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Non-Communicable Diseases in Rural North India: Burden, Risk Factors and Health-Seeking Behaviour -A Narrative Review

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KEYWORDS

Non-communicable diseases; Rural health; Risk factors; Health-seeking behavior; Uttar Pradesh; Primary care

ABSTRACT:

Introduction: Non-communicable diseases (NCDs) have emerged as the leading cause of morbidity and mortality in India, with a growing burden extending into rural regions. Although urban populations have traditionally been the focus of NCD research and interventions, accumulating evidence suggests that rural North India is undergoing a rapid epidemiological transition, marked by increasing exposure to behavioural and metabolic risk factors and persistent gaps in health-care access.

Methods: This narrative review synthesizes evidence from national burden estimates, large population-based surveys, and community-level studies published over the past decade, with a focus on rural North India and Uttar Pradesh. Literature was drawn from peer-reviewed journals and authoritative national surveys, including WHO STEPS-based studies, National Family Health Surveys, and systematic reviews of health-seeking behaviour for NCDs.

Results: National data indicate that NCDs account for nearly two-thirds of all deaths in India, driven primarily by cardiovascular diseases, diabetes, chronic respiratory diseases, and cancers. Community studies from rural Uttar Pradesh demonstrate high prevalence of tobacco use, very low fruit and vegetable intake, emerging overweight and obesity, and hypertension affecting approximately one-quarter to one-third of adults. Evidence also highlights a dual burden of malnutrition, with undernutrition coexisting alongside increasing cardiometabolic risk. Health-seeking behaviour studies reveal that while most individuals with NCDs seek treatment, a substantial minority remain untreated. Preference for private or informal providers, delayed care-seeking due to low perceived severity of disease, financial barriers, and pronounced gender and socioeconomic inequalities contribute to fragmented and suboptimal long-term care.

Conclusion: The available evidence indicates that rural North India is no longer protected from NCDs, with risk profiles increasingly resembling those of urban populations. Strengthening community-level surveillance, improving awareness of asymptomatic chronic conditions, and enhancing continuity of primary health-care–based NCD management are essential to address the growing rural NCD burden and reduce health inequities.

Introduction

Non-communicable diseases (NCDs), also referred to as chronic diseases, are the leading global cause of mortality and long-term disability. In 2021, NCDs accounted for approximately 43 million deaths, representing nearly 75% of all non-COVID global deaths, underscoring their immense and growing health burden worldwide (WHO, 2022). The principal NCD categories cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes share a set of modifiable behavioral risk factors including tobacco use, unhealthy diets, physical inactivity, and harmful alcohol consumption (WHO, 2021). These behavioral determinants contribute to metabolic abnormalities such as hypertension, obesity, hyperglycemia, and dyslipidemia, which substantially elevate NCD-related morbidity and mortality. Elevated blood pressure alone contributes to nearly 25% of NCD deaths globally (WHO, 2021). Low- and middle-income countries (LMICs) bear a

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disproportionate share of this burden. Approximately 82% of premature NCD deaths occur in LMICs, where socioeconomic constraints, delayed diagnosis, and limited healthcare access compound the challenge (United Nations, 2020). Recognizing this urgency, global frameworks including the UN Sustainable Development Goals (SDG 3.4) aim to reduce premature NCD mortality by one-third by 2030. The WHO STEPwise Approach to Surveillance (STEPS) provides standardized tools to monitor population-level NCD risk factors and guide national responses (Guthold et al., 2019). In India, the epidemiological landscape has transitioned rapidly, with NCDs emerging as the dominant cause of adult morbidity and mortality. Recent national estimates indicate that NCDs account for nearly 60% of all deaths in the country (Dandona et al., 2017). The increasing prevalence of hypertension, diabetes, cancer, and chronic respiratory diseases is driven largely by lifestyle transitions urbanization, reduced physical activity, dietary shifts toward processed foods and population aging (Gupta et al., 2019). To respond to this rising burden, India launched the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) in 2010, followed by the National Multisectoral Action Plan (2017–2022) aimed at reducing key NCD risk factors. Recent national surveys have strengthened the evidence base for NCD surveillance. The National Family Health Survey (NFHS-4, 2015–16) reported overweight/obesity (BMI ≥25 kg/m²) in 21% of women and 19% of men aged 15–49 years (IIPS & MoHFW, 2017). Tobacco use remained high, with 44% of men reporting current use compared with 6.8% of women (IIPS & MoHFW, 2017). The National NCD Monitoring Survey (NNMS 2017–18) demonstrated widespread penetration of major risk factors: 33% current tobacco use, 16% alcohol use, 26% overweight/obesity, 29% raised blood pressure, and 9% elevated blood glucose among adults aged 18–69 years (Mathur et al., 2020). These findings highlight the urgent need for early detection, risk reduction, and strengthening of primary healthcare services.

