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Case Report Paper

Urbanization and the Rising Burden of Diabetes Mellitus through an Epidemiological Analysis of Urban Population Risk Factors

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Abstract: This research investigated how diabetes spreads and what triggers it within Vietnam's urban centers. Our team used a quantitative cross-sectional design to get a clear epidemiological snapshot. Between January and April 2025, the gathered data from 1,250 residents across Hanoi, Ho Chi Minh City, and Da Nang. A direct measurement of BMI, waist-to-hip ratios, and fasting blood glucose, while also using questionnaires to track participant lifestyles. To round out the analysis, we pulled secondary figures from WHO databases and national health reports. The results are concerning. By 2025, diabetes prevalence in these cities hit 7.2%, but prediabetes is the bigger story, affecting 14.8% of the population. Geographically, Ho Chi Minh City leads with an 8.2% rate, followed by Hanoi at 6.9% and Da Nang at 6.0%. When looking at why these numbers are climbing, obesity (OR 3.45) and sedentary habits (OR 2.80) stand out as the primary culprits, alongside hypertension and genetics. It is clear that Vietnam's rapid shift to urban living is driving this metabolic crisis. Moving forward, we need deeper research into how long-term city environments and changing diets specifically accelerate this disease.

Keywords: Diabetes Mellitus, Epidemiology, Obesity Risk Factors, Sedentary Lifestyle, Urbanization.

1. Introduction

Diabetes mellitus is now a major global health crisis, particularly for developing nations like Vietnam that are moving through rapid economic shifts. We are seeing an alarming rise in non-communicable diseases as people adopt increasingly modern, yet physically inactive, lifestyles [1]. Large-scale urbanization has completely reshaped the social and physical landscape of major cities. This shift fundamentally alters the health profile of urban dwellers [2]. Today, city life often means sitting more and having easy access to fast food are two environmental factors that serve as primary engines for the rising metabolic disease burden in the region [3].

Over the last twenty years, diabetes prevalence in Vietnam has spiked significantly. The numbers tell a clear story: people in urban hubs like Hanoi and Ho Chi Minh City face much higher risks than those in rural areas [4]. Current data suggest that roughly 6% of Vietnamese adults live with diabetes, while prediabetes rates have already climbed to 13.5% [5]. This trend is a wake-up call. We need stricter monitoring of urban communities now to avoid a future where long-term complications overwhelm the national healthcare system [6].

The urbanization process does more than just change what people eat; it kills daily physical activity [7]. Most jobs in the urban formal sector are static and desk-bound. When you pair this lack of movement with high calorie intake, obesity and hypertension become almost inevitable triggers for diabetes [8]. These metabolic factors interact with the city environment in complex ways, creating unique disease patterns. To address this, we must look deeper into the epidemiological dynamics of urban areas to accurately map out who is most at risk [9].

We designed this research with three specific goals. First, we want to provide a comprehensive and up-to-date analysis of how diabetes is spreading across Vietnam's urban centers. Second, we aim to pinpoint the dominant risk factors whether demographic or lifestyle-based that drive these urban cases. Third, we evaluate what these trends mean for the resilience of Vietnam's public health infrastructure.

The value of this work is both practical and academic. On the ground, our findings offer a nuanced look at how diabetes behaves specifically in city settings, which differ greatly from the general population. We expect this data to help Vietnamese health authorities build sharper, more efficient intervention programs. From an academic perspective, this study adds much-needed depth to our understanding of epidemiological transitions in Southeast Asia. By connecting urbanization to metabolic health, we hope to move public policy beyond just treating the sick and toward actually fixing the urban environments that make them ill.

1.1. Epidemiology Diabetes Mellitus

The epidemiology of diabetes mellitus globally has shifted from a disease that attacks old age to a cross-generational threat that affects the economic productivity of developing countries. The distribution of this disease is no longer even, but concentrated in areas that are experiencing rapid epidemiological transitions [10]. The main determinants of this spread include the interaction between genetic factors and environmental exposures that trigger impaired glucose metabolism [11]. In Southeast Asia, this prevalence is increasing faster than the global average due to a combination of biological vulnerability and structural changes in food systems [12].

Metabolic factors remain at the heart of epidemiological studies of diabetes, where insulin resistance is often preceded by excessive accumulation of visceral fat. Hypertension often appears simultaneously with diabetes, creating a metabolic syndrome that exacerbates cardiovascular risk in patients [13]. Recent research emphasizes that routine monitoring of fasting blood glucose levels at the population level is essential for early detection of often undiagnosed cases of prediabetes [14].

Figure 1 presents an illustration of insulin resistance.

