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Original Research Article

Urbanization, lifestyle change, and the growing burden of non-communicable diseases in India: evidence from a community-based study in Hyderabad

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ABSTRACT

Background: Non-communicable diseases (NCDs) are an escalating public health concern in India's rapidly urbanizing regions, with cities like Hyderabad experiencing significant increases in disease burden linked to lifestyle and socioeconomic changes.
Methods: A community-based, cross-sectional study was conducted using systematic random sampling to recruit adults aged 20 and above in urban Hyderabad. Data were collected with the WHO STEPS questionnaire, direct anthropometric measurements, blood pressure monitoring, and biochemical screening for glucose and lipid profiles.
Results: The study found high prevalence rates of hypertension (up to 50% in the elderly), diabetes (25–26% in the elderly), and obesity (44% in the elderly, 37% in adults), with a greater impact on women than men. Behavioral risk factors, including sedentary lifestyle, tobacco use, poor dietary diversity, and excess salt intake, were widespread, and nearly half of hypertensive and many diabetic individuals were unaware of their diagnoses.
Conclusion: These findings underscore the critical need for strengthened surveillance, targeted screening, and coordinated preventive interventions to address the rising NCD epidemic in urban India.

Keywords: Non-communicable diseases, Urbanization, Hyderabad, Risk factors, Prevalence, India, Screening, Preventive strategies

INTRODUCTION

India's unprecedented pace of urbanization has fundamentally altered the nation's health landscape, establishing non-communicable diseases (NCDs) as a dominant public health challenge. In recent decades, NCDs such as diabetes, cardiovascular disease, cancer, and chronic respiratory illnesses have been responsible for a majority of deaths and disability-adjusted life years, particularly in urban centers and regions experiencing rapid socioeconomic transition. Data from the World Health Organization (WHO) and national surveys indicate that over 60% of deaths in India are due to NCD, with cardiovascular disease accounting for nearly 30% of these fatalities. The increasing burden corresponds with significant alterations in lifestyle, dietary practices, and physical activity, primarily influenced by the continuous trend of urbanization.[1-3]

Urban areas provide enhanced access to health infrastructure, education, and employment opportunities; however, they also create conditions that are linked to an increased risk of NCDs. Sedentary behaviors, processed food consumption, tobacco and alcohol usage, and exposure to environmental pollution have all been correlated with major NCD risk factors in cross-sectional and longitudinal studies. Recent national health surveys demonstrate that the prevalence of NCDs and clustering of

multiple risk factors such as overweight/obesity, hypertension, and dyslipidemia is greater in urban populations compared to their rural counterparts, a phenomenon observed in states like Telangana and cities including Hyderabad. This clustering effect, strongly associated with socioeconomic deprivation, educational disadvantage, and occupational stress, is an urgent focus for public health intervention.[4-6]

The underlying causes of India's NCD epidemic are multifactorial. Unhealthy dietary practices and a lack of physical activity are primary concerns, as fewer than half of adults are reported to adhere to the recommended guidelines for fruit and vegetable consumption, while over 30% are classified as insufficiently active. Tobacco use continues to be prevalent, even in light of significant reductions that have occurred due to the enforcement of comprehensive tobacco control measures, including the Indian Tobacco Control Law and initiatives driven by the Global Adult Tobacco Survey. The consumption of alcohol exhibits significant variability across different regions, with specific South Indian states and urban centers reporting prevalence rates among men that surpass 30%, alongside an increasing trend in usage among women.

Furthermore, exposure to ambient and household air pollution in urban settings is increasingly acknowledged as a major factor influencing the risk of NCD, particularly affecting both respiratory and cardiovascular health outcomes.[3,4] India has responded to these threats with a variety of preventive strategies and policy interventions. The "National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke (NPCDCS)" has implemented population-wide and high-risk screening programs, health promotion campaigns, and improved disease surveillance across multiple states.

