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PHYSIOLOGICAL RISK MARKERS FOR LIFESTYLE DISEASES IN URBAN YOUTH POPULATIONS

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Abstract

1. Introduction

Non-communicable diseases (NCDs) such as cardiovascular problems and diabetes mellitus, hypertension, and obesity have reached alarming proportions, especially among the young demographic population.[1] Once predominantly associated with aging populations, lifestyle-related diseases are now emerging earlier, reflecting profound shifts in societal behaviors, dietary patterns, and physical activity levels. The WHO (2023) estimates that over 70% of global deaths are attributable to NCDs, with a growing proportion occurring in individuals under the age of 30.[2] This demographic transition underscores the necessity of early identification and intervention strategies, particularly within urban environments where sedentary behavior, nutritional transitions, and psychosocial stressors are most prominent.

A key aspect of early detection lies in the monitoring of physiological risk markers, measurable indicators that can predict future disease outcomes. Markers such as elevated Body Mass Index (BMI), abnormal Waist-Hip Ratio (WHR), and hypertension serve as early warnings for developing chronic metabolic and cardiovascular conditions.[3] These parameters are not only cost-effective to assess but also highly relevant for community-based screening initiatives aimed at risk stratification and preventive health planning.

In adolescent and young adult populations, the presence of these risk markers is often overlooked due to the misconception that youth is inherently protective against chronic disease. However, emerging evidence from national surveys and cross-sectional studies in various urban regions reveals a troubling increase in the prevalence of these markers, indicating the onset of disease pathophysiology well before clinical symptoms manifest.[4] This silent progression not only predisposes individuals to lifelong morbidity but also exerts significant economic and social burdens on healthcare systems.

Moreover, the interplay between physiological indicators and modifiable lifestyle behaviors, such as dietary intake, physical inactivity, stress exposure, screen time, and tobacco use, suggests that early interventions targeting these behaviors can mitigate long-term risk.[5] The adolescent and young adult years represent a critical window during which behavioral patterns become established; thus, identifying vulnerable individuals within this age group provides an opportunity to alter disease trajectories at a broader level.

While national and international studies have extensively documented the rise in NCD risk factors among urban youth, regional disparities remain underexplored.[6] The Kashmir Valley, located in the northernmost region of India, presents a unique socio-cultural and environmental context that warrants focused investigation. Rapid urbanization has led to notable changes in lifestyle, characterized by increased consumption of energy-dense diets, reduced physical exertion, and rising mental health stressors associated with political uncertainty and conflict exposure.[7]

In this rapidly transitioning urban landscape, youth populations are particularly susceptible to the dual burden of nutritional transition and psychosocial instability. However, there is a paucity of region-specific epidemiological data examining the physiological and behavioral determinants of health among the participants. The limited studies that exist often lack biochemical assessment or are confined to small clinical samples, thereby failing to capture the broader public health implications. The urban youth of Kashmir are embedded within a socio-political ecosystem that adds complexity to conventional models of health behavior.

Furthermore, regional dietary practices marked by high carbohydrate intake and low vegetable or fiber consumption intersect with emerging fast-food trends to create a nutritional environment conducive to metabolic imbalance.[8]

Given these unique factors, the Kashmiri urban youth population represents an underrepresented but critical demographic in the national dialogue on NCD prevention. In this setting, an empirical understanding of physiological risk signals would not only close a critical research gap but also help guide targeted intervention programs and local health policy.

This study aims to conduct a comprehensive assessment of physiological risk markers indicative of lifestyle-related diseases among urban youth populations in the Kashmir Valley. By employing a cross-sectional community-based approach, the investigation seeks to establish baseline prevalence rates for clinical indicators such as BMI, WHR, and blood pressure. These objective markers will provide insight into the silent burden of disease in an age group often perceived as healthy.

The study will explore associations between physiological risk factors and modifiable lifestyle behaviors. Specific attention will be directed toward physical activity levels, dietary habits, screen time exposure, tobacco and alcohol use, and subjective stress perception. The correlation analysis will contribute to understanding the behavioral underpinnings of emerging health risks in this regional context.

