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SEDENTARY LIFESTYLE AND ITS HEALTH IMPLICATIONS: A REVIEW

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ABSTRACT

A sedentary lifestyle, characterized by prolonged periods of sitting or physical inactivity with energy expenditure ≤1.5 METs, has emerged as a critical global health concern. The shift toward sedentary behavior is driven by rapid technological advancements, urbanization, occupational demands, and lifestyle preferences. From office-bound professionals to adolescents engrossed in digital devices, inactivity now transcends age and demographic boundaries. This review highlights the multifaceted health implications of sedentary behavior and emphasizes the urgent need for behavioral and policy-level interventions. Sedentary epidemic demands a multifactorial approach. At the individual level, people are encouraged to incorporate at least 150 minutes of moderate physical activity per week, interspersed with regular movement breaks, use of standing desks, and limiting screen time. Workplaces can play a vital role by promoting ergonomically supportive environments, active breaks, and wellness initiatives. On a broader scale, urban planning should prioritize walkable neighborhoods, public parks, and policies that encourage physical activity in schools and communities.

KEYWORDS: urbanization, occupational, sedentary, multifactorial, ergonomically.

1. INTRODUCTION

Modern lifestyles have increasingly shifted toward sedentary behaviors due to technological advancements, urbanization, and changes in work environments. From office jobs to entertainment habits such as television watching or online gaming, sedentary behavior is becoming dominant across age groups. While physical inactivity was once linked mainly to aging or disability, it is now widespread among the general population, contributing to a rise in non-communicable diseases (NCDs).For example, many daily routines now involve long periods of sitting – commuting by car or train, working at computer-based jobs, and spending leisure time on smartphones, tablets, or gaming consoles. This widespread inactivity has been called "sedentarism," and it is strongly linked to chronic health problems: research suggests each extra hour spent sitting (beyond roughly seven hours per day) is associated with a roughly 5% increase in all-cause mortality.Globally, roughly one-quarter of adults and four out of five adolescents fail to meet recommended physical activity guidelines. and WHO analysis predicts nearly 500 million new cases of major NCDs between 2020 and 2030 if current inactivity trends continue.

2. Definition and Characteristics of Sedentary Lifestyle

Sedentary behavior is defined as any waking activity characterized by an energy expenditure ≤1.5 METs (metabolic equivalents), typically while sitting, reclining, or lying down (Tremblay et al., 2017). This includes time spent on screens, reading, or sitting at a desk. It is distinct from physical inactivity, though often co-occurring.

3. Causes of Sedentary Lifestyle

- Technological advancements
- Urban design
- Occupational structure
- Sociocultural factors.

4. Health Implications of Sedentary Behavior

4.1 Cardiovascular Health

Prolonged sitting is associated with elevated risk for heart disease and stroke. Studies reveal that sedentary time correlates with increased blood pressure, lipid imbalance, and endothelial dysfunction (Young et al., 2016). These physiological disturbances can lead to atherosclerosis, a major underlying cause of cardiovascular events. Moreover, sitting for long durations decreases skeletal muscle activity, particularly in the lower limbs, which

contributes to impaired glucose uptake and fat metabolism—both of which exacerbate cardiovascular risk factors. Research has also shown that individuals who sit for more than eight hours a day without regular physical activity have a risk profile comparable to that of smokers (Katzmarzyk et al., 2009). In addition, sedentary behavior negatively affects autonomic regulation of heart rate, reduces HDL cholesterol, and promotes chronic inflammation, all of which are precursors to heart disease and stroke. Even with recommended physical activity levels, uninterrupted sitting has been linked to poor cardiovascular outcomes, highlighting the importance of incorporating frequent movement breaks throughout the day (Ekelund et al., 2016).