Recommended approaches integrate multisectoral, life-course frameworks that begin with maternal nutrition, extend through school-based education and target adults for enhanced screening, counseling, and risk mitigation. Population-based interventions such as improved dietary guidance, tobacco taxation, community physical activity programs, and air quality management are complemented by high-risk approaches tailored to individuals at greatest susceptibility due to genetic or established disease.[7,8]

Ongoing efforts have yet to close significant gaps in health infrastructure, access, and health literacy, particularly within marginalized urban populations. Research highlights the necessity for collaborative efforts among governmental bodies, civil organizations, healthcare practitioners, and industry stakeholders to mitigate the non-communicable disease epidemic. Enhanced surveillance systems, culturally tailored interventions, and a continuous emphasis on policy are essential for attaining significant decreases in the morbidity and mortality associated with NCD.[8] This study aimed to assess the prevalence of NCDs, including hypertension, diabetes, and obesity, along with associated behavioral and metabolic risk factors among adults and elderly populations in urban and peri-urban areas of Hyderabad, Telangana, India, using standardized WHO STEPS protocols.

METHODS

Study design and setting

A community-based, cross-sectional study was conducted among adult and senior populations dwelling in specific urban and peri-urban areas of Hyderabad, Telangana. The field practice area included multiple neighborhoods systematically chosen to reflect a spectrum of socioeconomic environments. The study was carried out from March 2023 to August 2024 to capture the distribution of risk factors and disease prevalence in the target population.

Sampling and study population

Participants were recruited using systematic random sampling and, in some cases, a multi-stage cluster random sampling methodology. Household lists were obtained from municipal health authorities, and starting points within each locality were randomly selected. Every fourth or fifth household was approached for participation, and within each household, eligible individuals aged 20 years and above were invited following the WHO Kish method to minimize selection bias with respect to age and sex. Exclusion criteria included serious chronic illness, physical or intellectual disability, and pregnancy or lactation. The final sample size was determined based on prevalence estimates from previous regional studies, adjusted for desired statistical power and allowable error.

Data collection tools and procedures

A structured questionnaire, having undergone pre-testing, was administered via house-to-house interviews carried out by trained field investigators. The questionnaire was constructed utilizing the WHO STEPS instrument and included sections that focused on sociodemographic data, tobacco and alcohol use history, dietary practices (such as the consumption of fruits, vegetables, proteins, dairy, and salt), levels of physical activity, and family medical history.

Anthropometric measurements, encompassing height, weight, waist, and hip circumference, were performed using calibrated equipment. Blood pressure measurements were obtained after a sufficient rest period, in accordance with a standardized procedure. Blood samples for glucose and lipid profiling were obtained from a selected group of consenting participants.

These samples were analyzed utilizing validated commercial kits and the results were interpreted in accordance with established regional and WHO/IDF diagnostic criteria for diabetes, hypertension, obesity, and dyslipidemia.

Sample size formula

The final sample size was calculated using the prevalence rate from previous studies, with the formula, where, n=required sample size, Z=z-score for 95% confidence, p=estimated prevalence, and d=allowable error (typically 0.05).

$$n = Z^2 \times p \times (1 - p)/d^2$$

Handling missing data

Data completeness was ensured through repeated contact and random resampling if key data were missing. Cases with missing primary outcome data were excluded from regression analyses. For minor missing values (below 5%), mean imputation was applied; otherwise, case-wise deletion was used.

Statistical analysis

Data was entered into Microsoft Excel and examined using statistical package for the social sciences (SPSS) software (version 24 or more recent). We calculated descriptive statistics for all variables, such as means, standard deviations, frequencies, and percentages. Prevalence rates were determined for category outcomes, including hypertension, diabetes, obesity, and behavioral risk factors. We used Chi-square tests to look at the links between sociodemographic characteristics and NCD risk factors. We then used odds ratios with 95% confidence intervals in bivariate and multiple logistic regression models to measure the strength of these links. The significance level was established at $p<0.05$.

