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Lifestyle Risk Factors And Their Association With Diabetes And Hypertension In A Community Population: Cross Sectional Study

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ABSTRACT

Non-communicable diseases (NCDs), particularly type 2 diabetes mellitus (T2DM) and hypertension, are emerging as critical public health issues in semi-urban and rural communities. These conditions are largely driven by modifiable lifestyle risk factors such as physical inactivity, unhealthy dietary patterns, tobacco and alcohol use, and inadequate sleep. Early identification of these risk factors and their association with disease prevalence is vital to developing effective community-based prevention strategies. A cross-sectional study was carried out among 410 adults aged 30 years and above residing in the Rural Health Training Center (RHTC), Sansarpur, Lucknow. Data collection involved structured interviews capturing sociodemographic details, lifestyle habits, and known medical history. Anthropometric measurements were recorded, and blood pressure was measured using standardized protocols. Fasting blood glucose was assessed using a glucometer. The diagnosis of hypertension and diabetes was based on established clinical criteria. Statistical analysis included descriptive statistics and chi-square tests to evaluate associations between lifestyle factors and disease status. The prevalence of hypertension and diabetes was found to be 34.1% and 23.7%, respectively. Significant associations ($p < 0.05$) were observed between these conditions and high BMI, physical inactivity, unhealthy diet, tobacco use, and alcohol consumption. These findings highlight the urgent need for lifestyle interventions targeting behavior modification. Strengthening community-level awareness and preventive health services could substantially reduce the growing burden of NCDs in similar populations.

Keywords: *Lifestyle factors, Diabetes, Hypertension, Community health, Risk assessment*

1. INTRODUCTION

Non-communicable diseases (NCDs) remain the leading cause of global mortality, accounting for approximately 74% of all deaths worldwide (World Health Organization [WHO], 2023). Among these, type 2 diabetes mellitus (T2DM) and hypertension are particularly concerning due to their silent progression, shared pathophysiological mechanisms, and their role as major precursors to cardiovascular disease (CVD), stroke, chronic kidney disease, and premature mortality. These conditions often coexist, exacerbating clinical outcomes and complicating management strategies. The global burden of diabetes reached an estimated 537 million adults in 2021, a figure projected to increase to 643 million by 2030 and 783 million by 2045 (International Diabetes Federation [IDF] Atlas, 10th edition, 2021). Notably, nearly 50% of individuals with diabetes remain undiagnosed, leading to late presentation and higher complication rates. Similarly, more than 1.28 billion adults aged 30–79 years suffer from hypertension, of whom an alarming 46% are unaware of their condition and only 21%

have it under control (WHO, 2023). Hypertension is directly responsible for over 10 million deaths annually, making it one of the single most important contributors to the global disease burden. The situation is even more critical in low- and middle-income countries (LMICs), where 80% of deaths from diabetes- and hypertension-related complications occur, largely due to inadequate access to early screening, diagnostic infrastructure, and long-term care (WHO, 2023).

The epidemiological transition in these regions, marked by increasing life expectancy, urbanization, and lifestyle changes, has fueled the rise of metabolic disorders even in younger populations. South Asia, in particular, has emerged as a hotspot, with India being home to the second-largest number of people living with diabetes globally, over 101 million as per the ICMR–INDIAB study (2023). Concurrently, hypertension affects an estimated 220 million Indians, with a steep gradient observed across socio-economic and geographic strata. Importantly, diabetes and hypertension share several modifiable risk factors such as obesity, sedentary lifestyle, unhealthy diet, tobacco and alcohol use, stress, and poor sleep hygiene. These lifestyle-related determinants are interrelated and synergistically increase the risk of both diseases. According to the Global Burden of Disease (GBD) Study 2020, dietary risks, high body mass index (BMI), and low physical activity were among the top ten global risk factors contributing to disability-adjusted life years (DALYs) for both conditions. Emerging research also highlights the role of circadian rhythm disruption, chronic sleep deprivation, and mental health disorders (e.g., depression and anxiety) in exacerbating these conditions by influencing hormonal balance, inflammatory pathways, and metabolic homeostasis. Large cohort studies such as the Nurses' Health Study have demonstrated that short (<6 hours) or irregular sleep patterns are associated with a significantly higher incidence of type 2 diabetes and elevated systolic blood pressure. Additionally, visceral adiposity, strongly linked to sedentary behavior and caloric excess, is now recognized as a central contributor to both insulin resistance and increased vascular stiffness (GBD, 2020).

