3.11) and those aged 61 years or older (AOR: 5.83). Additionally, having a family history of hypertension was strongly associated with a higher risk (AOR: 3.59). Interestingly, individuals with high socioeconomic status had a 71% lower risk of hypertension compared to those with low socioeconomic status. On the other hand, abdominal obesity was not found to be a statistically significant factor in this study.	significant risk factors for hypertension. High socioeconomic status appears to be protective. Preventive strategies should promote physical activity and address lifestyle-related factors.
(Patterson et al., 2018)	To examine the dose–response relationship between sedentary behaviour and the risk of all-cause	Systematic review and dose–response meta-analysis of prospective studies; included 34 studies with over 1.3 million participants. Sedentary behaviour was	Each one-hour increase in daily sitting time was associated with a 2% higher risk of all-cause	High sedentary time is associated with increased risks of mortality and

	mortality, cardiovascular disease (CVD) mortality, cancer mortality, and incident type 2 diabetes.	typically measured via self-report or accelerometers.	mortality and a 5% higher risk of type 2 diabetes, with non-linear relationships observed. The risk of all-cause mortality rose more steeply after 8 hours of sitting per day, while the risk of cardiovascular disease (CVD) mortality increased more sharply after 6 hours per day. Although adjusting for physical activity attenuated these risks, it did not eliminate them.	type 2 diabetes, even after adjusting for physical activity. Reducing sedentary time could have public health benefits.
(Priasmoro & Lestari, 2023)	To examine the prevalence of a sedentary lifestyle and its influence on chronic disease risk and stress levels in Malang, Indonesia.	Quantitative descriptive study involving 420 respondents aged 17–55 years. Data were collected using the International Physical Activity Questionnaire (IPAQ) and Perceived Stress Scale (PSS). Statistical analysis used the Chi-Square and Odds Ratio tests.	A total of 83.8% of respondents were identified as having a sedentary lifestyle. While sedentary behavior was not significantly associated with the risk of chronic diseases such as obesity, diabetes, and heart disease ($p = 0.867$), it showed a significant association with moderate to severe stress levels ($p = 0.001$), indicating that prolonged inactivity may be a contributing factor to increased psychological	In the studied population, sedentary lifestyle is a dominant predictor of stress but not of chronic diseases. It emphasizes the need for increased physical activity to manage stress and promote better mental health.

			stress within the population.	
(Silveira et al., 2022)	To investigate the prevalence of sedentary behavior (SB) and physical inactivity (PI), their association with obesity, and the methods and cut-off points used for assessment in adults and older adults.	Systematic review and meta-analysis of 23 studies (n = 638,000), including 111,851 individuals with obesity. Data were collected using both objective (accelerometers/pedometers) and subjective (questionnaires) methods.	The combined prevalence of SB was 31% and PI was 43%. Obesity was significantly associated with SB (OR = 1.45) and PI (OR = 1.52). Subjective methods showed stronger associations than objective ones.	There is a high prevalence of sedentary behavior and physical inactivity in individuals with obesity. Both behaviors are significantly associated with increased obesity risk, highlighting the need for standardized assessment tools and targeted public health interventions.
(Sofra & Badami, 2020)	To assess the adverse effects of sedentary lifestyles and evaluate an alternative exercise method's impact on inflammation, oxidative stress, and metabolic health in diabetic and prediabetic individuals.	A one-month double-blind randomized clinical trial with 20 obese diabetic/prediabetic patients using a simulated multi-exercise regimen device. Measurements included blood tests, sonography, BMI, fat/muscle composition, and structured interviews.	Significant reductions in fasting and postprandial glucose and insulin, triglycerides, visceral and overall fat. Increases in HDL and skeletal muscle mass were observed. Sonography showed resolution of fatty liver in 7 patients.	The alternative exercise method was effective in improving metabolic health, reducing inflammation markers, and decreasing oxidative stress indicators in sedentary diabetic and prediabetic individuals. It may serve as a viable substitute for traditional exercise.
(Van Oort et al., 2020)	To examine the causal associations of 18 cardiovascular and	Two-sample Mendelian randomization using genetic data from large European GWAS datasets, including	Six modifiable risk factors (BMI, triglycerides,	Identified modifiable causal risk factors of

	lifestyle-related risk factors with hypertension using Mendelian randomization (MR).	FinnGen and UK Biobank cohorts.	alcohol dependence, type 2 diabetes, smoking initiation, and insomnia) were positively associated with hypertension risk. HDL-C and higher educational level were negatively associated.	hypertension, providing insights into prevention strategies. Findings support prioritizing HDL-C, BMI, and sleep in hypertension prevention.