Uttar Pradesh (UP), India's most populous state, faces significant challenges related to NCDs, especially in rural and underserved regions. Socioeconomic constraints low literacy, poverty, and limited access to healthcare may exacerbate risk factors and hinder timely diagnosis or treatment. Although NFHS data suggest rising trends in hypertension and diabetes in UP, detailed community-based evidence remains sparse. Evidence from rural North India, including STEPS-based surveys in Uttar Pradesh, has reported high tobacco use (>50% among men), very low fruit and vegetable consumption (>85–90% consuming <5 servings/day), and hypertension prevalence between 25–30% (Singh et al., 2017; Krishnan et al., 2008). Health-seeking behavior in rural North India shows high treatment-seeking overall but significant barriers to formal and preventive care, including preference for private facilities over government services, low use of public primary care, and socioeconomic influences on access and utilization (Yadav et al., 2022; Haridoss et al., 2025; Verma et al., 2021).This review synthesizes global, national, and regional literature on NCD risk factors and health-seeking behavior relevant to rural North India. It specifically contextualizes the WHO STEPS-based community survey planned in the rural practice area of IIMSR, Lucknow. The objectives are to (1) estimate the prevalence of major NCD risk factors, (2) examine socio-demographic correlates, and (3) assess patterns of health-seeking behavior. By consolidating human studies at multiple geographical levels, this review identifies key knowledge gaps and provides an evidence foundation for community-level NCD surveillance and policy planning.

Methods

We conducted a structured narrative review following PRISMA-like principles (though not a full systematic review). Databases (PubMed/MEDLINE, Google Scholar, JSTOR) and organizational repositories (WHO, NFHS/Ministry of Health) were searched up to mid-2025. Search terms included combinations of "non-communicable diseases," "NCD risk factors," "health-seeking behavior," "rural India," "North India," "Uttar Pradesh," "Lucknow," "STEPS," and related synonyms. We included peer-reviewed studies, government reports, and major surveys (NFHS, NNMS, GBD analyses) focused on adult human populations. Studies purely on children or communicable diseases were excluded. Reference lists of relevant articles were also scanned for additional sources. Because this is a narrative review, we synthesized findings thematically rather than performing meta-analysis.

Result:

Global NCD Burden and Risk Factors: NCDs) are chronic, multifactorial conditions that drive long-term disability and mortality worldwide. The WHO reports that NCDs caused at least 43 million deaths in 2021, accounting for 75% of all non-pandemic deaths globally (World Health Organization, 2024). The largest share of NCD mortality arises from four major disease groups cardiovascular diseases (CVDs), cancers, chronic respiratory diseases, and diabetes. For CVDs specifically, WHO estimates 19.8 million deaths in 2022 (World Health Organization, 2024). Chronic respiratory disease burden remains substantial; for example, COPD alone caused 3.5 million deaths in 2021 (World Health Organization, 2024). These outcomes are driven by modifiable exposures, including tobacco use, unhealthy diet, physical inactivity, harmful use of alcohol, and air pollution, which in turn generate metabolic risks such as raised blood pressure, overweight/obesity, elevated blood glucose, and dyslipidaemia (World Health Organization, 2021). Recent global estimates underscore the scale of these metabolic risks: WHO estimates

