



ASSESSMENT OF LIFESTYLE RISK FACTORS AND THEIR ASSOCIATION WITH NON-COMMUNICABLE DISEASES AMONG ADULTS IN RURAL AND URBAN COMMUNITIES: A COMPARATIVE CROSS-SECTIONAL STUDY

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Abstract

Background:

Non-communicable diseases (NCDs), including hypertension, diabetes mellitus, cardiovascular diseases, chronic respiratory disorders, and obesity, are among the leading causes of morbidity and mortality worldwide. Lifestyle-related risk factors such as tobacco use, unhealthy dietary habits, physical inactivity, excessive alcohol consumption, and chronic stress significantly contribute to the development and progression of NCDs. Rapid urbanization, socioeconomic transitions, and changing behavioral patterns have influenced the prevalence of these risk factors in both rural and urban populations. Understanding the distribution of lifestyle risk factors and their association with NCDs is essential for planning effective prevention and control strategies.

Objective:

To assess lifestyle risk factors among adults residing in rural and urban communities and to evaluate their association with the prevalence of non-communicable diseases.

Materials and Methods:

A comparative cross-sectional study was conducted among 400 adults aged 18 years and above, comprising 200 participants each from rural and urban communities. Participants were selected through multistage random sampling. Data were collected using a structured and pre-tested questionnaire covering socio-demographic characteristics, tobacco and alcohol use, dietary habits, physical activity levels, sleep patterns, and stress-related factors. Anthropometric measurements and blood pressure assessments were performed. Information regarding diagnosed NCDs was obtained through self-reports and available medical records. Statistical analyses included descriptive statistics, chi-square tests, and multivariable logistic regression to determine associations between lifestyle factors and NCD prevalence.

Results:

The prevalence of at least one non-communicable disease was significantly higher in urban participants (38.5%) compared to rural participants (27.0%) ($p < 0.05$). Physical inactivity (46.5% vs. 28.0%), obesity (24.0% vs. 13.5%), and frequent consumption of processed foods (42.5% vs. 18.0%) were more common among urban residents. Tobacco use was higher among rural participants (31.0% vs. 22.5%). Hypertension and diabetes mellitus were significantly associated with obesity, physical inactivity, unhealthy dietary habits, and tobacco use ($p < 0.05$). Logistic

regression analysis identified obesity, sedentary lifestyle, and tobacco consumption as independent predictors of NCD occurrence.

Conclusion:

Lifestyle-related risk factors are highly prevalent among both rural and urban populations, with notable differences in their distribution. Urban residents exhibited higher levels of physical inactivity and obesity, while tobacco use was more prevalent in rural areas. Targeted community-based interventions promoting healthy lifestyles, regular screening, and risk factor modification are essential to reduce the burden of non-communicable diseases.

Keywords: Non-communicable diseases, Lifestyle risk factors, Rural population, Urban population, Hypertension, Diabetes mellitus, Physical inactivity, Public health.

Introduction

Non-communicable diseases (NCDs) have emerged as one of the most significant public health challenges of the twenty-first century. These diseases, primarily including cardiovascular diseases, diabetes mellitus, chronic respiratory diseases, cancer, and obesity-related disorders, account for a substantial proportion of global morbidity, mortality, and disability. According to the World Health Organization (WHO), NCDs are responsible for approximately 74% of all deaths worldwide, with a considerable burden occurring in low- and middle-income countries. The growing prevalence of NCDs poses serious social, economic, and healthcare challenges, making their prevention and control a global health priority.

The development of NCDs is closely linked to several modifiable lifestyle and behavioral risk factors. Tobacco use, harmful consumption of alcohol, unhealthy dietary habits, physical inactivity, obesity, inadequate sleep, and chronic psychological stress are recognized as major contributors to the onset and progression of these conditions. Unlike genetic and non-modifiable risk factors, lifestyle-related determinants can be modified through appropriate public health interventions, health education, and behavioral changes. Consequently, identifying and addressing these risk factors is essential for reducing the burden of NCDs and improving population health outcomes.

India is currently undergoing a rapid epidemiological transition characterized by a shift from communicable diseases to non-communicable diseases as leading causes of illness and death. Urbanization, industrialization, changing dietary patterns, technological advancements, and sedentary lifestyles have significantly influenced health behaviors across the country. While urban populations have traditionally been considered at greater risk for lifestyle-related diseases, recent evidence indicates that rural communities are also experiencing an increasing prevalence of NCDs due to changing socioeconomic conditions and adoption of unhealthy lifestyle practices.