4.2 Metabolic Disorders

There is a significant link between sedentary behavior and type 2 diabetes mellitus. Insufficient muscle activity lowers glucose uptake and insulin sensitivity (Owen et al., 2010).This physiological impairment is especially prominent in the large postural muscles, which play a critical role in maintaining metabolic health. When these muscles remain inactive for extended periods, glucose transporters like GLUT-4 are underutilized, reducing the efficiency of cellular glucose uptake. As a result, insulin resistance begins to develop, even in otherwise healthy individuals. Prolonged sedentary time has been shown to alter lipid metabolism, increase visceral adiposity, and elevate inflammatory markers, all of which contribute to the pathogenesis of type 2 diabetes. Moreover, large-scale epidemiological studies have demonstrated that individuals with high daily sitting times have up to a 112% higher risk of developing type 2 diabetes compared to those who are more physically active (Wilmot et al., 2012). These effects persist even in people who meet physical activity guidelines, indicating that simply exercising once a day is not sufficient to counteract the metabolic consequences of prolonged inactivity (Dunstan et al., 2012). Consequently, reducing sedentary time through frequent movement breaks and light physical activity has become a critical recommendation for diabetes prevention and management.

4.3 Obesity

Sedentary behavior contributes to positive energy balance and fat accumulation. Combined with poor dietary habits, it significantly increases the prevalence of obesity.This is because prolonged sitting drastically reduces overall energy expenditure, making it easier to consume more calories than are burned throughout the day. Unlike moderate or vigorous physical activity, sedentary activities such as watching television or working on a computer involve

minimal muscular contractions, particularly in large muscle groups, resulting in lower metabolic rates. Over time, this imbalance promotes the storage of excess energy as adipose tissue, particularly in the abdominal region, which is associated with a higher risk of metabolic disorders. Additionally, sedentary lifestyles are often correlated with mindless snacking and consumption of energy-dense, nutrient-poor foods, further compounding the risk of weight gain (Thorp et al., 2011). Epidemiological studies have shown that individuals who spend more than six hours per day engaged in sedentary behaviors are significantly more likely to be overweight or obese compared to those who sit less (Hu et al., 2003). Moreover, childhood exposure to sedentary routines is a major predictor of adult obesity, creating a cycle of inactivity and weight gain that is difficult to reverse without deliberate lifestyle changes.

4.4 Musculoskeletal Disorders

Extended sitting, particularly with poor posture, leads to chronic back pain, cervical spondylosis, and reduced joint flexibility (Waongenngarm et al., 2018). This is primarily due to the sustained pressure placed on the spine and surrounding musculature, especially when sitting ergonomically unsupported or slouched forward for prolonged periods. Poor posture during sitting, such as forward head tilt and rounded shoulders, increases mechanical strain on the cervical and lumbar vertebrae, which over time may result in disc degeneration and nerve compression. Additionally, lack of regular movement reduces synovial fluid circulation within joints, contributing to stiffness and limited range of motion. Muscle imbalances also develop, where certain muscles like the hip flexors and hamstrings become tight, while others such as the gluteals and core muscles weaken, further impairing postural support and alignment. Prolonged sitting can also reduce blood flow to spinal structures, compounding musculoskeletal discomfort. Occupational studies indicate that office workers who remain seated for more than six hours a day report significantly higher rates of musculoskeletal complaints, particularly in the lower back and neck regions (Shariat et al., 2018). Over time, these issues not only affect physical performance but can also lead to decreased quality of life and increased healthcare utilization.

4.5 Mental Health

A sedentary lifestyle is associated with increased symptoms of depression and anxiety. Physical inactivity affects neurotransmitter balance, mood regulation, and sleep patterns (Zhai et al., 2015).Reduced physical activity limits the release of endorphins, serotonin, and

dopamine—neurochemicals that play crucial roles in enhancing mood and promoting emotional well-being. Furthermore, prolonged sedentary time has been linked to dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, leading to elevated cortisol levels, which are strongly associated with chronic stress and anxiety disorders. Individuals who spend excessive time sitting are also more likely to experience disrupted circadian rhythms, contributing to poor sleep quality and fatigue, which can worsen depressive symptoms. Social isolation, commonly linked to sedentary behavior like excessive screen time or remote work environments, further compounds feelings of loneliness and psychological distress. Longitudinal studies have shown that people engaging in high levels of sedentary behavior have a 25–30% greater risk of developing depression over time, independent of other health behaviors (Teychenne et al., 2010). Regular physical activity, even at light intensity, has been shown to significantly reduce symptoms of mild to moderate depression, underscoring the mental health importance of minimizing sedentary habits.