The findings are expected to offer a foundation for policy development, particularly in the domains of school and college-based health programs, urban public health planning, and the design of youth-centric health literacy campaigns.

2. Materials and Methods

To assess the emerging burden of physiological and lifestyle-related risk factors among urban youth, a comprehensive epidemiological approach was employed. This study was designed to systematically capture biometric, behavioral, and biochemical parameters within a defined population exposed to rapid urbanization in the Kashmir Valley. A robust methodology integrating standardized clinical assessments, laboratory diagnostics, and validated survey instruments was applied to ensure scientific rigor and regional relevance. A schematic representation of the study's methodological components is shown in Figure 1.

Figure 1. An overview of the framework for study methodology

2.1 Study Design

A cross-sectional analysis, community-based observational study was performed to investigate the occurrence of physiological risk markers indicative of lifestyle diseases among youth residing in Kashmir. The study design facilitated the simultaneous assessment of clinical risk indicators and lifestyle behaviors within a defined demographic, enabling a population-level snapshot of emerging NCD burdens.

2.2 Study Setting and Population

The study was conducted in the department of physiology, GMC Srinagar, from February to July 25. The study population comprised youth aged 18 to 22 years who had resided in the selected urban wards for at least 12 months. This age group was targeted due to its increased susceptibility to behavioral risk factors and its potential for early physiological changes indicative of chronic disease development.

Inclusion Criteria

- Urban residents aged 18-22 years
- Capacity to provide informed consent or assent

Exclusion Criteria

- Diagnosed chronic illnesses (diabetes, thyroid disorders, cardiovascular disease)
- Ongoing medication that could influence metabolic or cardiovascular parameters
- Pregnant individuals or those with known endocrine abnormalities

A Simple random sampling approach was adopted. Initially, Participants were randomly selected among students of the college. A total of 352 individuals participated in the study, resulting in a 97.8% response rate.

2.3 Data Collection Tools and Protocols

Clinical exams and structured interviews were used to gather data.

2.3.1 Sociodemographic and Lifestyle Assessment

A modified WHO STEPS questionnaire, pre-tested for regional relevance, was used to document:

- Age, gender, education level, household income
- Physical activity levels (hours/week of moderate-to-vigorous activity)
- Dietary intake patterns (frequency of fruit, vegetable, fast food, and sugary beverage consumption)
- Daily screen time exposure
- Tobacco and alcohol use
- Stress perception using the Perceived Stress Scale (PSS-10)

2.3.2 Anthropometric and Physiological Measures

Standardized anthropometric and physiological assessments were conducted:

- Height was measured using a stadiometer to the nearest 0.1 cm.
- Weight was recorded using a calibrated digital scale to the nearest 0.1 kg.
- BMI was computed as weight (kg)/height² (m²) and classified according to WHO criteria: underweight (<18.5), normal (18.5–24.9), overweight (25–29.9), obese (≥30).
- Waist and hip circumference were recorded with a non-stretchable tape and used to calculate the waist-hip ratio.
- Blood pressure was measured using a digital sphygmomanometer with two readings taken five minutes apart after 10 minutes of rest. The average of the readings was used.

2.4 Statistical Analysis

SPSS v22 was performed for statistical analysis. Descriptive statistics summarized variables as means ± SD or frequencies (%). Group comparisons used *t*-tests, ANOVA, and chi-square tests. Correlations were evaluated using Pearson's or Spearman's coefficients. Logistic regression identified predictors of high-risk markers, adjusting for age, gender, and socioeconomic status. Significance was set at $p < 0.05$.

The study was approved by the Institutional Review Board.

3. Results

3.1 Sociodemographic and Lifestyle Characteristics

The study enrolled 352 participants, evenly distributed by gender (50.9% male, 49.1% female), with a mean age of 19.8 ± 2.6 years. Most respondents (61.6%) belonged to the 18–22 age group. A notable proportion (58.5%) stated that their weekly amount of moderate-to-intense physical exercise was fewer than 150 minutes. Additionally, 43.2% of participants indicated screen time exceeding four hours daily. Fast food consumption over three times per week was observed in 39.8%, and 62.2% had insufficient fruit and vegetable intake. Tobacco and alcohol use were reported by 1.0 % and 0.5% of participants, respectively. The average Perceived Stress Scale (PSS-10) score was 18.4 ± 5.7, suggesting moderate psychological stress, as mentioned in Table 1.