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1.4 billion adults (30–79 years) had hypertension in 2024 (World Health Organization, 2025), while obesity has accelerated markedly WHO reports that in 2022, 2.5 billion adults were overweight and 890 million were living with obesity (World Health Organization, 2025). Diabetes is rising similarly; the International Diabetes Federation (IDF) estimates 589 million adults (20–79 years) were living with diabetes in 2024, projected to rise to 853 million by 2050 (International Diabetes Federation, 2025). Environmental risks further amplify NCDs: WHO estimates the combined effects of household and ambient air pollution are associated with 6.7 million premature deaths annually, largely through CVD, COPD and lung cancer pathways (World Health Organization, 2023), while the State of Global Air analysis estimates 8.1 million deaths attributable to air pollution in 2021 (Health Effects Institute, 2024). NCD risks show strong socio-demographic gradients; recent cross-country analyses demonstrate that tobacco and harmful alcohol use often cluster among poorer groups in LMICs, while overweight is more concentrated among better-off groups (Khan et al., 2021), and multi-country evidence confirms systematic wealth/education gradients in smoking across LMICs (Flor et al., 2022). Urban–rural contrasts are also dynamic: a global meta-analysis shows that the urban–rural hypertension gap has narrowed over time as rural prevalence has converged with, and in some settings overtaken, urban prevalence (Geldsetzer et al., 2022). Policy responses align with SDG target 3.4, and WHO has extended the Global NCD Action Plan to 2030 with an accompanying 2023–2030 implementation roadmap (World Health Organization, 2023). Robust surveillance remains central; the WHO STEPwise approach (STEPS) provides a standardized framework (questionnaire, physical and biochemical measures) and updated manuals/tools to enable comparable tracking of NCD risk factors over time (World Health Organization, 2021). Global estimates of NCD mortality, hypertension, obesity, diabetes and air-pollution–attributable deaths are presented in Table 1.

Table 1: Global NCD Burden & Key Risk Factor Estimates

Indicator	Latest Estimate	Year	Definition & Population	Source
Total NCD deaths	43 million deaths	2021	All ages, NCDs (cardiovascular, cancer, respiratory, diabetes)	WHO Fact Sheet (2025)
CVD deaths	19.8 million deaths	2022	All ages, cardiovascular diseases	WHO-derived analysis
COPD deaths	3.65 million deaths	2021	Chronic obstructive pulmonary disease mortality	GOLD Report/estimates
Hypertension prevalence	1.4 billion adults aged 30–79 with hypertension	2024	Adults aged 30–79 with raised BP (≥140/90 mmHg or treated)	WHO Hypertension Fact Sheet (2025)
Diabetes prevalence	589 million adults aged 20–79	2024	All types of diabetes in adults	IDF Diabetes Atlas (2025)
Diabetes deaths	3.4 million deaths	2024	Diabetes-related mortality	IDF Diabetes Atlas (2025)
Obesity (adults)	>1 billion adults with obesity	2022	Adults with BMI ≥30 kg/m²	WHO/NCD-RisC obesity estimates
Air pollution–related deaths	6.7–8.1 million deaths*	2021	Deaths attributable to ambient + household air pollution	GBD/WHO estimates

*Range reflects different estimation frameworks (WHO 6.7 m; GBD 8.1 m).

India's NCD burden and risk profile:

India's NCD burden and risk profile: India continues to experience a rapid epidemiological transition with NCDs now accounting for the majority of mortality. The India State-Level Disease Burden Initiative documented that deaths attributable to NCDs increased from 37.9% in 1990 to 61.8% in 2016 (Dandona et al., 2017). More recent national assessments continue to indicate that NCDs constitute roughly six in ten deaths in India in the current transition phase (Bramhankar et al., 2025). The major contributors remain aligned with national policy and disease-burden syntheses cardiovascular diseases (including ischaemic heart disease and stroke), chronic