Differences in living environments, occupational patterns, access to healthcare, educational status, and socioeconomic conditions contribute to variations in lifestyle risk factors between rural and urban populations. Urban residents often exhibit higher levels of physical inactivity, obesity, consumption of processed foods, and stress-related disorders. In contrast, rural populations may have higher rates of tobacco use, delayed healthcare-seeking behavior, and limited access to preventive healthcare services. Understanding these differences is important for developing targeted interventions that address the unique health challenges faced by each population group.

Several studies have demonstrated a strong association between lifestyle risk factors and the occurrence of NCDs. Physical inactivity has been linked to obesity, hypertension, and cardiovascular diseases, while unhealthy dietary practices contribute to metabolic disorders and diabetes mellitus. Tobacco use remains a major risk factor for cardiovascular diseases, chronic respiratory disorders, and several forms of cancer. Similarly, excessive alcohol consumption and chronic stress have been associated with adverse health outcomes and increased disease risk. Despite growing awareness of these associations, the prevalence of unhealthy lifestyle behaviors remains high in many communities.

Comparative assessments of rural and urban populations provide valuable information regarding the

distribution of lifestyle risk factors and their impact on disease occurrence. Such studies help identify vulnerable groups, evaluate existing health disparities, and support evidence-based public health planning. Furthermore, understanding the relationship between lifestyle behaviors and NCD prevalence can guide policymakers in designing effective prevention strategies, promoting healthy living, and strengthening community-based healthcare programs.

In view of the increasing burden of non-communicable diseases and the rising prevalence of unhealthy lifestyle behaviors, the present study was undertaken to assess lifestyle risk factors among adults residing in rural and urban communities and to examine their association with non-communicable diseases. The findings of this study are expected to contribute to the development of targeted interventions aimed at reducing lifestyle-related health risks and improving community health outcomes.

Materials and Methods Study Design and Setting

A community-based, comparative cross-sectional study was conducted to assess lifestyle risk factors and their association with non-communicable diseases (NCDs) among adults residing in rural and urban communities. The study was carried out over a period of six months from January 2025 to June 2025 in selected rural and urban field practice areas attached to the Department of Community Medicine of a tertiary care teaching institution.

Study Population

The study population comprised adults aged 18 years and above residing in the selected rural and urban communities. Individuals who had been living in the study area for at least one year were considered eligible for participation.

Inclusion Criteria

- Adults aged ≥ 18 years.
- Permanent residents of the selected rural or urban community for at least one year.
- Individuals willing to participate and provide informed consent.

Exclusion Criteria

- Pregnant women.
- Individuals with severe physical or mental illness preventing participation.
- Visitors and temporary residents.
- Participants unwilling to provide informed consent.

Sample Size

The sample size was determined using the formula for cross-sectional studies: [

$$n = \frac{Z^2 pq}{d^2}$$

]

Assuming a prevalence of lifestyle-related risk factors of 50%, a confidence level of 95%, and an allowable error of 5%, the calculated sample size was approximately 384. To improve representativeness and account for non-response, a total of **400 participants** were included in the study.

The participants were equally distributed between:

- Rural community: 200 participants
- Urban community: 200 participants

Sampling Technique

A multistage random sampling technique was employed.

Stage 1: Selection of Study Areas

One rural and one urban field practice area were selected randomly from the areas covered by the

institution.

Stage 2: Selection of Households

Households within each selected area were chosen using systematic random sampling.

Stage 3: Selection of Participants

One eligible adult participant was selected from each household using a simple random sampling method. If more than one eligible individual was available, one participant was selected through the lottery method.

Data Collection Tool

Data were collected using a pre-tested and structured questionnaire developed after an extensive review of relevant literature and WHO STEPwise guidelines for NCD risk factor surveillance.

The questionnaire consisted of the following sections:

Section A: Socio-Demographic Characteristics

- Age
 - Gender
 - Educational status
 - Occupation
 - Marital status
 - Family income
 - Socioeconomic status
- #### **Section B: Lifestyle Risk Factors**
- Information regarding:
- Tobacco consumption (smoking and smokeless forms)
 - Alcohol consumption
 - Dietary habits
 - Fruit and vegetable intake
 - Consumption of processed and fast foods
 - Salt intake
 - Physical activity levels
 - Sleep duration
 - Stress levels

Section C: Medical History

Information on:

- Hypertension
- Diabetes mellitus
- Cardiovascular diseases
- Chronic respiratory diseases
- Obesity and other diagnosed NCDs

Section D: Anthropometric and Clinical Measurements

Measurements included:

- Height (cm)
 - Weight (kg)
 - Body Mass Index (BMI)
 - Waist circumference (cm)
 - Blood pressure (mmHg)
- #### **Operational Definitions Physical Inactivity**

Participants performing less than 150 minutes of moderate-intensity physical activity per week were classified as physically inactive according to WHO recommendations.