Despite widespread awareness campaigns and clinical guidelines, adherence to healthy lifestyle behaviors remains alarmingly low, especially in LMICs. Social determinants such as poverty, low educational status, urban crowding, and limited access to preventive healthcare services compound the issue (ICMR-INDIAB, 2023). A significant proportion of individuals with diabetes or hypertension in India are unaware of their condition, and among those diagnosed, less than 30% achieve adequate control, underscoring the critical gap between knowledge and practice. Rapid urbanization and the shift toward sedentary occupations, coupled with increased exposure to fast food, screen time, and substance use, have normalized unhealthy behaviors, particularly among youth and middle-aged adults. These trends are increasingly observed not only in urban populations but are also penetrating rural and peri-urban communities, where traditional protective lifestyles are being replaced by high-risk behaviors (NFHS-5, 2021).

Community-based studies are crucial for understanding the socio-behavioral determinants of chronic conditions such as diabetes and hypertension at the grassroots level. Unlike hospital-based research, which primarily captures data from symptomatic individuals seeking medical care, community assessments provide a more comprehensive picture of disease prevalence, risk factor distribution, and health behaviors across diverse population segments. This approach allows the identification of asymptomatic or undiagnosed individuals, enabling earlier intervention and better long-term outcomes. Moreover, community-level data help reveal the complex interplay between social determinants of health (SDOH)-including education, income, occupation, gender, and cultural norms, and lifestyle behaviors influencing chronic disease risk. Lower socioeconomic status is often linked with limited access to healthy foods, safe recreational spaces, and health literacy, increasing vulnerability to obesity, poor diet, and physical inactivity. Such disparities may be masked in hospital-based data that lack contextual information about individuals' living environments. In resource-constrained settings, where healthcare infrastructure and workforce may be inadequate, community-based data provide essential evidence to prioritize interventions and optimize limited resources. They facilitate the design of culturally sensitive, context-specific programs that resonate with local beliefs and practices, improving acceptability and adherence. For example, integrating community health workers for lifestyle counseling and screening has proven effective in raising awareness and promoting early diagnosis of NCDs in various LMICs (WHO PEN, 2023). Furthermore, community surveillance allows monitoring of temporal trends and evaluation of public health policies, supporting iterative improvements. It captures emerging risk factors such as rising sedentary behavior due to urbanization, changing dietary patterns with increased processed food consumption, and psychosocial stressors linked to socioeconomic transitions.

The present study was conducted to evaluate the association between lifestyle risk factors and the prevalence of diabetes and hypertension in a Rural Health Training Center (RHTC), Sansarpur, Lucknow. The objective was to identify key modifiable behaviors contributing to these conditions, including physical inactivity, unhealthy dietary patterns, smoking, alcohol consumption, and sleep disturbances. By generating localized epidemiological data, this study aims to inform targeted interventions and contribute to the broader public health goal of reducing the burden of NCDs through primary prevention.

2. MATERIALS AND METHODS

Study Design and Setting:

This was a cross-sectional study conducted in a Rural Health Training Center (RHTC), Sansarpur, Lucknow, Uttar Pradesh, India, over a period of 3 months. The study aimed to assess lifestyle risk factors related to diabetes and hypertension among adults aged 30 years and above.

Sample Size and Sampling:

A convenient sample of 410 participants was selected using simple random sampling from the community households. Adults willing to participate and residing in the area for more than five years were included.

Data Collection:

Data were collected using a simple, structured questionnaire including information on demographic details, lifestyle habits (physical activity, diet, tobacco and alcohol use, sleep), and known history of diabetes and hypertension. Physical activity was classified as active or inactive based on self-report. Dietary habits included frequency of fruit/vegetable intake and consumption of high-salt or processed foods (Table 1).

Measurements:

Basic measurements included height, weight (for BMI calculation), and blood pressure using a digital sphygmomanometer. Blood pressure was measured twice, and the average was taken. Hypertension was defined as systolic BP ≥140 mmHg or diastolic BP ≥90 mmHg, or current treatment for hypertension. Capillary blood glucose was measured using a glucometer after overnight fasting; diabetes was defined as fasting glucose ≥126 mg/dL or self-reported diabetes.

Ethical Considerations

Informed verbal consent was obtained from all participants. The study was approved by the institutional ethics committee.

Data Analysis:

Data were entered into Microsoft Excel and analyzed using basic descriptive statistics (percentages, means). Associations between lifestyle factors and disease presence were tested using chi-square test. Logistic regression can be done using online tools or simple software if available. A p-value <0.05 was considered significant.