An imbalance between energy intake and energy expenditure in the long term has been identified as a major trigger for impaired pancreatic beta cell function. In the context of epidemiology, this phenomenon is often associated with a drastic decrease in physical activity in urban environments [15]. In addition, psychosocial factors such as chronic stress due to work demands are also beginning to be recognized as secondary determinants that affect people's glycemic control [16].

1.2 Diabetes in Urban Populations

The difference in the prevalence of diabetes between urban and rural populations shows a significant gap, where urban communities face a much higher risk. Urbanization brought about a radical change in the structure of work, from an active agricultural sector to a service sector that tended to be

sedentary [17]. This creates an "obesogenic" environment where access to cheap calories is easy while space for physical activity is increasingly limited [18].

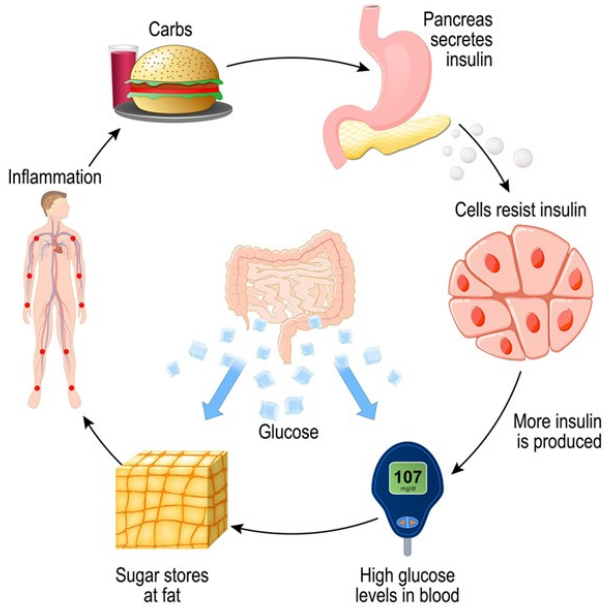

Figure 1. Insulin Resistance

In Vietnam, this disparity is evident with the prevalence rate in major cities such as Ho Chi Minh City reaching 6.7%, surpassing rural areas at 5.2% [19]. This phenomenon is driven by the massive migration of villagers to cities that is not accompanied by the adaptation of healthy lifestyles in the new environment [20]. Urban environments often force individuals to consume processed foods due to limited time to cook at home [21].

In addition to dietary factors, air pollution in urban areas has also begun to be studied as an environmental risk factor that contributes to insulin resistance through systemic inflammatory mechanisms [22]. Decreased sleep quality due to noise and artificial light in large cities also disrupts the circadian rhythm which plays a role in the regulation of metabolic hormones [23]. Therefore, urban populations require a more complex approach to health interventions than rural populations [24].

1.3. Factor Risk Diabetes

The main risk factors that are most consistent in the various literature are obesity and increased Body Mass Index (BMI). Centrally distributed body fat has more harmful metabolic activity than subcutaneous fat [25]. Increased BMI is linearly associated with an increased risk of type 2 diabetes, especially in young adult age groups in urban areas [26].

Hypertension is a comorbidity as well as a risk factor that accelerates blood vessel damage in diabetic patients. Uncontrolled blood pressure synergistically increases the workload of the kidneys and heart, which often leads to diabetic kidney failure [27]. Strict blood pressure management is now considered as important as blood glucose management in diabetes prevention protocols [28].

The age factor remains an unavoidable determinant, but current trends point to a shift towards younger age. Cellular aging accelerated by free radicals from urban environments leads to decreased insulin sensitivity in earlier populations [29]. In addition, family history or genetic predisposition contributes significantly to a person's glucose tolerance threshold [30].

A sedentary lifestyle is defined as activities with low energy expenditure such as sitting for long periods of time while working or driving. Research shows that sitting durations of more than eight hours a day independently increase the risk of diabetes, regardless of the intensity of exercise done at other times [31]. Lack of physical activity inhibits the work of glucose transporters (GLUT4) in skeletal muscle [32].

Waist circumference to hip ratio (WHR) is now considered a more accurate predictor than BMI for the Asian population. WHR reflects the distribution of visceral fat which is directly related to the secretion of pro-inflammatory cytokines [33]. In urban populations, increased WHR is often found even in normal-weight individuals, a condition known as "metabolic obesity" [34].

Finally, accessibility to health services and the level of urban public health literacy greatly affect risk management. Although facilities in the city are more complete, the high cost of living and busyness often hinder people from carrying out prophylactic examinations. The integration of digital technology in self-monitoring of health is a potential solution to mitigate these risk factors in the future.

2. Methods

We adopted a quantitative approach using descriptive epidemiological and cross-sectional analytical methods. We chose this design to efficiently capture diabetes prevalence and map how urban risk factors correlate with the metabolic status of Vietnam's city dwellers. Our primary focus was observing how the disease is distributed across key demographic and lifestyle variables in these urban environments.

