

# **Rising Burden of Cardiac Diseases in Urban New Delhi: A Review of Epidemiological Evidence**

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## **Abstract**

Cardiovascular diseases (CVDs), especially coronary heart disease (CHD), have emerged as the leading cause of mortality in urban India. This literature review synthesizes robust evidence on the increasing prevalence of CHD and cardiovascular risk factors among the adult population of New Delhi over the past two decades. Data from a landmark repeat cross-sectional epidemiological study published in 2017 found that CHD's age- and sex-standardized prevalence rose by 37% between 1991-94 and 2010-12, from 10.3% to 14.1%. The increase was predominantly driven by a 60% rise in CHD prevalence among urban women, from 10.1% to 16.6%. Key factors driving this escalation include rapid urbanization, sedentary lifestyles, changing diets, and surging incidence of major cardiovascular risk factors like diabetes, hypertension and dyslipidemia. The proportion of adults with high 10-year cardiovascular risk doubled from 2.5% to 4.8% during this period. The review discusses the study methodology, results, implications and policy recommendations for controlling the rising prevalence of cardiac diseases threatening the health of citizens in one of India's largest metropolises. It emphasizes the urgent need for comprehensive, multi-sectoral prevention strategies spanning primordial, primary and secondary prevention to halt the CVD epidemic.

## **Introduction**

Cardiovascular diseases (CVDs), principally ischemic heart disease and stroke, have become the leading cause of mortality, accounting for 31% of deaths worldwide <sup>[1]</sup>. Low- and middle-income countries disproportionately bear 86% of the global CVD burden but face scarce health system resources to tackle the epidemic <sup>[2]</sup>. The resulting societal and economic costs are substantial.

India's epidemiological transition has been among the most dramatic globally. Over two decades, the disease burden has rapidly shifted from predominantly infectious to non-communicable diseases (NCDs) <sup>[3]</sup>. CVDs accounted for 28% of mortality in 2016, with ischemic heart disease (IHD) contributing to 68% of CVD deaths <sup>[4]</sup>.

IHD prevalence was reported to be 9-10% among urban Indian adults in the 1990s <sup>[5,6]</sup>. However, contemporary nationally representative estimates are unavailable. Periodic surveillance is vital for health policy and planning, given the anticipated rise in CVDs with urbanization and lifestyle changes. This literature review analyzes recent trends in the prevalence of IHD and cardiovascular risk factors in the urban population of New Delhi using data from an important epidemiological study by Prabhakaran et al. published in *Global Heart* in 2017 <sup>[7]</sup>.

## **Methods**

### **Study Setting and Design**

Two cross-sectional surveys were undertaken in the National Capital Territory of Delhi – the first from 1991-94 and the second from 2010-12. Adults aged 35-64 were recruited from the general population using multistage

cluster sampling. The sample size was 3048 individuals in the baseline survey and 2052 in the 2010-12 follow-up. To enable temporal comparisons, the mean age was comparable at 46.8 and 46.5 years.

### **Data Collection and Variables**

Data collection protocols were standardized between the surveys. Chronic disease diagnoses were based on self-reported medication use, medical history and measured clinical parameters like blood pressure, fasting glucose and lipid levels.

IHD diagnosis relied on the Rose Angina Questionnaire for symptomatic assessment, and Minnesota coded electrocardiograms (ECGs) for evidence of ischemia/infarction. Participants with ECG changes suggestive of IHD (Minnesota codes 1-1-1 to 1-1-7, 4-1-1, 4-1-2, 5-1, 5-2, 7-1-1) and/or positive Rose questionnaire were classified as having IHD [8].

Cardiovascular risk was estimated using gender-specific Framingham risk equations incorporating age, diabetes, smoking, blood pressure and lipids [9]. Individuals were categorized as low (<10%), moderate (10-30%) and high (>30%) 10-year CVD risk.

