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The Impact of Sedentary Lifestyle on Diabetes in Tamil Nadu: A Review

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Abstract

The prevalence of diabetes, particularly Type 2 Diabetes Mellitus (T2DM), has surged in Tamil Nadu, reflecting a broader global trend. This review examines the impact of sedentary lifestyles on the increasing incidence of diabetes in the region, highlighting key contributing factors and potential interventions. Sedentary behaviour, characterized by prolonged sitting and minimal physical activity, has become a dominant lifestyle pattern due to urbanization, technological advancements, and occupational demands. This shift has led to a rise in obesity, insulin resistance, and other metabolic disorders, which are precursors to T2DM. Studies conducted in Tamil Nadu reveal a stark urban-rural divide, with urban areas exhibiting higher diabetes prevalence due to sedentary work environments and dietary changes. However, rural populations are not immune, as modernization introduces similar lifestyle changes. Key risk factors include high body mass index (BMI), positive family history of diabetes, and lack of physical activity. Women, married individuals, and those with limited health literacy are disproportionately affected. The review underscores the urgent need for targeted interventions, including public health campaigns promoting active lifestyles, dietary modifications, and regular health screenings. Community-based programs tailored to local cultural and socioeconomic contexts can effectively address these challenges. Additionally, workplace wellness initiatives and urban planning that encourages physical activity can mitigate the impact of sedentary lifestyles. By addressing these factors, Tamil Nadu can curb the diabetes epidemic and improve the overall quality of life for its residents. This review serves as a call to action for policymakers, healthcare providers, and communities to prioritize diabetes prevention and management strategies.

Keywords: *Diabetes, Occupational Demands, Sedentary Lifestyles, Technological Advancements, Urbanization.*

Introduction

The rapid shift in lifestyle patterns due to urbanization and technological advancements has led to an alarming increase in sedentary behaviour, which is becoming a global public health concern. In India, particularly in Tamil Nadu, the interplay between these lifestyle changes and the rising diabetes prevalence of diabetes highlights a critical area for research and intervention. Type 2 Diabetes Mellitus (T2DM), often associated with sedentary behaviour, has emerged as a significant challenge for healthcare systems, impacting

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individuals across diverse socioeconomic and demographic groups.

A sedentary lifestyle, characterized by extended periods of inactivity such as sitting or reclining, is strongly correlated with metabolic dysfunctions, obesity, and insulin resistance—key precursors to diabetes. In Tamil Nadu, this phenomenon is compounded by urban migration, desk-bound occupations, and dietary transitions favouring processed foods, making residents increasingly vulnerable to T2DM. While urban populations bear the brunt, rural areas are not exempt as lifestyle transformations gradually infiltrate these regions.

This introduction establishes the necessity of exploring the connections between sedentary lifestyles and diabetes in Tamil Nadu. By reviewing existing studies and data, this work aims to shed light on the key risk factors, the urban-rural divide, and the sociocultural context contributing to this public health issue etc. Moreover, understanding these dynamics is essential to developing tailored interventions that address both the behavioural and systemic drivers of diabetes. Through such efforts, Tamil Nadu can serve as a model for other regions grappling with similar health crises.

The objectives for this study are as follows: to identify the prevalence of sedentary lifestyles in Tamil Nadu and analyze its correlation with the rising incidence of Type 2 Diabetes Mellitus (T2DM). To investigate the sociodemographic and cultural factors contributing to sedentary behaviour and how they exacerbate diabetes risk across different population groups. To assess the urban-rural divide in diabetes prevalence and explore how modernization influences sedentary behaviour in both settings. To review existing public health policies and interventions aimed at promoting active lifestyles and mitigating the impact of sedentary behaviour on diabetes. To propose culturally tailored, community-driven strategies for preventing and managing diabetes by addressing sedentary behaviours. To emphasize the role of awareness campaigns and educational programs in empowering individuals and communities to adopt healthier lifestyle choices and to analyze workplace and infrastructural dynamics that contribute to sedentary lifestyles and suggest ways to incorporate physical activity into daily routines.

Analysis of the Study

The Prevalence of Sedentary Lifestyles in Tamil Nadu and their Correlation with the Rising Incidence of Type 2 Diabetes Mellitus (T2DM)

Prevalence of Sedentary Lifestyle in Tamil Nadu

A study conducted by the Indian Council of Medical Research (ICMR) highlights the increasing prevalence of sedentary behaviour in Tamil Nadu, driven by urbanization and technological advancements [1]. Factors such as prolonged screen time, desk-bound occupations, and reduced physical activity contribute significantly to this trend. The study emphasizes the need for public health interventions to promote active lifestyles.