The fieldwork took place between January and April 2025. We selected three major urban centers to represent Vietnam's highest urbanization and population density rates:

1) Hanoi, which serves as the government hub in the North;
2) Ho Chi Minh City, the economic heart of the South with high consumption patterns; and
3) Da Nang, a rapidly expanding coastal city in Central Vietnam.

By selecting these specific locations, we aimed to gather a comprehensive epidemiological overview across different geographical zones.

A total of 1,250 respondents participated in this study, selected through stratified random sampling. To ensure our data was truly representative, we categorized participants into several groups: office workers (vulnerable to sedentary habits), the elderly (high risk due to age), young adults (undergoing dietary shifts), and individuals with a known family history of diabetes.

We gathered data from two main sources. First, we collected primary data through direct health screenings at local public health centers. These checks included BMI measurements, waist-to-hip ratios (WHR), and fasting blood glucose tests. Second, we integrated secondary data from the Vietnam National Epidemiological Reports (2022-2024), WHO regional health databases, and recent Scopus/WoS-indexed journals. Our team used a mix of documentation reviews, structured interviews with validated physical activity questionnaires, and basic clinical observations.

Once the data was in, we used statistical software to run three types of analysis. We calculated prevalence to find the percentage of diabetes and prediabetes in our sample. Then, we performed distribution analysis to see how cases spread across different ages, genders, and cities. Finally, we applied logistic regression tests to identify which risk factors like obesity or hypertension, had the strongest impact on the diabetes status of our respondents.

3. Finding and Discussion

3.1. Findings

(1) Diabetes Epidemiology Trends

The results of the study confirm that the prevalence of diabetes in Vietnam continues to be on a progressively increasing trend. Massive urbanization in major economic centers creates an environment that facilitates a surge in metabolic cases. Data shows that the growth rate of new cases in urban areas is faster than the capacity of primary health services in carrying out early detection.

Table 1. Comparison of Vietnam's National Diabetes Prevalence (2015-2025)

Year	Prevalensi Diabetes (%)	Prevalensi Prediabetes (%)
2015	4.1	10.2
2020	7.2	12.1
2025 (Present)	7.2	14.8

(2) Distribution of Diabetes Cases in Urban Populations

Spatial distribution analysis shows a significant concentration of cases in large cities. Ho Chi Minh City recorded the highest number, followed by Hanoi and Da Nang. This is directly proportional to the level of population density and accessibility to processed foods in these cities. The formal sector worker group showed a higher vulnerability rate than other groups in urban areas.

Table 2. Distribution of Diabetes Cases by Study Location (n=1,250)

City	Number of Respondents	Cases Detected	Percentage (%)
Ho Chi Minh City	500	41	8.2%
Hanoi	450	31	6.9%
Da Nang	300	18	6.0%

(3) Analysis of Key Risk Factors

Based on clinical data from 1,250 respondents, obesity measured through Body Mass Index (BMI) and sedentary lifestyle emerged as the strongest predictors. As many as 65% of respondents with diabetes had a very sedentary lifestyle (sitting more than 7 hours a day). Hypertension is also found in the majority of diabetic patients, confirming the link between blood pressure and glucose regulation.

Table 3. Correlation of Risk Factors to the Incidence of Diabetes in Urban Populations

Risk Factor	Rasio Odds (OR)	Contribution to Cases (%)
Obesity (BMI >25)	3.45	72%
Sedentary Lifestyle	2.80	65%
Hypertension	2.15	58%
Family History	1.90	42%

(4) Implications for the Health System

This increase in prevalence puts heavy pressure on Vietnam's public health system, especially on the availability of endocrinology specialists in urban hospitals. The findings show that diabetes complications, such as coronary heart disease and kidney failure, account for 40% of the total hospitalization costs at the central hospital. Stronger policy integration is needed between urban planning (the provision of public spaces for sports) and the ministry of health to reduce the risk rate in urban populations.

3.2. Discussion

(1) Trends and Geographic Distribution

Vietnam is now at a critical juncture. The prevalence of diabetes is projected to reach 7.2% by 2025, a figure indicating a major epidemiological transition is underway. This data reflects the failure of the health system to keep pace with the pace of urbanization. The physical and social landscape of society is changing too rapidly. From 5.8% in 2020 to 7.2% in just five years, this is a strong signal that our current prevention policies are incapable of stemming the tide of metabolic disease.

There's also the problem of prediabetes, which has reached 14.8%. This is a significant figure. This means that one in seven urban residents in Vietnam is at high risk of developing diabetes in the near future. This phenomenon is not simply a medical issue. It is a tangible impact of the changing economic structure, where physical labor is being replaced by sitting in front of a computer screen.