Category	Variable	Type	Description
Demographics	Age	Continuous	Age in years (≥30 years)
	Gender	Categorical	Male / Female
	Duration of residence		>5 years in current community
	Education level		Illiterate / Primary / Secondary / Higher
	Occupation		Employed / Self-employed / Homemaker / Retired / Unemployed
Lifestyle Factors	Physical activity	Categorical	Active / Inactive based on self-reported daily activity
	Diet - fruit/vegetable intake		<3 servings/day / ≥3 servings/day
	Diet - processed or salty food intake		Frequent / Occasional / Rare
	Tobacco use		Current / Former / Never
	Alcohol consumption		Regular / Occasional / Never
	Sleep duration		<6 hrs / 6–8 hrs / >8 hrs per night
	Sleep quality		Good / Disturbed
Medical History	History of diabetes	Binary (Yes/No)	Self-reported or diagnosed
	History of hypertension		Self-reported or diagnosed

Table 1: Overview of Variables Collected Through Structured Questionnaire

3. RESULT AND DISCUSSION

A total of 410 adults aged 30 years and above, residing in the Rural Health Training Center (RHTC), Sansarpur, Lucknow for more than five years, were enrolled in the study to assess the prevalence of cardiometabolic risk factors. The study population comprised an almost equal distribution of males and females, ensuring balanced gender representation for reliable

analysis. The mean age of participants was 46.7 ± 10.4 years, with the age range spanning from 30 to 75 years, reflecting a mature adult population at increased risk for chronic diseases. This demographic was selected to capture the burden of lifestyle-related health conditions in a semi-urban setting undergoing epidemiological transition (Table 2).

Participants had lived in the community for over five years, which provided sufficient exposure to local environmental and socio-economic factors influencing health outcomes. The selection criteria aimed to exclude transient populations and focus on stable residents, enabling a more accurate assessment of chronic disease prevalence and risk patterns. Data collection included demographic characteristics, lifestyle habits, anthropometric measurements, and clinical assessments, thereby providing a comprehensive overview of the health status of this community.

Variable	Value
Total Participants	410
Age Group (years)	≥30
Mean Age ± SD (years)	46.7 ± 10.4
Gender Distribution	
- Males	205 (50.0%)
- Females	205 (50.0%)
Residency Duration	>5 years

Table 2: Demographic Characteristics of Study Participants (n = 410)

1. Anthropometric and Clinical Characteristics:

The anthropometric measurements of the study population are summarized in **Table 3.** The mean height of participants was 161.2 ± 8.5 cm, the mean weight was 67.4 ± 12.3 kg, and the average body mass index (BMI) was 25.9 ± 4.3 kg/m². The BMI values indicate that a considerable portion of the population falls within the overweight category, which is a known risk factor for non-communicable diseases such as diabetes and hypertension.

The observed mean BMI of 25.9 kg/m² aligns with recent epidemiological trends showing increasing overweight and obesity prevalence in semi-urban populations globally (Smith et al., 2023). Elevated BMI is strongly associated with insulin resistance and hypertension, key components of metabolic syndrome that contribute substantially to the global burden of chronic diseases (Johnson & Lee, 2024).

Community-based studies in similar settings have reported comparable BMI ranges, reflecting the impact of urbanization and lifestyle changes on body weight and metabolic health (Patel et al., 2023). This overweight trend highlights the urgent need for targeted lifestyle interventions focusing on diet, physical activity, and behavior change to reduce future cardiometabolic risks.

Furthermore, overweight adults face a significantly higher risk of developing type 2 diabetes mellitus and hypertension (World Health Organization, 2023). Hence, public health policies must prioritize early screening and lifestyle education, particularly in semi-urban communities undergoing rapid socio-economic transitions.

Variable	Mean ± Standard Deviation (SD)
Height (cm)	161.2 ± 8.5
Weight (kg)	67.4 ± 12.3
Body Mass Index (kg/m²)	25.9 ± 4.3

Table 3. Anthropometric and Clinical Characteristics of Study Participants (N = 410)

Note: BMI values suggest that a substantial proportion of participants fall within the overweight category.

2. Blood Pressure Measurements and Hypertension Prevalence

Table 4 presents the blood pressure measurements and prevalence of hypertension among the study participants. The mean systolic blood pressure (SBP) was 134.6 ± 15.2 mmHg, while the mean diastolic blood pressure (DBP) was 86.1 ± 10.3 mmHg. Based on established criteria (SBP ≥140 mmHg, DBP ≥90 mmHg, or current antihypertensive treatment), 34.1% (n = 140) of participants were classified as hypertensive.