Lifestyle Behaviour among Medical Students

Research on undergraduate medical students in Tamil Nadu reveals that 46% of participants reported a lack of exercise, with 30.5% engaging in sedentary activities like television viewing or mobile usage for over four hours daily [2]. This study underscores the early onset of sedentary habits, which can persist into adulthood, increasing the risk of metabolic disorders, including T2DM.

Correlation between Sedentary Lifestyles and T2DM

A cross-sectional study in Tamil Nadu utilized the Indian Diabetic Risk Score (IDRS) to assess the relationship between sedentary behaviour and diabetes risk [3]. The findings indicate a moderate positive correlation between sedentary lifestyles, elevated BMI, and

random blood sugar levels. The study highlights the importance of regular physical activity and dietary modifications in mitigating diabetes risk.

Impact of Sedentary Work on Diabetes Risk

Research focusing on sedentary occupations in Chennai, such as banking and IT sectors, found a significant association between sedentary work and increased diabetes risk [4]. The study recommends workplace wellness programs and active lifestyle promotion to address this issue.

Sociodemographic and Cultural Factors Contributing to Sedentary Behaviour and their Impact on Diabetes Risk

Sociodemographic Factors and Sedentary Behaviour

Studies have shown that sedentary behaviour is influenced by various sociodemographic factors such as age, gender, employment status, and urbanization. For instance, older adults, women, and individuals living in urban areas are more likely to engage in prolonged sedentary activities [5]. Unemployment and living alone are also associated with higher sedentary times, as these factors may limit opportunities for physical activity [5].

Cultural and Environmental Influences

Cultural norms and societal expectations can shape sedentary behaviour. For example, in some cultures, leisure activities may predominantly involve sitting, such as watching television or socializing [6]. The physical environment, including access to recreational spaces and walkable neighbourhoods, plays a significant role in reducing sedentary behaviour [6].

Sedentary Behavior and Diabetes Risk

Sedentary behaviour has been linked to an increased risk of type 2 diabetes. Prolonged sitting and low energy expenditure are associated with insulin resistance and impaired glucose metabolism [7]. Replacing sedentary time with moderate-to-vigorous physical activity has been shown to significantly reduce diabetes risk, highlighting the importance of lifestyle interventions [8, 9].

Population-Specific Insights

Different population groups experience varying levels of sedentary behaviour due to disparities in socioeconomic status, education, and cultural practices. Tailored interventions that consider these differences are essential for effective diabetes prevention [7].

The Urban-rural Divide in Diabetes Prevalence and the Influence of Modernization on Sedentary Behavior

Urban-Rural Divide in Diabetes Prevalence

Studies indicate that diabetes prevalence is generally higher in urban areas compared to rural ones. For instance, in India, urban regions report a prevalence of 16.4%, while rural areas show 8.9% [10, 11]. This disparity is attributed to factors such as lifestyle differences, dietary patterns, and access to healthcare. In rural areas, limited healthcare infrastructure and lower awareness about diabetes contribute to underdiagnosis and delayed treatment [10]. However, modernization and economic transitions are narrowing this gap, with rural areas experiencing a rise in diabetes cases due to changing lifestyles and dietary habits [11].

Modernization and Sedentary Behavior

Modernization has led to increased sedentary behaviour across both urban and rural settings. In urban areas, the rise of desk jobs, reliance on motorized transport, and screen-based leisure activities have significantly reduced physical activity [12, 13]. In rural areas, modernization has introduced mechanization in agriculture and other labour-intensive activities, reducing the need for physical exertion [14]. The digital era has further exacerbated sedentary lifestyles, with increased screen time and reduced

engagement in traditional physical activities [13].

Impact on Health

Modern lifestyles, characterized by prolonged sitting and minimal physical activity, contribute significantly to the risk of diabetes. Reduced movement and low energy expenditure can lead to insulin resistance and disruptions in glucose metabolism, highlighting the health challenges associated with sedentary behaviour [14]. Urban redesign and interventions promoting active transport and recreational physical activities have shown potential in mitigating sedentary behaviour and its health impacts [12].