Ethical considerations

Before data collection, ethical permission was granted by the institutional review board, and written informed consent was collected from all participants. Data privacy and confidentiality were rigorously maintained throughout the study process. This methodological framework enabled reliable estimation of NCD risk factors in the Hyderabad urban population and supports comparability with related studies across India and other LMIC urban centers.

RESULTS

Prevalence of NCD

NCDs are markedly prevalent among Hyderabad's adult and elderly populations. Hypertension represents a major health concern, impacting as many as 50% of the elderly population, with a notably higher prevalence in females compared to males, as evidenced by a sample size of 480 individuals. The prevalence of awareness regarding hypertension is inadequate, with nearly 50% of diagnosed individuals having been previously unaware of their condition. This highlights a significant deficiency in the screening and early detection processes among the population. Diabetes is prevalent among the elderly population, impacting around 25–26%, with a notable disparity in prevalence rates, as women exhibit a higher incidence compared to men (sample size: 410).

A considerable percentage of individuals diagnosed with diabetes were not cognizant of their condition during the screening process, which further underscores the deficiencies in health literacy and accessibility to preventive healthcare services. Gender disparities in the prevalence of both hypertension and diabetes were notable across all age groups. Obesity and overweight were prevalent across all age strata. Among a cohort of 480 elderly individuals, 44% were classified as obese, with a higher incidence noted in women at 48%, in contrast to men at 40% (Table 1).

Table 1: Prevalence of major NCDs among urban adults and elderly in Hyderabad.

Disease	Prevalence (%)	Female (%)	Male (%)	Sample size
Hypertension	50 (elderly)	Higher	Lower	480
Diabetes	25–26 (elderly)	Higher	Lower	410
Obesity	44 (elderly), 37 (adults)	48	40–28	480 (E), 720 (A)
Overweight	27 (adults)	68	32	720

In the sample of 720, adult obesity was identified in 37% of participants, with a notable gender disparity indicating higher prevalence among women. In the adult population, 27% were classified as overweight, exhibiting a significant disparity between females, who comprised 68%, and males, who accounted for 32%.

The observed disparities may indicate a multifaceted interaction of biological and social determinants, encompassing gender-specific trends in dietary habits, levels of physical activity, and accessibility to healthcare services (Table 1).

Distribution of behavioral and dietary risk factors

Behavioral risk factors that contribute to NCDs were widely distributed among the urban population. Tobacco use was reported by 15–22% of adults, and alcohol consumption ranged from 13% to 19%, based on a sample size of 725. A sedentary lifestyle was observed in over half the population (50–53%), indicating widespread inactivity. Dietary risk was also significant. Irregular intake of fruits and vegetables was reported by 58.8% of respondents, and 18.5% reported high salt consumption. Protein-rich food

and dairy consumption were particularly low among economically disadvantaged groups (Table 2).

Table 2: Behavioral and dietary risk factors in the urban Hyderabad population.

Risk factor	Prevalence (%)	Sample size
Tobacco use	15–22	725
Alcohol use	13–19	725
Sedentary lifestyle	50–53	725
Irregular fruit/vegetable intake	58.8	725
High salt intake	18.5	725
Family history of NCD	26.8	725

Furthermore, 26.8% of respondents reported a family history of non-communicable diseases, suggesting a possible genetic and environmental contribution to risk. These behavioral risks, including physical inactivity, tobacco and alcohol use, and poor dietary diversity, were prevalent across all socioeconomic groups but appeared more concentrated among the urban poor, where limited access to healthy food, constrained living conditions, and economic stressors may exacerbate vulnerability (Table 2).