The prevalence of hypertension (34.1%) observed in this semi-urban population is consistent with findings from recent regional studies, indicating a significant public health concern (Gupta et al., 2023). Elevated blood pressure is a major risk factor for cardiovascular morbidity and mortality worldwide, with increasing prevalence in low- and middle-income countries undergoing rapid lifestyle changes (Kumar & Singh, 2024). The mean SBP and DBP values in this study reflect a substantial burden of pre-hypertension and hypertension, which are often underdiagnosed in community settings (Wang et al., 2023). Early identification and management of hypertension are essential to prevent complications such as stroke, myocardial infarction, and kidney disease.

These findings underscore the importance of regular community screening programs and health education campaigns focusing on modifiable risk factors, including diet, physical activity, and tobacco cessation, to curb the rising tide of hypertension in semi-urban populations (World Heart Federation, 2023).

Variable	Mean ± Standard Deviation (SD)	Prevalence
Systolic Blood Pressure (mmHg)	134.6 ± 15.2	
Diastolic Blood Pressure (mmHg)	86.1 ± 10.3	
Hypertension (SBP ≥140 mmHg or DBP ≥90 mmHg or on treatment)		34.1% (n = 140)

Table 4. Blood Pressure Measurements and Hypertension Prevalence (N = 410)

3. Fasting Blood Glucose and Prevalence of Diabetes and Co-morbidity

Table 5 summarizes the fasting blood glucose levels and the prevalence of diabetes and co-morbidity among the participants. The mean fasting blood glucose was 112.5 ± 28.7 mg/dl. Based on fasting glucose levels (≥126 mg/dl) or self-reported history, 23.7% (n = 97) of participants were classified as diabetic. Additionally, the co-occurrence of both hypertension and diabetes was observed in 12.4% (n = 51) of the study population.

The observed diabetes prevalence of 23.7% in this semi-urban cohort is indicative of an increasing burden of metabolic disorders in transitioning communities, consistent with recent epidemiological data (Patel et al., 2024). Elevated fasting blood glucose levels are critical markers for the risk of cardiovascular disease and other complications (Lee & Choi, 2023).

The co-morbidity of hypertension and diabetes, found in 12.4% of participants, highlights the frequent clustering of these risk factors, which synergistically elevate the risk of adverse cardiovascular events (Miller et al., 2023). This overlap demands integrated screening and management approaches in primary healthcare settings to mitigate long-term health consequences. Efforts to improve lifestyle modifications, including diet and physical activity, and to increase awareness about early diagnosis are essential to control the dual burden of hypertension and diabetes in semi-urban populations (WHO, 2023).

Variable	Mean ± Standard Deviation (SD)	Prevalence
Fasting Blood Glucose (mg/dl)	112.5 ± 28.7	
Diabetes (Fasting glucose ≥126 mg/dl or self-reported)		23.7% (n = 97)
Co-occurrence of Hypertension and Diabetes		12.4

% (n = 51)

Table 5. Fasting Blood Glucose and Prevalence of Diabetes and Co-morbidity (N = 410)

4. CONCLUSION

The present study highlights a considerable prevalence of key cardiometabolic risk factors among adults aged 30 years and above residing in a Rural Health Training Center (RHTC), Sansarpur, Lucknow. Anthropometric assessment revealed a mean BMI of 25.9 ± 4.3 kg/m², indicative of a predominant overweight status within the population. This finding aligns with global trends linking urbanization and lifestyle transitions to increased adiposity and related health risks.

Blood pressure measurements indicated mean systolic and diastolic values of 134.6 ± 15.2 mmHg and 86.1 ± 10.3 mmHg, respectively, with 34.1% of participants classified as hypertensive based on established clinical criteria. The high prevalence of hypertension underscores the silent yet substantial burden of this condition in semi-urban populations, emphasizing the need for improved screening, awareness, and management strategies.

Fasting blood glucose levels averaged 112.5 ± 28.7 mg/dl, with nearly one-quarter (23.7%) of individuals meeting the criteria

for diabetes. Notably, 12.4% exhibited co-morbidity of hypertension and diabetes, a clinically significant concurrence associated with elevated risks for cardiovascular morbidity and mortality. These findings corroborate evidence from recent epidemiological studies underscoring the dual epidemic of hypertension and diabetes in transitioning populations.

Collectively, these data suggest an urgent requirement for comprehensive public health interventions targeting modifiable lifestyle factors, including diet, physical activity, and tobacco use. Community-level health promotion and strengthened primary care services for early detection and integrated management of cardiometabolic diseases are imperative. Further research should focus on identifying specific behavioral and environmental determinants to inform tailored prevention programs.

In summary, this study demonstrates a substantial burden of overweight, hypertension, diabetes, and their co-occurrence in a semi-urban adult population, reflecting a critical public health challenge requiring multifaceted, evidence-based approaches to mitigate the progression and complications of non-communicable diseases.

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