Public Health Policies and Interventions

Promoting Active Lifestyles

Public health policies worldwide have increasingly focused on encouraging physical activity to combat sedentary lifestyles and associated health risks. The OECD report on Healthy Eating and Active Lifestyles highlights various interventions, including food labelling, lifestyle counselling, and taxation on unhealthy products, to promote healthier choices [15]. Additionally, the WHO Regional Office for Europe emphasizes urban planning strategies that create environments conducive to physical activity, such as accessible green spaces and pedestrian-friendly infrastructure [16]. The WHO Global Action Plan on Physical Activity (2018-2030) outlines 20 policy actions aimed at reducing physical inactivity by 15% globally [17].

Mitigating Sedentary Behaviour and its Impact on Diabetes

Sedentary behaviour is a significant risk factor for type 2 diabetes, prompting various interventions to reduce its impact. A systematic review and meta-analysis found that breaking up sedentary time significantly improves glycemic control in adults with type 2 diabetes [18]. Digital behaviour change interventions (DBCIs) have also shown promise in reducing sedentary behaviour and increasing physical activity among diabetic patients, with randomized controlled trials demonstrating improvements in step count and activity levels [19]. Additionally, the **SEEDS project** explored co-created interventions among adolescents to improve physical activity and snacking behaviours, addressing barriers to healthier lifestyles [20].

Culturally Tailored, Community-Driven Strategies for Diabetes Prevention and Management

Culturally Tailored Interventions

Culturally tailored strategies have been shown to improve diabetes prevention and management outcomes, particularly among minority populations. A systematic review found that interventions incorporating language, location, messaging, and facilitators from the target community significantly improved glycemic control and lifestyle behaviours [21]. The National Diabetes Prevention Program (DPP) has adapted its curriculum to meet the needs of diverse populations, ensuring accessibility through culturally and linguistically tailored materials [22]. Additionally, interventions tailored for Black African ancestry populations have demonstrated effectiveness in improving diabetes knowledge and reducing HbA1c levels [23].

Community-Driven Approaches

Community-based programs have proven effective in diabetes prevention and management. A study in rural India implemented a nonpharmacological lifestyle intervention using trained community members, leading to significant reductions in fasting blood glucose and obesity parameters [24]. Similarly, peer support programs have shown long-term benefits, with improvements in HbA1c, BMI, and diabetes distress among participants [25]. Government initiatives, such

as the National Program for Prevention and Control of Diabetes in India, provide community clinics and educational resources to enhance diabetes care [26].

Addressing Sedentary Behaviours

Reducing sedentary behaviour is a crucial component of diabetes management. A systematic review and meta-analysis found that breaking up sedentary time significantly improves glycemic control in adults with type 2 diabetes [27]. Community-based interventions promoting physical activity and movement have demonstrated success in reducing diabetes risk [28]. Public health initiatives encourage reducing screen time, incorporating movement into daily routines, and promoting active work environments to mitigate the effects of sedentary lifestyles [29].

Awareness Campaigns and Educational Programs for Healthier Lifestyles

Impact of Awareness Campaigns

Public health campaigns play a crucial role in promoting healthy behaviours and preventing diseases. Research highlights that well-designed campaigns can raise awareness, change attitudes, and encourage behaviour modification [29]. Campaigns targeting tobacco use have successfully reduced smoking rates, while those promoting healthy eating and physical activity have led to improved dietary habits and increased exercise levels [30]. Additionally, campaigns focusing on early screening for chronic diseases have contributed to better treatment outcomes [29].

Educational Programs for Diabetes Prevention

Educational programs are essential in empowering individuals to manage and prevent diabetes. A community-based diabetes prevention program in rural India demonstrated significant improvements in fasting blood glucose levels and obesity parameters through nonpharmacological lifestyle interventions [24]. The National Institute of Public Health Training and Research offers skill development programs for diabetes educators, equipping healthcare professionals with the knowledge to support patients in managing their condition [31]. Furthermore, initiatives like the Diabetes Foundation India's MARG program focus on educating schoolchildren, teachers, and parents about diabetes prevention [32].

Community Engagement and Long-Term Impact

Community-driven educational programs have shown long-term benefits in improving health outcomes. Peer support initiatives and culturally tailored interventions have been effective in reducing diabetes distress, improving HbA1c levels, and promoting sustainable lifestyle changes [24]. Digital health education platforms further enhance accessibility, ensuring that individuals receive continuous support and guidance in adopting healthier habits.