Table 1. Sociodemographic and Lifestyle Characteristics of Urban Youth (n = 352)

Variable	Value
Age (mean ± SD)	19.8 ± 2.6 years
Gender – Male	179 (50.9%)
Gender – Female	173 (49.1%)
Physical activity <150 min/week	206 (58.5%)
Screen time >4 hrs/day	152 (43.2%)
Fast food >3 times/week	140 (39.8%)
Low fruit/vegetable intake	219 (62.2%)
Tobacco users	4 (1.0 %)
Alcohol users	2 (0.5 %)
Perceived Stress Scale (PSS-10) Score	18.4 ± 5.7

3.2 Anthropometric and Clinical Risk Marker Profiles

Anthropometric assessments showed a mean BMI of 23.6 ± 4.1 kg/m². According to the WHO classification, 22.4% of the participants were overweight, 7.1% obese, and 13.6% underweight, while 56.0% maintained a normal BMI. Central obesity, defined by an elevated WHR, was present in 29.3% of the participants. Blood pressure measurements revealed a mean systolic pressure of 118.5 ± 12.3

mmHg and a diastolic pressure of 76.8 ± 8.9 mmHg. Prehypertension was identified in 25.6% of participants, as mentioned in Table 2.

Table 2. Anthropometric and Clinical Measurements of Urban Youth

Parameter	**Value**
BMI (mean ± SD)	23.6 ± 4.1 kg/m²
Underweight (BMI <18.5)	48 (13.6%)
Normal weight (BMI 18.5–24.9)	197 (56.0%)
Overweight (BMI 25–29.9)	79 (22.4%)
Obese (BMI ≥30)	25 (7.1%)
Elevated Waist-Hip Ratio (WHR)	103 (29.3%)
Systolic Blood Pressure (mean ± SD)	118.5 ± 12.3 mmHg
Diastolic Blood Pressure (mean ± SD)	76.8 ± 8.9 mmHg
Prehypertension (SBP 120–139 or DBP 80–89)	90 (25.6%)