4.6 Cancer Risk

Epidemiological studies link sedentary time to higher risks of colorectal, breast, and endometrial cancers. Mechanisms include inflammation, hormonal imbalance, and reduced immunity (Biswas et al., 2015).Prolonged sitting is associated with increased levels of insulin and insulin-like growth factors, both of which have been implicated in cancer development due to their role in promoting cell proliferation and inhibiting apoptosis. Furthermore, physical inactivity contributes to chronic low-grade inflammation, marked by elevated levels of C-reactive protein (CRP) and interleukin-6 (IL-6), which can create a tumor-promoting environment. In the case of breast and endometrial cancers, sedentary behaviour may also influence circulating levels of estrogen and other sex hormones, thereby increasing hormonal exposure in tissues susceptible to malignant transformation. Moreover, inactivity can impair natural killer cell activity and other components of immune surveillance that are vital in detecting and destroying abnormal cells before they become cancerous. A meta-analysis involving over 4 million participants found that high levels of sedentary behavior were significantly associated with a 24% increased risk of colon cancer and a 21% increased risk of lung cancer, independent of physical activity levels (Schmid &Leitzmann, 2014). These findings highlight the importance of not only increasing physical activity but also minimizing total sitting time throughout the day to reduce cancer risk.

5. Sedentary Lifestyle in Children and Adolescents

The sedentary lifestyle among children and adolescents is a growing concern worldwide, driven by increased screen time, academic pressure, and limited opportunities for physical activity. With the rise of digital devices, many children spend several hours a day sitting—whether for online classes, gaming, or social media—leading to physical inactivity becoming a routine part of life. This trend has serious health implications. Childhood obesity is strongly linked to sedentary behavior, increasing the risk of early-onset diabetes, hypertension, and metabolic disorders. (Young, D. R.*et al)* Additionally, poor posture from prolonged sitting can result in musculoskeletal problems, including back and neck pain. Mental health is also affected, with studies showing associations between inactivity and higher levels of anxiety, depression, and reduced cognitive performance. Lack of physical activity in early years can also lead to poor bone development, (Katzmarzyk, *et al*) weaker cardiovascular health, and a greater likelihood of continuing an inactive lifestyle into adulthood. Combating this issue requires coordinated efforts from families, schools, and communities. Encouraging outdoor play, limiting screen time, and integrating physical activities into daily routines are essential strategies. Promoting an active lifestyle early on supports not only physical well-being but also emotional and social development in children and adolescents. (Zhai, L.,*et al*)

6. Recommendations and Interventions

Addressing the health risks associated with a sedentary lifestyle requires a multi-level approach involving individual behavior change, workplace adjustments, educational reforms, and supportive public policies. The following recommendations and interventions can effectively reduce sedentary time and promote physical activity.

6.1. Individual-Level Interventions

Increase Physical Activity: Adults should engage in at least 150 minutes of moderate-intensity aerobic activity per week, while children and adolescents should get 60 minutes daily.

- Break Prolonged Sitting: Incorporate short activity breaks every 30–60 minutes during long sitting periods—such as stretching, walking, or simple body movements. (Teychenne *etal*.)
- Active Lifestyle Habits: Use stairs instead of elevators, walk or cycle for short distances, and engage in hobbies that involve physical movement.

- Limit Screen Time: Set limits on recreational screen use, especially among children, and promote alternative active leisure options.