Workplace and Infrastructural Dynamics Affecting Sedentary Lifestyles

Workplace Dynamics Contributing to Sedentary Behavior

Modern workplaces are designed for efficiency but often inadvertently promote sedentary behaviour. Research highlights that office workers spend a significant portion of their workday sitting, leading to adverse health effects [33]. A review of workplace sedentary behaviour found that prolonged sitting increases the risk of cardiovascular disease, obesity, and metabolic disorders [34]. Additionally, individual perspectives on physical activity and workplace culture play a role in determining movement levels during work hours [33].

Infrastructural Factors and Sedentary Lifestyles

Urban infrastructure significantly influences physical activity levels. Studies show that

environments with limited pedestrian-friendly spaces and inadequate access to recreational areas contribute to sedentary lifestyles. A major urban redesign project demonstrated that improved infrastructure, such as walkable streets and accessible green spaces, can reduce sedentary behaviour and encourage active transport [35]. Furthermore, research indicates that environmental and lifestyle factors, including digital habits and neighbourhood design, impact sedentary behaviour among adolescents [36].

Strategies to Incorporate Physical Activity into Daily Routines

Several interventions have been proposed to counteract sedentary behaviour in workplaces and urban settings:

1. **Workplace Interventions:** Implementing standing desks, encouraging walking meetings, and promoting active breaks can reduce sedentary time [37].
2. **Urban Planning:** Designing cities with pedestrian-friendly infrastructure, cycling lanes, and accessible parks can encourage movement [35].
3. **Daily Routine Adjustments:** Simple strategies such as taking the stairs, walking during phone calls, and engaging in micro-workouts can seamlessly integrate physical activity into daily life [38-40].

Discussions

A sedentary lifestyle is increasingly recognized as a major risk factor for diabetes, particularly in Tamil Nadu, where urbanization and changing work habits have led to reduced physical activity.

1. **Rising Diabetes Cases in Tamil Nadu**

Tamil Nadu has seen a significant rise in Type 2 diabetes cases, partly due to sedentary behaviour and lifestyle changes. Studies indicate that lack of physical activity, prolonged sitting, and unhealthy dietary habits contribute to the growing prevalence of diabetes [41].

2. **Link Between Sedentary Work and Diabetes**

Research suggests that individuals engaged in sedentary jobs, such as banking and IT professions, are at a higher risk of developing diabetes. A study conducted in Chennai found that employees with minimal physical activity had elevated blood sugar levels, emphasizing the need for workplace interventions [42].

3. **Indian Diabetic Risk Score (IDRS) and Screening**

The Indian Diabetic Risk Score (IDRS) is a useful tool for assessing diabetes risk among adults. A study conducted in Tamil Nadu hospitals found a moderate positive correlation between IDRS and blood sugar levels, highlighting the importance of early screening [41].

4. **Preventive Measures and Lifestyle Modifications**

To combat the impact of sedentary lifestyles, experts recommend:

1. **Regular physical activity** (at least 30 minutes of exercise daily)
2. **Healthy diet choices** (reducing processed foods and increasing fiber intake)
3. **Workplace wellness programs** (encouraging movement breaks and ergonomic setups)

5. **Policy Interventions and Public Awareness**

Government initiatives promoting diabetes awareness, lifestyle modifications, and preventive healthcare can help mitigate the impact of sedentary behaviour. Encouraging active commuting, fitness programs, and community engagement are crucial steps.

Conclusion

The increasing prevalence of sedentary lifestyles in Tamil Nadu has emerged as a significant contributor to the rising burden of diabetes. Research highlights that prolonged physical inactivity negatively affects metabolic health, leading to an increased risk of type 2 diabetes and associated complications.

Workplace dynamics, urban infrastructure, and societal behaviours collectively reinforce sedentary habits, making it imperative to adopt proactive intervention strategies.

Public health policies promoting physical activity, culturally tailored community programs, and educational initiatives have shown promise in mitigating the effects of sedentary behaviour. Efforts to integrate movement into daily routines, encourage active commuting, and improve workplace environments can play a crucial role in diabetes prevention and management. Additionally, awareness campaigns and digital health interventions can empower individuals to make informed lifestyle choices.

Addressing sedentary behaviour requires a "multi-sectoral approach" that combines policy-driven interventions with grassroots initiatives. By fostering an environment that prioritizes movement and healthy living, Tamil Nadu can effectively curb the impact of diabetes and improve the overall well-being of its population. Strengthening these efforts through continuous research and community engagement will ensure sustainable health outcomes in the long term.

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Nil.

Conflicts of Interest

None of the authors have any conflicts of interest to declare.

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