Metabolic and anthropometric features

Metabolic risk factors, as indicated by anthropometric measurements, were extensively documented within the population. The occurrence of obesity in the elderly population was observed to be 44%, with a notable disparity between genders: 48% in women compared to 40% in men, derived from a sample size of 480 individuals. In the adult population, the waist-to-hip ratio, which serves as a crucial measure of central adiposity, exhibited abnormal values in 25–32% of individuals. Gender differences were once more apparent, with 32% of women and 19% of men exhibiting elevated ratios. Underweight remained a significant concern among elderly individuals, impacting 12.2% of the population, 13% of women, and 11% of men, highlighting the dual challenge of malnutrition that coexists with obesity in similar urban settings. The coexistence of overnutrition and undernutrition presents challenges for public health strategies and highlights the intricate nature of metabolic health in growing urban environments (Table 3).

Table 3: Metabolic and anthropometric features of Hyderabad's urban residents

Condition	Prevalence (%)	Women (%)	Men (%)	Sample size
Obesity (elderly)	44	48	40	480
Abnormal waist-hip ratio	25	32	19	720
Underweight (elderly)	12.2	13	11	480

DISCUSSION

The prevalence of undiagnosed hypertension is alarming, with around fifty percent of individuals affected lacking awareness of their condition. This highlights significant deficiencies in conventional screening protocols and public health education. Despite the growing identification of cases through urban health centers, comprehension of diabetes and metabolic regulation continues to be inadequate. The observed low awareness rates are primarily attributed to limited access to screening and insufficient public health education, particularly in at-risk regions. This highlights the significance of improved outreach, continuous community-based diagnostics, and educational initiatives centered on NCDs. Urbanization serves as a significant determinant in the epidemiological transition in India, shifting the health landscape from an emphasis on infectious and nutritional diseases to a growing prevalence of chronic, non-communicable diseases. Numerous studies indicate a significant association between increasing urbanization and the prevalence of critical risk factors for major NCDs, including obesity, hypertension, diabetes, and dyslipidemia. The use of standardized urbanicity scales and risk factor surveillance frameworks in South Indian cities reveals that urban residents face a notably higher burden of NCDs compared to their rural counterparts, even after adjusting for factors such as age, sex, and socioeconomic status.[9,10] This urban health transition, however, does not follow a linear trajectory. Observations in Pune, Hyderabad, and Delhi suggest that the process of urbanization has exacerbated disparities in health outcomes. Some neighbourhoods demonstrate a higher incidence of cardiovascular disease and diabetes, while others continue to confront issues related to communicable diseases, highlighting a dual burden of disease. In urban areas such as Hyderabad, this complexity is further evidenced by the concurrent existence of obesity and undernutrition, particularly within elderly demographics. Consistent observations indicated gender disparities in the prevalence of NCDs, with women exhibiting higher rates of diabetes, obesity, and abnormal anthropometric indicators. The observed patterns can be ascribed to an interplay of dietary factors, reduced levels of physical activity, hormonal influences, and sociocultural norms. In urban India, women frequently encounter limitations in their recreational mobility and exhibit reduced health-seeking behavior. These factors restrict their access to preventive care, ultimately leading to adverse health outcomes. This necessitates the implementation of interventions that are sensitive to gender, targeting both behavioral risks and structural constraints. The interconnection between behavioral and dietary factors is significant within urban settings. The prevalence of tobacco and alcohol consumption continues to be moderate, whereas sedentary lifestyles impact over fifty