Obesity

Obesity was defined as Body Mass Index (BMI) ≥ 25 kg/m² according to Asian Indian guidelines.

Tobacco User

Individuals currently using smoking or smokeless tobacco products at least once daily or regularly during the previous six months.

Alcohol Consumer

Participants consuming alcoholic beverages at least once per week during the preceding six months.

Non-Communicable Disease

Participants diagnosed by a registered medical practitioner with hypertension, diabetes mellitus, cardiovascular disease, chronic respiratory disease, or other chronic NCDs.

Data Collection Procedure

Data were collected through face-to-face interviews conducted by trained investigators. Anthropometric measurements were recorded using standardized equipment.

- Height was measured using a stadiometer.
- Weight was measured using a calibrated digital weighing scale.
- BMI was calculated as weight (kg)/height² (m²).
- Blood pressure was measured using a standardized digital sphygmomanometer after a minimum of five minutes of rest.

Participants diagnosed with elevated blood pressure or other abnormal findings were advised to seek medical consultation.

Study Variables Dependent Variable

- Presence or absence of non-communicable diseases.

Independent Variables

- Age
- Gender
- Educational status
- Socioeconomic status
- Tobacco use
- Alcohol consumption
- Dietary habits
- Physical activity
- Body Mass Index
- Sleep duration
- Stress levels

Statistical Analysis

The collected data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) version 26.0.

The following statistical methods were employed:

- Descriptive statistics (mean, standard deviation, frequency, and percentage)
- Chi-square test to assess associations between categorical variables
- Independent sample t-test for comparison of continuous variables between rural and urban groups
- Multivariable logistic regression analysis to identify independent predictors of NCDs

Odds ratios (OR) with 95% confidence intervals (CI) were calculated. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee before commencement of the study. Written informed consent was obtained from all participants after explaining the objectives and procedures of the study. Confidentiality and anonymity of participant information were strictly maintained throughout the study. Participation was voluntary, and respondents were free to withdraw from the study at any stage without any consequences.

Results

A total of **400 adults** participated in the study, comprising **200 participants from rural communities** and **200 participants from urban communities**. The study evaluated the prevalence of lifestyle-related risk factors and their association with non-communicable diseases (NCDs).

Table 1. Socio-Demographic Characteristics of Participants (N = 400)			
Variable	Rural (n=200) Urban (n=200) Total (%)		
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Age Group (Years)			
18–30	58	52	27.5
31–45	72	76	37.0
46–60	48	50	24.5
>60	22	22	11.0
Gender			
Male	112	108	55.0
Female	88	92	45.0
Education (Graduate and Above)	64	96	40.0

The majority of participants belonged to the 31–45 years age group (37.0%), with males accounting for 55.0% of the study population.

Prevalence of Lifestyle Risk Factors

Table 2. Distribution of Lifestyle Risk Factors Among Rural and Urban Participants

Risk Factor	Rural n (%)	Urban n (%)	p-value
Tobacco Use	62 (31.0)	45 (22.5)	0.048*
Alcohol Consumption	38 (19.0)	52 (26.0)	0.087
Physical Inactivity	56 (28.0)	93 (46.5)	<0.001*
Obesity (BMI $\geq$ 25 kg/m ²)	27 (13.5)	48 (24.0)	0.006*
Inadequate Fruit and Vegetable Intake	118 (59.0)	126 (63.0)	0.412
Processed/Fast Food Consumption	36 (18.0)	85 (42.5)	<0.001*
High Perceived Stress	42 (21.0)	74 (37.0)	<0.001*
Inadequate Sleep (<7 hours/day)	51 (25.5)	69 (34.5)	0.041*

*Statistically significant ($p < 0.05$)

Urban participants exhibited significantly higher levels of physical inactivity, obesity, processed food consumption, stress, and inadequate sleep. Tobacco use was significantly more common among rural participants.