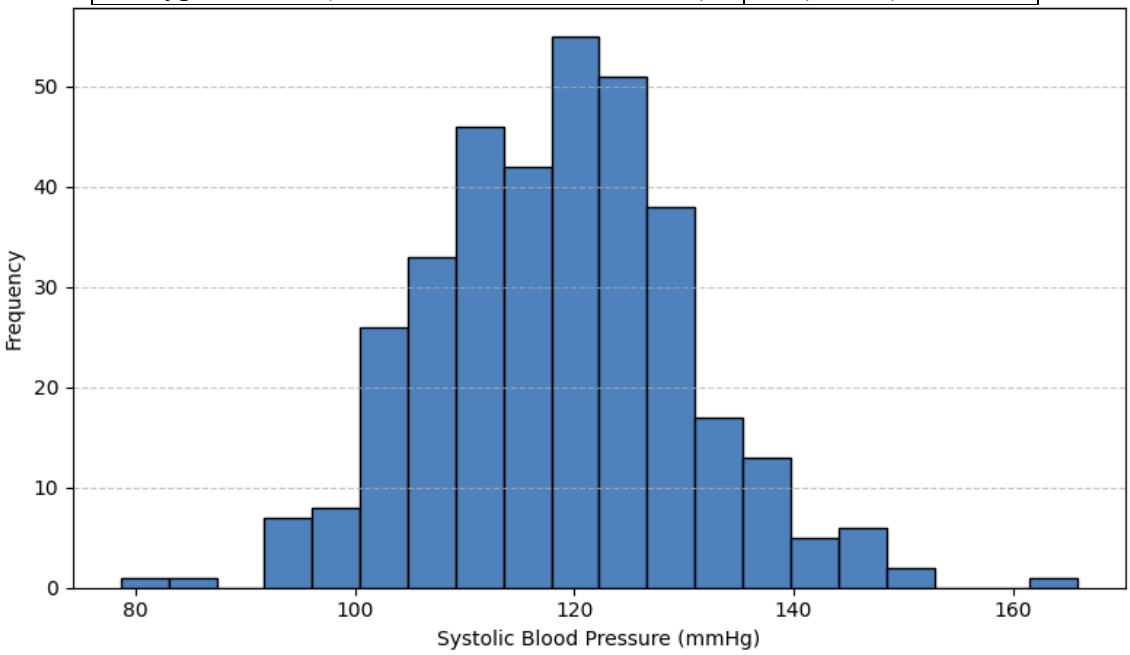

Figure 2. Distribution of Systolic Blood Pressure Among Urban Kashmiri Youth

Figure 2 illustrates the distribution of SBP among 352 urban youth aged 18–22 years in Kashmir. The mean SBP was 118.5 mmHg (SD ± 12.3), with a visible concentration of values near the upper-normal and prehypertensive thresholds. The pattern suggests an early trend toward elevated cardiovascular risk within this demographic.

3.3 Associations Between Lifestyle Behaviors and Risk Markers

Bivariate analysis showed that screen time greater than four hours per day was pointedly related to both overweight status (p = 0.002). Low physical activity was linked with elevated WHR and prehypertension (p < 0.01). High perceived stress was modestly related to increased systolic blood pressure (p = 0.041). These associations are presented in Table 3 and visually summarized in Figure 3.

10.53555/t59dh792 Table 3. Bivariate Associations Between Lifestyle Factors and Risk Markers

Lifestyle Factor	Associated Risk Marker(s)	p-value
Screen time >4 hours/day	Overweight	0.002 / 0.017
Low physical activity	Elevated WHR, Prehypertension	<0.01
High perceived stress (PSS >20)	Elevated Systolic Blood Pressure	0.041

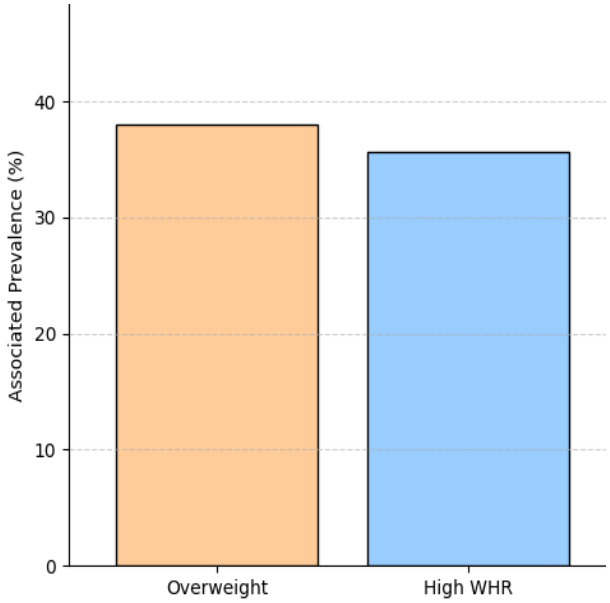

Figure 3. Lifestyle Factors and Associated Risk Marker Prevalence

Figure 3 shows the prevalence of key physiological risk markers linked to specific lifestyle behaviors among urban Kashmiri youth. Screen time >4 hours/day was associated with overweight (38.0%), low physical activity with high WHR (35.6%).

3.4 Predictors of Physiological Risk Markers

Multivariable logistic regression analysis identified several independent predictors of physiological risk markers. Sedentary behavior (screen time >4 hours/day) was a significant predictor of overweight/obesity (adjusted Odds Ratio (OR) = 2.36; 95% CI: 1.51–3.68; $p < 0.001$). Low physical activity predicted elevated WHR (OR = 1.94; 95% CI: 1.12–3.34) and prehypertension (OR = 1.88; 95% CI: 1.09–3.21). Full regression outputs are presented in Table 5.