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respiratory diseases, diabetes and cancers (Srivastava et al., 2011; Nethan et al., 2017). Recent nationally representative surveys confirm that behavioural and metabolic risks are widespread. In NFHS-5 (2019–21), any tobacco use among adults (15+) was 38.0% in men and 8.9% in women, while alcohol consumption was 18.8% in men and 1.3% in women (MoHFW, 2021). NFHS-5 also reported that high or very high blood glucose (>140 mg/dL) or taking medication was 13.5% in women and (corresponding estimates for men were also substantial) (MoHFW, 2021), and independent analyses using NFHS-5 biomarkers estimate diabetes prevalence around 16.1% among adults aged ≥15 years, with clear age and wealth gradients (Maiti et al., 2023). For comprehensive risk-factor profiling, the NNMS (2017–18; published recently) reported 32.8% current tobacco use, 15.9% current alcohol use, 41.3% insufficient physical activity, and 98.4% consuming <5 servings/day of fruits/vegetables; it also estimated ~28–29% raised blood pressure and ~9% raised blood glucose (Mathur et al., 2021; Ramamoorthy et al., 2022). Nutritional transition is similarly evident: CNNS (2016–18) documented the coexistence of adolescent thinness with a non-trivial prevalence of overweight/obesity (MoHFW, 2019). Recent equity analyses further show persistent socio-demographic gradients in adiposity and cardiometabolic risk, including wealth-patterning of overweight/obesity and central obesity (Let et al., 2023; Chaudhary et al., 2023). Policy responses have expanded in the last decade: NPCDCS (2010) and the National Multisectoral Action Plan (2017–2022) operationalized targets aligned with WHO's NCD framework (MoHFW, 2010; MoHFW, 2017), and the programme has since broadened as NP-NCD with updated operational guidance (MoHFW, 2024). Under Ayushman Bharat, Health and Wellness Centres re-designated Ayushman Arogya Mandirs (AAMs) have scaled population-based NCD screening, with official updates reporting 107.10 crore hypertension screenings and 94.56 crore diabetes screenings conducted at AAMs by February 2025 (PIB, 2025); facility-level evaluations also indicate substantial treatment initiation and medicine availability for hypertension/diabetes services in assessed districts (Desai et al., 2025). Despite these advances, recent national evidence continues to show gaps in detection and continuity of care, especially among poorer and rural populations (Varghese et al., 2023; Sharma et al., 2024). As shown in Table 2, nationally representative surveys demonstrate a high prevalence of behavioral and metabolic NCD risk factors in India, with tobacco use ranging from 32.8% (NNMS) to 38.0% among men (NFHS-5), and raised blood pressure affecting nearly one-third of adults in NNMS.

Table 2: Comparison of Key NCD Risk Factors in India: NFHS-5 vs NNMS

Risk Factor	NFHS-5 (2019–21)	NNMS (2017–18)	Population / Age Group	Source
Any tobacco use	Men: 38.0%Women: 8.9%	32.8% (overall)	NFHS-5: Adults ≥15 yrs NNMS: Adults 18–69 yrs	MoHFW 2021; Mathur et al., 2021
Current alcohol use	Men: 18.8%Women: 1.3%	15.9% (overall)	NFHS-5: Adults ≥15 yrs NNMS: Adults 18–69 yrs	MoHFW 2021; Ramamoorthy et al., 2022
Raised blood pressure	13.5% women (SBP ≥140/DBP ≥90 or on medication) *	28–29% (measured BP or on treatment)	NFHS-5: Adults ≥15 yrs NNMS: Adults 18–69 yrs	MoHFW 2021; Mathur et al., 2021
Raised blood glucose / diabetes	13.5% women (random glucose ≥140 mg/dL or on medication) *	9% (raised glucose or on treatment)	NFHS-5: Adults ≥15 yrs NNMS: Adults 18–69 yrs	MoHFW 2021; Mathur et al., 2021
Insufficient physical activity	Not assessed	41.3%	Adults 18–69 yrs	Ramamoorthy et al., 2022
<5 servings fruits & vegetables /day	Not assessed	98.4%	Adults 18–69 yrs	Ramamoorthy et al., 2022

*NFHS-5 reports biomarker data separately for men and women; the 13.5% figure is explicitly reported for women. Comparable consolidated male estimates are not presented in the standard NFHS-5 fact sheets and are therefore not inferred here.