This literature review included eight peer-reviewed studies, including observational studies, cross-sectional analyses, systematic reviews, and randomized clinical trials. The findings consistently demonstrate a significant association between sedentary lifestyles and a variety of comorbidities, including hypertension, type 2 diabetes, and obesity. Based on the reviewed studies, it is evident that sedentary behavior is strongly associated with various adverse health outcomes, including metabolic, cardiovascular, and psychological conditions. Sedentary time has been linked to increased risks of type 2 diabetes, hypertension, and obesity, as well as elevated all-cause mortality. Moreover, sedentary activities such as prolonged television viewing pose even greater risks. In adolescents, reduced markers of airway inflammation suggest that even respiratory health may be affected by inactivity. The observed dose-response relationships highlight that the health risks escalate with each additional hour of sedentary behavior, underscoring the importance of reducing prolonged sitting in daily routines.

In addition to physical health outcomes, a sedentary lifestyle has been shown to contribute to psychological stress, as demonstrated by findings from the Indonesian population. Meanwhile, studies examining interventions, such as low-impact exercise regimens, provide promising evidence for mitigating these risks and improving metabolic health indicators. The causal role of lifestyle factors, especially BMI, triglycerides, and insomnia, in hypertension further reinforces the need for targeted public health strategies. Collectively, these findings emphasize the urgent need to reduce sedentary behavior through structured interventions, policy efforts, and education to improve overall population health and prevent non-communicable diseases.

DISCUSSION

Hypertension

The relationship between sedentary lifestyle and hypertension has been consistently highlighted across various studies, underscoring its role as a significant modifiable risk factor. Guo et al (2020) demonstrated that each additional hour of sedentary behavior was associated with a 4% increased risk of hypertension, and this risk was amplified with extended periods of television viewing. This dose–response relationship suggests that the amount and nature of sedentary behavior (e.g., passive screen time) may influence

cardiovascular health outcomes. Supporting this, Patterson et al (2018) found that the risk of cardiovascular disease (CVD) mortality increased sharply after six hours of sitting per day, even after adjusting for levels of physical activity. This indicates that prolonged sedentary time exerts an independent effect on blood pressure regulation and cardiovascular risk.

Further evidence from a cross-sectional study in Bangladesh by Joardar et (2020) revealed a hypertension prevalence of 39% among urban adults with sedentary lifestyles. Advancing age and a family history of hypertension were identified as strong predictors, while higher socioeconomic status appeared to offer a protective effect. These findings suggest that sedentary behavior interacts with other demographic and genetic factors, compounding the risk of hypertension. Moreover, Van Oort et al (2020) using Mendelian randomization methods, confirmed the causal role of several lifestyle-related risk factors in the development of hypertension, including body mass index (BMI), triglycerides, smoking initiation, alcohol dependence, type 2 diabetes, and insomnia. Their study also highlighted protective associations with higher levels of HDL cholesterol and educational attainment, suggesting the influence of both biological and social determinants.

These findings support a multifaceted understanding of hypertension as a lifestyle-related condition influenced by both behavioral and genetic risk factors. The consistent association between prolonged sedentary behavior and elevated blood pressure across diverse populations reinforces the need for public health interventions that promote regular movement and reduce sedentary time. Integrating physical activity promotion into hypertension prevention strategies could be particularly beneficial in high-risk groups such as older adults, urban residents, and individuals with existing metabolic comorbidities. Moving forward, policy measures that encourage active lifestyles, limit screen time, and improve access to health education could play a pivotal role in reducing hypertension prevalence and its associated disease burden (Guo et al., 2020; Patterson et al., 2018; Van Oort et al., 2020).

Type 2 Diabetes

The growing body of evidence highlights a strong link between sedentary behavior and the risk of developing type 2 diabetes, indicating that prolonged physical inactivity is a significant behavioral determinant of metabolic dysfunction. According to a comprehensive dose–response meta-analysis by Guo et al (2020), each additional hour of sedentary time was associated with a 5% increase in the risk of type 2 diabetes. Furthermore, more specific sedentary activities, such as television viewing, demonstrated even stronger associations each additional hour per day increasing diabetes risk by 8%. This supports the idea that different types of sedentary lifestyles have varying levels of risk, with passive screen-related activities potentially having more harmful metabolic effects, likely influenced by accompanying habits such as frequent snacking or extended periods of sitting without breaks.