Table 4. Logistic Regression: Predictors of Physiological Risk Markers

Predictor Variable	Outcome	Adjusted OR (95% CI)	p-value
Screen time >4 hrs/day	Overweight/Obesity	2.36 (1.51–3.68)	<0.001
Low physical activity	High WHR	1.94 (1.12–3.34)	0.014
Low physical activity	Prehypertension	1.88 (1.09–3.21)	0.023

3.5 Overall Burden and Clustering of Risk Markers

A cumulative analysis revealed that 64.8% of participants had at least one physiological risk marker while 22.4% exhibited two or more. The most prevalent risk clusters included overweight with prehypertension. Clusters were more common among participants with high screen time, poor diet, and elevated stress levels. Figure 4 illustrates the distribution of risk clustering, highlighting the emergence of complex metabolic profiles at a young age.

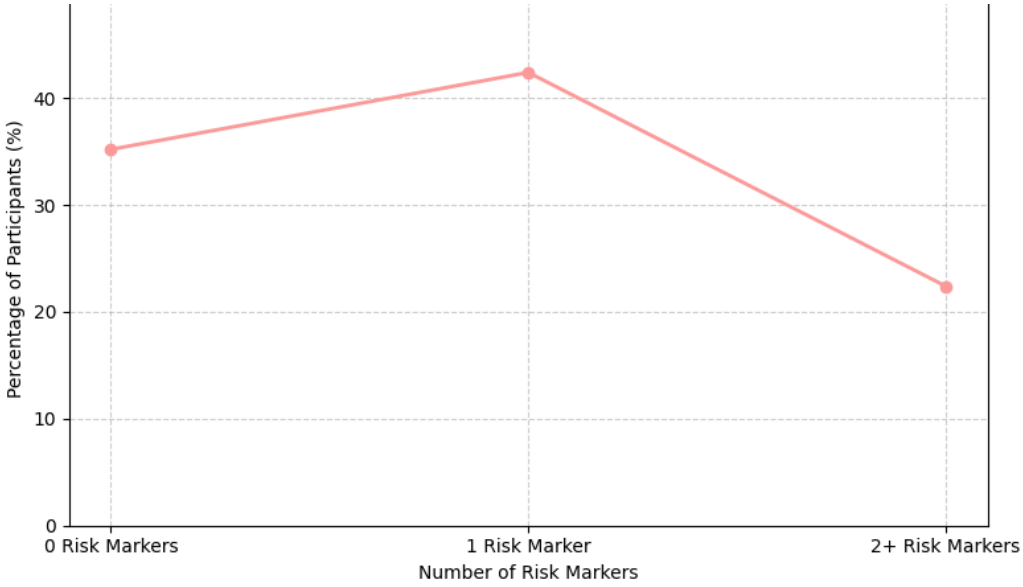

Figure 4. Clustering of Physiological Risk Markers Among Urban Youth

Figure 4 illustrates the distribution of clustered physiological risk markers among 352 urban youth in Kashmir. While 35.2% of participants exhibited no markers, 42.4% had one risk marker, and 22.4% showed two or more. The clustering pattern highlights a substantial burden of emerging lifestyle-related disease risk at an early age.

4. Discussion

The results of this study underscore a substantial and growing burden of physiological and biochemical risk markers for non-communicable diseases (NCDs) among urban youth in Kashmir. The prevalence of overweight, prehypertension within this young population reveals early signs of metabolic dysfunction, shaped by modifiable lifestyle behaviors, such as physical inactivity, poor dietary habits, excessive screen time, and elevated psychological stress.[9]

Over half of the participants failed to meet recommended physical activity thresholds, while nearly two-thirds reported inadequate fruit and vegetable intake. These behaviors corresponded to higher rates of overweight (22.4%) and obesity (7.1%), as well as elevated waist-hip ratios in nearly one-third of the sample. Prehypertension was observed in 25.6% of participants, indicating early onset of cardiovascular strain. These findings support the hypothesis that physiological risks, often undetected in younger populations, are now emerging much earlier due to urban lifestyle shifts.[10,11]

Multivariable analysis revealed strong associations between lifestyle factors and physiological outcomes. High screen time was a significant predictor of overweight, while low physical activity was linked to central adiposity and prehypertension.[12,13] The clustering of risk markers among 22.4% of participants further reflects a multi-system burden that warrants urgent public health attention.