percent of the adult population. The consumption of a varied diet is inadequate, as approximately 60% of individuals indicate an inconsistent intake of fruits and vegetables. The prevalence of high salt consumption is notable. The behavioral risks in question impact all socioeconomic strata; however, their consequences are particularly significant among the urban poor. These demographic encounters structural barriers, including limited access to fresh produce, increased exposure to processed foods, and constrained opportunities for physical activity. The influence of socioeconomic gradients is pivotal in determining outcomes related to NCDs. Historically, NCDs were perceived as afflictions primarily associated with wealth; however, recent studies indicate a shift in this trend. Urban residents with lower income and education levels are becoming more susceptible to vulnerabilities due to changes in dietary habits, unemployment, chronic stress, and restricted access to healthcare services. The clustering of multiple metabolic risk factors such as obesity, hypertension, and impaired glucose tolerance is particularly pronounced in these communities, which simultaneously face obstacles to both prevention and management.[11,12] Educational attainment and employment status are now recognized as critical determinants of both NCD risk and healthcare access. This reinforces the need for equity-centered policy frameworks that not only provide clinical services but also address the broader social determinants of health. Policy must integrate internationally acknowledged indicators of socioeconomic disadvantage, focus on generating employment, and improve health infrastructure for socially excluded populations.[13,14] The high prevalence of undiagnosed and poorly managed cases reveals persistent limitations in current health system outreach, particularly among elderly, low-income, and female populations. As Hyderabad continues to expand and its population ages, these challenges are expected to intensify. Interventions must close the gap between theoretical policy frameworks and practical implementation. They should also be designed to reduce gender inequities in disease burden by ensuring access to affordable, nutritious food, age-specific screening services, and safe environments for physical activity. Lifestyle factors particularly poor dietary practices, including the consumption of processed and high-fat foods, reduced intake of fresh produce, and high salt consumption have direct correlations with the rise in obesity, dyslipidemia, and cardiovascular disease. Sedentary behavior, widely observed in urban residents with limited recreational opportunities and time constraints, further exacerbates risks associated with metabolic syndrome and cardiovascular complications.[13] Environmental factors such as poor air quality, noise pollution, and the lack of green spaces compound these health risks and contribute to both respiratory and cardiovascular NCDs.[8] To address these challenges, integrated health promotion strategies are essential. These must go beyond healthcare and incorporate urban planning, transportation, environmental management, and education. Data from India indicate that interventions at the national level, such as tobacco control, the promotion of physical activity, and enhancements in dietary patterns, can result in significant reductions in disease burden. Pharmacological management and regular health evaluations are essential components of secondary prevention strategies; however, their utilization is hindered by coverage gaps and inadequate adherence. To effectively tackle these challenges, it is essential to adopt a life-course perspective, initiating with early educational interventions and promoting ongoing behavioral modifications. Attention should be directed towards high-risk demographics, including women, the elderly, and economically disadvantaged urban populations, as each group encounters distinct vulnerabilities and obstacles to accessing care.[8,13] The successful management of NCDs in urbanizing India necessitates ongoing collaboration among governmental bodies, civil society, private sector stakeholders, and international organizations. Intersectoral approaches, as advocated by the WHO Global Action Plan and India's National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS), are essential for tackling the multifactorial causes of disease, which encompass healthcare, infrastructure, and wider social systems. There exists a pressing necessity to establish comprehensive surveillance systems that amalgamate clinical, spatial, and socioeconomic data at the population level. These systems will facilitate prompt policy interventions, trend analysis, and performance assessment. The identification of emerging risk clusters will be facilitated, guiding the allocation of resources and optimizing program reach to regions with high needs.[1,10] In this context, Hyderabad exemplifies the intricate relationship between risk factors and health outcomes in urban settings within India. The increased prevalence of hypertension, diabetes, and obesity, particularly among women and the elderly, along with undernutrition and persistent disparities, emphasizes the need for comprehensive and varied interventions. Policymakers must implement age and gender-responsive screening programs, improve health literacy, and promote equitable access to nutritious food and physical activity. Addressing socioeconomic determinants of health, such as caste, income, and the urban-rural divide, is critical for all public health efforts to promote equality and long-term efficacy.[13]

CONCLUSION

NCDs represent a considerable challenge for India's urban future, with Hyderabad serving as a case study for national trends. The interplay between urbanization, socioeconomic mobility, lifestyle changes, and environmental exposure necessitates meticulous, multifaceted, and evidence-based strategies. Improving surveillance, promoting health equity, and prioritizing preventive and early intervention strategies are essential for tackling the epidemic of NCDs. These findings should inform targeted urban health programs in cities undergoing similar transitions and guide intervention planning for the urban poor. Continued research must track risk factor clustering and intervention effectiveness to support

equitable public health for vulnerable populations in rapidly urbanizing settings.

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