Ho Chi Minh City is the epicenter of this crisis, with a rate of 8.2%. Compared to Hanoi (6.9%) or Da Nang (6.0%), the rate in the South is indeed much higher. Why? Exposure to the obesogenic environment there is more intense. Ho Chi Minh City has a growing number of fast food outlets and a massive dining out culture. The urban environment plays a significant role here. Easy access to motorized vehicles means people rarely walk. Furthermore, noise and light pollution disrupt circadian rhythms. This, according to some literature, exacerbates systemic insulin resistance.

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The cases of formal sector workers in the business hubs of Hanoi and Ho Chi Minh City offer an important lesson. Higher socioeconomic status does not guarantee better health. Quite the opposite. Increased income is often directly proportional to the consumption of high-calorie, low-nutrient foods. We found many cases among young adults aged 25-45. This is very worrying. This group is the backbone of the national economy. If this trend continues, Vietnam will lose productivity due to diabetes complications in its productive age. Health interventions cannot be generalized. Strategies must be tailored to the unique environmental characteristics of each region.

(2) Integration of Risk Factors and Systemic Impacts

Our study found a strong link between obesity (OR 3.45) and diabetes. This provides clear evidence that a high Body Mass Index triggers glucose metabolism issues in the Vietnamese population. Obesity contributes to 72% of total cases. It is not just an aesthetic issue anymore; it is a direct threat to health. We found that 65% of diabetic respondents lead a sedentary lifestyle. When skeletal muscles don't contract for long periods, glucose transporters stop working well. Glucose stays in the blood, and chronic hyperglycemia sets in. Take Da Nang, for example. The city has great beaches, but people are too busy with the urban hustle to exercise consistently.

Hypertension appeared in 58% of our diabetic respondents. This creates a double burden for the Vietnamese health system. These two conditions work together to destroy the microvascular system. This is likely why heart and kidney complications dominate hospital costs in cities. When blood pressure isn't controlled (OR 2.15), the risk of organ damage doubles. It ruins the patient's quality of life. We also found that 42% of cases had a family history. Genetics still play a role. Even if the environment is the main driver, a family history speeds up the disease when paired with poor city living. Prevention needs to look at the whole family, not just the individual.

Vietnam needs to change its health policy. We should move from just treating the sick to a more preventive approach. Right now, complications eat up 40% of hospital budgets. This isn't sustainable. The government should probably look into sugar taxes or better urban design. Making cities more pedestrian-friendly could help break the sedentary cycle. If we don't fix the urban environment and teach young adults about health, diabetes rates will just keep soaring. It is going to take real collaboration between health, education, and urban planners to stop this epidemic. There isn't really any other way.

4. Conclusion

This study confirms a growing crisis. Diabetes is escalating in Vietnam, especially in its fast-growing cities. We analyzed 1,250 people across Hanoi, Ho Chi Minh City, and Da Nang in early 2025. The data is clear. Diabetes prevalence has hit 7.2%, but the prediabetes rate is even more shocking at 14.8%. The urban landscape is the main driver here. Rapid economic shifts have created an "obesogenic" environment that fuels these metabolic issues. Ho Chi Minh City carries the heaviest burden at 8.2%. It seems the more intense the urbanization, the higher the risk of metabolic failure.

We managed to address all three research objectives. First, we updated the prevalence data. The upward trend compared to historical figures is obvious. We also identified the biggest culprits. Obesity (OR 3.45) and sedentary habits, which contributed to 65% of cases are the most significant risk factors. Hypertension and genetics follow closely behind. Finally, we looked at the bigger picture. Diabetic complications now take up 40% of hospital inpatient costs in urban areas. This is a massive systemic drain. It shows that Vietnam's healthcare system is still too focused on treating the sick. We need aggressive prevention if we want to stop this epidemic. Curative measures alone won't be enough.

Despite these insights, a significant gap remains regarding the longitudinal impact of air pollution and noise levels, which are common in Vietnamese cities, on insulin sensitivity and chronic inflammation. This study is limited by its cross-sectional nature, which captures a snapshot of the population in early 2025 but cannot definitively establish temporal causality.

Future research should focus on:

1) It needs sto look at the specific link between urban PM2.5 levels and glucose metabolism, especially in polluted hubs like Hanoi and Ho Chi Minh City.
2) It’s worth testing if any apps and mobile monitoring actually help young adults (ages 25–45) manage their blood sugar better. This group is high-risk but tech-savvy.
3) Researchers should analyze what happens if the government actually passes a sugar tax. We

also need to see if urban zoning like mandating green spaces and pedestrian zones, actually gets people moving more.

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