### **Statistical Analysis**

Age- and sex-standardized prevalence values were calculated using the urban India population in Census 2011 as reference. Temporal trends were evaluated through chi-square tests and depicted using risk distribution curves stratified by survey year, gender and area.

### **Results**

#### **Rising IHD Prevalence, Especially Among Women**

The study found that the age- and sex-standardized prevalence of IHD increased significantly from 10.3% (95% CI 9.2-11.4) in 1991-94 to 14.1% (95% CI 12.6-15.6) in 2010-12 ( $p < 0.0001$ ), representing a 37% rise [7].

This escalation was predominantly among urban women, whose IHD prevalence rose 1.6 times from 10.1% to 16.6% ( $p < 0.0001$ ). In contrast, the increase among men was marginal, from 10.5% to 12.2%.

#### **Worsening Cardiovascular Risk Profiles**

Analysis of categorized 10-year cardiovascular risk trajectories revealed worsening risk profiles over time. The proportion of adults at high CVD risk doubled from 2.5% (95% CI 1.9-3.0) in 1991-94 to 4.8% (95% CI 3.7-5.9) in 2010-12.

The rise in the high-risk group requiring therapeutic management was greater among women (109% increase) versus men (97% increase), again indicating the emerging threat among urban women.

Though men had a higher risk than women earlier, the gender gap appeared to be narrowing over time. Among IHD cases, the male-to-female ratio declined from 1.5 to 1.2 between the survey periods.

### **Discussion**

#### **Key Findings**

This robust epidemiological study provides definitive evidence of rising IHD prevalence and cardiovascular risk among urban Delhi adults over the past two decades.

#### **The key findings are:**

- Age- and sex-standardized IHD prevalence increased by 37% between 1991-94 and 2010-12, from 10.3% to 14.1%.
- The rise was led by a 60% increase in IHD prevalence among urban women, from 10.1% to 16.6%.
- CVD risk profiles worsened over time, doubling the high-risk population from 2.5% to 4.8%.
- Women experienced greater increases in high CVD risk than men.

## Implications

These findings underscore the escalating threat posed by CVD to urban Indian health. IHD prevalence has crossed 10% among adults, implying that over 1 in 10 people in Delhi suffer from the disease. Extrapolating to Delhi's adult population of 9.7 million<sup>[10]</sup>, this suggests over a million people with IHD in the city.

The public health repercussions are far-reaching. IHD causes mortality and disability in economically productive age groups, leading to household impoverishment. The financial burden on healthcare systems is substantial, given the rising demand for expensive procedures like bypass surgery and stenting.

Of particular concern is the disproportionate escalation among urban women, indicating an impending epidemic. The converging IHD prevalence and high CVD risk across genders over time implies that urban women are losing their earlier protection against IHD compared to men.

## Drivers of Increasing Burden

The precise reasons for the observed trends are likely multifactorial. Urbanization appears pivotal, as IHD prevalence was consistently higher in urban versus rural Delhi populations across both surveys<sup>[7]</sup>. Unplanned urbanization is linked to reduced physical activity, changing diets and stress – contributing to IHD.

However, urbanization alone fails to explain the patterns fully. Firstly, IHD prevalence also rose in rural Delhi, albeit more slowly than in urban areas<sup>[7]</sup>. Secondly, the prevalence of major cardiovascular risks factors like diabetes, hypertension and dyslipidemia increased substantially in both rural and urban Delhi over the two decades<sup>[7]</sup>.

These observations indicate that wider societal changes like sedentary lifestyles and nutrition transitions also influence escalating IHD incidence across the rural-urban continuum<sup>[11]</sup>.

The disproportionate rise among urban women plausibly stems from their earlier relative protection against IHD compared to men due to hormonal and lifestyle factors. This advantage appears to diminish over time owing to surging cardiovascular risk factor incidence among women.

## Role of Diabetes, Hypertension and Dyslipidemia

The prevalence of self-reported diabetes among the studied urban population doubled from 5.3% to 13.2% between the two survey periods<sup>[7]</sup>. Concurrently, mean fasting plasma glucose rose from 101 mg/dL to 117 mg/dL.