Prevalence of Non-Communicable Diseases

Table 3. Prevalence of NCDs Among Rural and Urban Participants

Disease	Rural n (%)	Urban n (%)	Total (%)
Hypertension	42 (21.0)	59 (29.5)	25.3

Diabetes Mellitus	26 (13.0)	41 (20.5)	16.8
Obesity	27 (13.5)	48 (24.0)	18.8
Cardiovascular Disease	11 (5.5)	18 (9.0)	7.3
Chronic Respiratory Disease	15 (7.5)	12 (6.0)	6.8
At Least One NCD	54 (27.0)	77 (38.5)	32.8

The prevalence of at least one NCD was significantly higher among urban participants (38.5%) compared to rural participants (27.0%) ($p < 0.05$).

Association Between Lifestyle Risk Factors and NCDs

Table 4. Association of Selected Lifestyle Factors with Presence of NCDs

Risk Factor	NCD Present (%)	NCD Absent (%)	p-value
Tobacco Use	46.7	25.4	<0.001*
Physical Inactivity	52.3	28.8	<0.001*
Risk Factor	NCD Present (%)	NCD Absent (%)	p-value
Obesity	61.3	14.5	<0.001*
Processed Food Consumption	48.9	24.2	<0.001*
High Stress Levels	44.2	22.7	0.002*
Inadequate Sleep	39.8	25.1	0.011*

*Statistically significant ($p < 0.05$)

Participants with obesity, physical inactivity, tobacco use, unhealthy dietary habits, stress, and inadequate sleep had significantly higher prevalence of NCDs.

Mean Clinical Parameters of Participants

Table 5. Comparison of Clinical Parameters Between Rural and Urban Groups

Parameter	Rural (Mean $\pm$ SD)	Urban (Mean $\pm$ SD)	p-value
BMI (kg/m ²)	23.1 $\pm$ 3.8	25.2 $\pm$ 4.2	<0.001*
Systolic BP (mmHg)	126.8 $\pm$ 14.5	131.9 $\pm$ 15.2	0.002*
Diastolic BP (mmHg)	81.7 $\pm$ 9.4	84.6 $\pm$ 10.1	0.008*

Urban participants demonstrated significantly higher BMI and blood pressure levels compared to rural participants.

Logistic Regression Analysis

Multivariable logistic regression analysis was performed to identify independent predictors of NCD occurrence.

Table 6. Independent Predictors of NCDs

Variable	Adjusted Odds Ratio (AOR)	95% CI	p-value
Obesity	3.82	2.11–6.94	<0.001*
Physical Inactivity	2.76	1.62–4.68	<0.001*
Tobacco Use	2.21	1.27–3.86	0.005*
High Stress Levels	1.94	1.11–3.37	0.019*
Processed Food Consumption	1.88	1.08–3.25	0.026*

*Statistically significant ($p < 0.05$)

Obesity emerged as the strongest predictor of NCDs, followed by physical inactivity, tobacco use, stress, and frequent consumption of processed foods.

Summary of Findings

The study revealed a substantial burden of lifestyle-related risk factors among both rural and urban populations. Urban residents exhibited significantly higher rates of physical inactivity, obesity, processed food consumption, stress, and inadequate sleep, whereas tobacco use was more prevalent among rural participants. The prevalence of NCDs was significantly greater in urban communities. Obesity, sedentary lifestyle, tobacco use, stress, and unhealthy dietary habits were identified as significant independent predictors of NCDs. These findings underscore the need for targeted lifestyle modification programs, community-based health promotion initiatives, and regular screening activities to reduce the growing burden of non-communicable diseases in both rural and urban settings.

Discussion

The present study assessed lifestyle-related risk factors and their association with non-communicable diseases (NCDs) among adults residing in rural and urban communities. The findings revealed a high prevalence of modifiable behavioral risk factors in both populations, with significant differences in their distribution between rural and urban settings. Furthermore, several lifestyle factors, including obesity, physical inactivity, tobacco use, stress, and unhealthy dietary habits, were found to be significantly associated with the occurrence of NCDs.

The prevalence of at least one NCD in the present study was 32.8%, with a significantly higher prevalence among urban participants (38.5%) compared to rural participants (27.0%). This finding is consistent with reports from the World Health Organization and various national surveys, which indicate that urban populations often experience a greater burden of NCDs due to sedentary lifestyles, dietary transitions, and increased exposure to environmental and psychosocial stressors. The ongoing epidemiological transition in developing countries, including India, has contributed to the rapid rise of NCDs in both urban and rural communities, although the burden remains comparatively higher in urban areas.