In line with these findings, Patterson et al., 2018 reported that sedentary time independently predicted the incidence of type 2 diabetes, even after

controlling for physical activity levels. Their meta-analysis, involving over 1.3 million individuals, found a non-linear relationship, where the risk rose more steeply with prolonged daily sitting, particularly beyond 8 hours per day. This suggests that while regular physical activity is essential, it may not fully mitigate the metabolic risks of extended sedentary periods. Adding further depth, Van Oort et al (2020) Through a Mendelian randomization approach, evidence was provided supporting the causal relationship between type 2 diabetes and hypertension. This indicates shared pathophysiological pathways likely influenced by obesity, insulin resistance, and chronic inflammation.

Interestingly, intervention-based studies also support these associations. Sofra & Badami (2020) demonstrated that reducing a sedentary lifestyle through an alternative exercise method significantly improved glucose and insulin levels in diabetic and prediabetic individuals. Their findings showed reduced fasting and postprandial glucose, decreased triglycerides and body fat, and increased HDL and muscle mass. These improvements indicate that even low-intensity or simulated physical activity can yield substantial metabolic benefits for individuals at high risk or already diagnosed with type 2 diabetes.

These studies underscore the importance of addressing a sedentary lifestyle as a critical modifiable factor in diabetes prevention and management. Public health policies and clinical guidelines should go beyond promoting physical activity and emphasize strategies to reduce total sitting time and interrupt prolonged bouts of inactivity. Tailored interventions that incorporate behavioral counseling, environmental modifications, and structured activity alternatives may be particularly effective in reducing the burden of type 2 diabetes in both developed and developing regions.

Obesity

Obesity is one of the most prevalent and complex health conditions influenced by lifestyle behaviors, and a sedentary lifestyle has emerged as a critical contributing factor. The evidence consistently shows that individuals who engage in prolonged sedentary activities face a significantly higher risk of becoming overweight or obese. In a large-scale dose–response meta-analysis, Guo et al (2020) found that a sedentary lifestyle was strongly associated with increased obesity risk, with a relative risk (RR) of 1.38 at three hours of sitting per day. Television viewing presented an even higher risk, where three hours per day correlated with a 53% increased risk of obesity (RR = 1.53). These findings suggest that the duration and context of sedentary activity play a role, potentially due to accompanying behaviors such as unhealthy eating and reduced metabolic expenditure.

Silveira et al (2022) further, a systematic review and meta-analysis involving over 638,000 individuals confirmed this relationship. They reported that a sedentary lifestyle and physical inactivity were significantly associated with obesity, with odds ratios of 1.45 and 1.52, respectively. Interestingly, the subjective assessment method showed stronger associations than objective tools like accelerometers, suggesting that self-reported data might capture contextual factors (e.g., screen time, social inactivity) linked to weight gain. These findings highlight the need for improved,

standardized methods to assess a sedentary lifestyle in obesity-related research.

In addition to observational studies, intervention-based research has demonstrated that reducing a sedentary lifestyle can yield measurable improvements in obesity-related markers. Sofra & Badami (2020) conducted a randomized clinical trial on obese diabetic and prediabetic patients using an alternative low-impact exercise regimen. The intervention significantly reduced visceral and overall body fat and improved metabolic parameters such as triglycerides and HDL levels. These findings underscore the potential of even non-traditional or simulated physical activity in combating obesity, particularly in populations with limited mobility or comorbid conditions.

The evidence illustrates a robust association between sedentary lifestyles and obesity. Given the rising global burden of obesity and its complications, reducing sedentary time should be prioritized in public health strategies. Interventions should not only promote physical activity but also aim to break up prolonged sitting, especially in high-risk groups such as adults with existing metabolic conditions or those in sedentary occupations. Future research should continue to explore culturally adapted, accessible interventions that integrate behavioral, environmental, and technological components to reduce a sedentary lifestyle and curb obesity rates.

CONCLUSIONS

This literature review confirms that a sedentary lifestyle significantly contributes to the risk of hypertension, type 2 diabetes, and obesity. As sedentary lifestyles become increasingly common, particularly among urban and elderly populations, it is crucial to implement public health initiatives, encourage active living, and develop culturally appropriate interventions to help reduce the impact of associated non- communicable diseases.

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