Non-communicable disease burden in Uttar Pradesh (rural vs. urban): Uttar Pradesh, India's most populous state, has a predominantly rural population and comparatively weaker

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health indicators, making NCD prevention and control particularly challenging. Statewide household surveillance (NFHS) indicates that major NCD risk factors are common in UP and show rural–urban differentials. In NFHS-4 (2015–16), among adults aged 15–49 years, any tobacco use was substantially higher in rural than urban areas for both women (rural 8.2% vs urban 5.8%) and men (rural 55.1% vs urban 48.2%), while current alcohol use among men was similar across residence (rural 22.4% vs urban 21.6%) and remained very low among women (≤0.2%) (IIPS et al., 2017). The same NFHS-4 state report shows measured hypertension (SBP ≥140 and/or DBP ≥90 mmHg, or on treatment) among women 15–49 years to be modestly higher in urban than rural areas (urban 10.1% vs rural 8.9%), and similarly among men 15–49 years (urban 13.6% vs rural 10.0%) (IIPS 2017). For glycaemic status (random blood glucose) in NFHS-4, the proportion with very high random glucose (>160 mg/dl) was higher in urban than rural areas among women (urban 3.0% vs rural 1.9%) and men (urban 3.4% vs rural 2.9%) (IIPS et al., 2017). These rural–urban patterns suggest higher behavioural risk (tobacco) in rural settings, with somewhat higher measured metabolic risk markers (hypertension/glucose) in urban settings in the 2015–16 survey.

More recent state indicators from NFHS-5 (2019–21) for UP reported with urban/rural breakdown for key NCD indicators show that tobacco use remains higher in rural areas: among adults aged 15 years and above, women using any tobacco were 9.1% rural vs 6.5% urban, and men were 47.6% rural vs 34.7% urban (IIPS 2021). Alcohol consumption in NFHS-5 was also higher in rural men (15.1% rural vs 13.2% urban) and remained low in women (0.3% in both rural and urban) (IIPS et al., 2021). For blood pressure (age 15+), NFHS-5 reports elevated BP (SBP ≥140 and/or DBP ≥90, or on medication) as 20.9% urban vs 17.6% rural in women, and 24.8% urban vs 20.7% rural in men (IIPS et al., 2021). For glycaemia, NFHS-5 reports very high random blood sugar (>160 mg/dl) as 6.1% urban vs 4.6% rural and high/very high (>140 mg/dl) or on diabetes medication as 13.2% urban vs 11.1% rural (IIPS et al., 2021). Taken together, the statewide NFHS data indicate that rural UP carries a heavier burden of behavioural risks (especially tobacco), while urban UP shows higher measured metabolic risk (blood pressure and hyperglycaemia) in the available NFHS indicators.

Beyond statewide surveillance, community-based studies from rural UP provide granular evidence of substantial NCD risk factor clustering. In a WHO-STEPS-based community study from a rural block of Gautam Budh Nagar district, the prevalence of smoking, smokeless tobacco use, alcohol use and sedentary lifestyle among men was 26.0%, 35.1%, 16.9% and 9.6%, respectively; in women the corresponding prevalences were 4.6%, 15.4%, 0% and 19.0%. The same study reported hypertension and diabetes prevalence of 15.6% and 13.0% among men, and 20.0% and 7.7% among women, demonstrating notable cardiometabolic risk even in rural settings (Srivastav et al., 2017). In another STEPS-based rural survey from Barabanki district (near Lucknow), daily smoked tobacco was reported as 58.0% in men and 12.2% in women, daily smokeless tobacco use as 54.5% in men and 37.8% in women, and current alcohol consumption as 20.5% in men and 4.7% in women; low fruit/vegetable consumption (<5 servings/day) was extremely common, and measured hypertension (SBP >140 and/or DBP >90 or on antihypertensives) was 29–30% in both sexes (Agarwal et al., 2017). These community studies reinforce that rural UP is not "protected" from NCD risk; rather, many rural communities exhibit high tobacco exposure and diet-related risks, along with substantial hypertension/diabetes prevalence, supporting the need for strengthened prevention, screening and continuity of care through primary health services and community outreach. As shown in Table 3, tobacco use was substantially higher in rural than urban Uttar Pradesh in NFHS-4 (2015–16), whereas measured hypertension and hyperglycaemia were more prevalent in urban areas. Updated patterns from NFHS-5 (2019–21) are summarized in Table 4.