One of the most important findings of the study was the significantly higher prevalence of physical inactivity among urban residents. Nearly half of the urban participants reported inadequate physical activity compared to less than one-third of rural participants. Urbanization, mechanization, increased use of motorized transportation, and desk-based occupations may contribute to reduced physical activity levels. Previous studies have consistently demonstrated that sedentary lifestyles are associated with an increased risk of obesity, hypertension, cardiovascular diseases, and type 2 diabetes mellitus. The present findings support these observations and emphasize the importance of promoting regular physical activity as a preventive strategy against NCDs.

Obesity was significantly more prevalent among urban participants and emerged as the strongest independent predictor of NCDs in the logistic regression analysis. Obesity is a well-established risk factor for hypertension, diabetes mellitus, cardiovascular diseases, and metabolic syndrome. The higher prevalence of obesity observed in urban communities may be attributed to unhealthy dietary patterns, reduced physical activity, and increased consumption of calorie-dense processed foods. Similar findings have been reported in several Indian and international studies, highlighting obesity as a major public health concern requiring urgent intervention.

The study also demonstrated a significant association between unhealthy dietary habits and NCD prevalence. Frequent consumption of processed and fast foods was considerably higher among urban participants and was identified as an independent predictor of NCD occurrence. The nutritional transition characterized by increased intake of foods rich in saturated fats, refined carbohydrates, sugar, and salt has contributed significantly to the growing burden of chronic diseases worldwide. Dietary modification, therefore, remains a key component of NCD prevention and control strategies. Tobacco use was found to be significantly higher among rural participants and was strongly associated with NCD occurrence. Tobacco consumption remains one of the most important preventable causes of morbidity and mortality globally. It is a major risk factor for cardiovascular diseases, chronic respiratory disorders, stroke, and several forms of cancer. The higher prevalence of tobacco use in rural populations may be influenced by cultural practices, lower educational levels,

limited awareness regarding health risks, and easier accessibility of tobacco products. These findings underscore the need for strengthened tobacco control measures and targeted awareness campaigns in rural communities.

Psychological stress emerged as another significant determinant of NCDs in the present study. Urban participants reported higher levels of perceived stress compared to their rural counterparts. Increasing work-related pressures, social isolation, financial concerns, and lifestyle changes associated with urban living may contribute to elevated stress levels. Chronic stress has been linked to hypertension, metabolic disorders, cardiovascular diseases, and adverse health behaviors such as smoking and unhealthy eating. Therefore, stress management interventions should be integrated into comprehensive NCD prevention programs.

Inadequate sleep was also significantly associated with the presence of NCDs. Participants reporting less than seven hours of sleep per day exhibited higher rates of chronic diseases. Emerging evidence suggests that insufficient sleep contributes to metabolic dysregulation, obesity, insulin resistance, hypertension, and cardiovascular risk. Modern lifestyles, excessive screen exposure, occupational demands, and stress may negatively affect sleep quality and duration, particularly among urban populations.

The study further highlighted significant differences in clinical parameters between rural and urban participants. Urban residents exhibited higher mean body mass index (BMI), systolic blood pressure, and diastolic blood pressure compared to rural participants. These findings are indicative of an increased cardiometabolic risk profile among urban populations and are consistent with previous epidemiological studies conducted in India and other developing countries.

The identification of obesity, physical inactivity, tobacco use, stress, and unhealthy dietary practices as independent predictors of NCDs has important public health implications. Since these factors are largely modifiable, community-based interventions focusing on lifestyle modification can substantially reduce disease burden. Health promotion activities should emphasize regular physical activity, balanced nutrition, tobacco cessation, stress management, and routine health screening. Additionally, primary healthcare systems should strengthen preventive services and facilitate early identification of individuals at risk.

Limitations of the Study

The present study has certain limitations. The cross-sectional design limits the ability to establish causal relationships between lifestyle factors and NCDs. Information regarding behavioral risk factors was obtained through self-reporting, which may be subject to recall and reporting bias. Additionally, the study was conducted in selected communities and may not fully represent the broader population. Longitudinal and multicentric studies involving larger sample sizes are recommended to further validate the findings.

Conclusion of Discussion

The study demonstrates that lifestyle-related risk factors are highly prevalent among both rural and urban adults, with urban populations showing a greater burden of obesity, physical inactivity, unhealthy dietary habits, and stress. These factors were significantly associated with the occurrence of non-communicable diseases. Obesity emerged as the strongest predictor of NCDs, followed by physical inactivity and tobacco use. The findings emphasize the need for targeted public health interventions, community awareness programs, lifestyle modification initiatives, and regular screening services to reduce the growing burden of NCDs and improve overall population health.

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