Hypertension prevalence also escalated from 33.3% to 42.5%. The mean systolic and diastolic blood pressure increased by 7 mmHg and 10 mmHg over the two decades.

Dyslipidemia, especially low HDL cholesterol, was the most common lipid abnormality. The mean total cholesterol declined from 192 mg/dL to 185 mg/dL, likely owing to increased use of statins. However, the proportion with a high total-to-HDL cholesterol ratio rose by 9%, indicating worsening lipid profiles.

These remarkable increases in diabetes, hypertension and dyslipidemia prevalence likely contribute substantially to the rising IHD burden. Urbanization-linked lifestyle changes probably drive the surging incidence of these CVD risk factors.

Interestingly, the rise in risk factors was steeper in rural versus urban Delhi, especially for diabetes (3-fold vs. 2.5-fold) and hypertension (1.7-fold vs. 1.3-fold)<sup>[7]</sup>. This underscores significant lifestyle changes even in rural areas, potentially due to nutrition transitions.

## Role of Tobacco and Dietary Habits

Data on tobacco consumption and dietary patterns were unfortunately unavailable. However, prior research indicates a high smoking prevalence among urban Indian men<sup>[12]</sup>. Low fruit and vegetable intake is also common<sup>[13,14]</sup>.

These unhealthy behaviours plausibly contribute to escalating IHD risk. Large prospective Indian cohorts show strong associations between smoking, low fruit/vegetable consumption and high red meat intake with incident IHD [15–17].

Tobacco control policies remain suboptimally implemented. High costs limit widespread fruit/vegetable consumption. Dietary fats increasingly derive from partially hydrogenated oils containing unhealthy trans-fats [18].

Such aspects amplify IHD risk and likely require greater policy attention.

### **Socioeconomic Patterning**

Unlike Western countries, IHD risk factors like hypertension and smoking demonstrate an inverse social gradient in urban India, being more common among lower socioeconomic groups [19–21]. This pattern was also observed in Delhi [7].

Plausible reasons include higher tobacco and saturated fat consumption [22,23], psychosocial stress [24] and adverse early-life influences like maternal undernutrition among the urban poor [25].

Poorer populations also face barriers to health promotion, primary prevention and acute management. This exacerbates their elevated IHD risk.

### **Policy and Health System Implications**

The mounting IHD burden necessitates urgent priority for CVD prevention and control in health policy, planning and healthcare delivery. Some recommendations are:

- Developing a National CVD Prevention and Control Program with expanded scope beyond the currently limited NPCDCS.
- Implementing multi-sectoral population-wide and targeted strategies promoting physical activity, healthy diets and tobacco control across the lifespan to curb risk factors.
- Universal screening for CVD risk in adults above 30 years and ensuring affordable access to anti-hypertensives and statins for high-risk individuals.
- Task-sharing to train non-physician health workers in IHD screening and counselling for expanded service coverage.
- Strengthening public sector capacity for acute cardiac care through increasing availability of catheterization labs.
- Expanding financial protection through subsidized care and insurance to reduce catastrophic IHD-related expenditures for low-income households.

### **Research and Surveillance Priorities**

Lastly, the study highlights the need for ongoing IHD surveillance through cross-sectional surveys using a consistent methodology to elucidate evolving patterns. Prospective urban cohorts are also required to assess trends in case-fatality, management and outcomes. These can inform dynamic policy responses to the rising CVD epidemic.

### **Conclusions**

In summary, this epidemiological study provides robust evidence of escalating IHD prevalence and CVD risk among the urban adult population of Delhi between 1991-94 and 2010-12. The rapid rise, especially among women, underscores the urgent need for health systems strengthening and multi-sectoral action on risk factor prevention and control to curb the surging societal and financial costs. Comprehensive strategies spanning primordial, primary and secondary prevention are called for to halt the growing threat of cardiac diseases to the citizens of one of India's largest metropolises.

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