6.2. Workplace and Educational Interventions

- Ergonomic Workstations: Use sit-stand desks and encourage good posture to reduce physical strain. **(**Schmid, D *et al*.).
- Active Breaks and Meetings: Promote walking meetings, standing breaks, and short exercise sessions during the workday or school hours.
- Structured Physical Education: Schools should ensure regular and mandatory physical education classes and incorporate physical activities into the daily curriculum.

6.3. Policy and Community-Level Actions

- Urban Design: Build walkable cities with parks, cycling paths, and pedestrian zones to encourage physical movement.
- Public Awareness Campaigns: Launch initiatives to educate the public about the dangers of sedentary and the benefits of active living.
- Community Programs: Support fitness programs, sports events, and family-based activities at the community level. (Owen, N., *et al* (2010).

CONCLUSION

The sedentary lifestyle has become a defining feature of modern civilization, intricately woven into the fabric of contemporary living through digital dependency, urban infrastructure, and occupational structures. While technological advancements have undoubtedly improved convenience and productivity, they have simultaneously encouraged prolonged periods of physical inactivity, culminating in a silent epidemic that poses severe risks to public health. This review brings into sharp focus the multifaceted health threats posed by sedentary behavior and underscores the urgent need for comprehensive preventive strategies.

The evidence presented clearly shows that sedentary behavior is an independent risk factor for numerous chronic diseases, irrespective of engagement in regular exercise. Cardiovascular conditions such as heart disease and stroke are exacerbated by prolonged sitting, which contributes to dyslipidemia, hypertension, endothelial dysfunction, and systemic inflammation. Likewise, the relationship between sedentarism and metabolic

disorders, particularly type 2 diabetes, is well-documented, with inactivity impairing glucose metabolism and insulin sensitivity at the cellular level.

Obesity, a prominent global health crisis, is closely associated with sedentary behavior. The imbalance between calorie intake and expenditure, further intensified by passive screen time and unhealthy snacking habits, significantly contributes to fat accumulation and metabolic syndrome. Furthermore, the musculoskeletal consequences—ranging from postural imbalances to chronic spinal discomfort—demonstrate how sedentarism compromises the body's structural and functional integrity. These physical impairments are often compounded by reduced flexibility, muscle atrophy, and restricted mobility, further diminishing the quality of life..

Mental health is another domain gravely affected by a lack of physical movement. Sedentary lifestyles are strongly linked to increased rates of depression, anxiety, and psychological distress, often due to disruptions in neurotransmitter activity, hormonal imbalances, and social isolation. Sleep disturbances and reduced self-esteem further contribute to emotional instability, creating a negative feedback loop that perpetuates inactivity and poor health.

Alarmingly, emerging research also indicates a correlation between sedentary behavior and cancer, with elevated risks for colorectal, breast, endometrial, and even lung cancer. These links are mediated through mechanisms such as hormonal dysregulation, chronic inflammation, and diminished immune surveillance—highlighting the deep systemic effects of prolonged inactivity.

Children and adolescents, once considered naturally active, are now increasingly subject to the sedentary trap due to academic pressure, screen-based recreation, and a lack of accessible play spaces. Early exposure to sedentary patterns not only impairs physical and cognitive development but also sets the stage for lifelong health challenges, including obesity, poor posture, and behavioral issues.

Combating sedentary behavior requires a multidimensional approach. At the individual level, adopting consistent physical activity, minimizing sitting time, and incorporating movement into daily routines are crucial. In professional environments, introducing standing desks, active meetings, and structured breaks can help alleviate continuous inactivity. On a policy level, city planning must prioritize walkability, public green spaces, and school-based activity

programs. Educational campaigns promoting awareness of the risks associated with sedentarism are equally important in shaping healthier habits.

In conclusion, a sedentary lifestyle is not just a personal health issue—it is a societal challenge that demands collective action. Encouraging movement across all domains of life is imperative to curb the rising tide of non-communicable diseases. Physical activity should not be perceived merely as a fitness option but embraced as a cornerstone of holistic health, resilience, and long-term well-being.

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