These results align with trends reported in national and regional datasets. The CNNS (Comprehensive National Nutrition Survey, 2016–18) and NFHS-5 (2019–21) indicate rising rates of overweight and prehypertension among adolescents in urban India.[14] Similarly, studies conducted in Delhi, Mumbai, and Bengaluru have documented comparable prevalence of obesity (18–25%) in youth populations exposed to sedentary lifestyles. The findings from Kashmir mirror these trends but also reflect unique regional dynamics.[15,16] The compounded effects of conflict-related stress, limited access to organized physical activity, and dietary transitions in Kashmir likely amplify these health risks.

The relation between perceived stress and systolic blood pressure reinforces the role of psychosocial determinants in shaping cardiovascular risk among young adults.[17]

The implications of these findings are considerable. First, they emphasize the urgent requirement to incorporate early NCD screening and prevention strategies into school and college health programs. Identifying high-risk individuals during adolescence provides a crucial window for timely intervention before the onset of irreversible chronic disease. Public health initiatives must be tailored to urban youth contexts, integrating behavioral change communication, nutritional education, and

structured physical activity components.[18] In Kashmir, where urban youth face unique environmental and psychological challenges, these programs should also address mental health and resilience-building.

Second, the study demonstrates the value of physiological risk marker screening even in asymptomatic youth populations. Current national guidelines often prioritize screening among adults, but the evidence presented here suggests that metabolic risks are deeply rooted in the adolescent years.

Despite the strengths of its design, this study has several demerits. Its cross-sectional design restricts the capability to begin causal relationships between lifestyle behaviors and health outcomes. Longitudinal studies would be necessary to assess the progression of risk markers over time. The use of self-reported data for lifestyle behaviors, including diet and physical activity, may introduce recall bias or social desirability bias. Moreover, while the sample was representative of urban youth, it may not fully capture the diversity of youth experiences across the entire Kashmir Valley or rural counterparts.

Additionally, potential confounders such as menstrual cycle phases in females, sleep quality, or undiagnosed subclinical infections were not accounted for, which could have minor influences on the readings.[19]

Future research should focus on three key directions. First, longitudinal cohort studies are required to track the trajectory of these risk markers and evaluate which factors most significantly predict conversion to full-blown NCDs. Second, intervention studies targeting youth behavior change, particularly digital health interventions and school-based wellness programs, can help identify scalable models for risk reduction.[20] Third, regional studies comparing urban and rural youth in Kashmir would clarify the role of urbanization in accelerating metabolic risks and support the tailoring of health policies.

The study reveals a troubling rise in early physiological risk factors for lifestyle diseases among Kashmiri youth. The findings call for immediate preventive strategies targeting modifiable behaviors and integrating routine screening in adolescent populations. Given the growing burden of NCDs in India, addressing these risks during youth may be the most effective path to long-term health equity and chronic disease prevention.

5. Conclusion

The study highlights a concerning prevalence of early physiological risk markers for lifestyle diseases among urban youth in Kashmir. Among the 352 participants aged 18–22 years, 22.4% were overweight, 7.1% were obese, and 25.6% exhibited prehypertension. Sedentary behavior, inadequate physical activity, and unhealthy dietary habits were strongly related to these outcomes. Logistic regression confirmed that screen time over four hours per day doubled the odds of being overweight (OR = 2.36), while low physical activity predicted both elevated WHR and prehypertension. The results underscore the urgent requirement for early screening and prevention strategies targeting youth. The presence of multiple risk markers at such an early stage raises concern for future cardiovascular, metabolic, and endocrine complications if left unaddressed. Region-specific interventions integrating physical activity promotion, nutritional education, and mental health support are essential. Investing in youth health today can reduce a significant portion of non-communicable disease burden in future.

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