Table 3: Rural–urban distribution of selected non-communicable disease risk factors in Uttar Pradesh, NFHS-4 (2015–2016)

Indicator (definition as per source)	Women Urban	Women Rural	Men Urban	Men Rural
Uses any type of tobacco (%)	5.8	8.2	48.2	55.1
Drinks alcohol (%)	0.1	0.2	21.6	22.4
Hypertension: SBP ≥140 and/or DBP ≥90 or on treatment (%)	10.1	8.9	13.6	10.0
Very high random blood glucose >160 mg/dl (%)	3.0	1.9	3.4	2.9

Source: *National Family Health Survey-4 (NFHS-4), Uttar Pradesh State Report, 2015–2016. International Institute for Population Sciences (IIPS) and ICF.*

Definitions: *Hypertension defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg or current antihypertensive medication use; blood glucose based on random capillary measurement as reported in NFHS-4.*

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Table 4: Rural–urban distribution of selected non-communicable disease risk factors in Uttar Pradesh, NFHS-5 (2019–2021)

Indicator	Urban (%)	Rural (%)	Notes
Women 15+ use any tobacco	6.5	9.1	Any tobacco (women)
Men 15+ use any tobacco	34.7	47.6	Any tobacco (men)
Women 15+ consume alcohol	0.3	0.3	Current alcohol use
Men 15+ consume alcohol	13.2	15.1	Current alcohol use
Women 15+ elevated BP or on meds	20.9	17.6	SBP ≥140 and/or DBP ≥90 or on medication
Men 15+ elevated BP or on meds	24.8	20.7	SBP ≥140 and/or DBP ≥90 or on medication
Random blood sugar very high >160 mg/dl	6.1	4.6	Random blood sugar measurement
Random blood sugar high/very high >140 mg/dl or on meds	13.2	11.1	Random blood sugar measurement

Source: *National Family Health Survey-5 (NFHS-5), Uttar Pradesh Fact Sheet and State Report, 2019–2021. International Institute for Population Sciences (IIPS).*

Definitions: *Elevated blood pressure defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg or on medication; elevated blood glucose based on random capillary blood glucose measurement or current diabetes medication, as per NFHS-5 methodology.*

Rural Uttar Pradesh (community studies): Rural UP shows a substantial burden of behavioural and metabolic NCD risk factors in community surveys using standardized approaches. In Barabanki district (rural Satrikh block), a WHO STEPS–based cross-sectional survey of 300 adults aged ≥25 years reported any tobacco use 34.3% overall (men 43.7%, women 24.8%); daily smoking 58.0% in men and 12.2% in women; and daily smokeless tobacco use 54.5% in men and 37.8% in women (Agarwal et al., 2017). Diet quality was poor, with 94.3% consuming <5 servings/day of fruits and vegetables, while overweight (BMI ≥25 kg/m²; Asia-Pacific criteria) was 15.7% (men 20.5%, women 10.7%) and measured hypertension (SBP ≥140 and/or DBP ≥90 or on treatment) was 29.7% overall (Agarwal et al., 2017). In a rural block of Gautam Budh Nagar district, a STEPS approach survey reported, among men, smoking 26.0%, smokeless tobacco 35.1%, alcohol use 16.9%, and sedentary lifestyle 9.6%; among women the corresponding prevalences were 4.6%, 15.4%, 0%, and 19.0%, respectively (Srivastav et al., 2017). The same study documented hypertension in 15.6% of men and 20.0% of women, and diabetes in 13.0% of men and 7.7% of women (Srivastav et al., 2017).

Urban Uttar Pradesh (survey and urban community data): Statewide survey data show that urban UP has lower tobacco use than rural Uttar Pradesh, but a higher prevalence of overweight/obesity and higher measured glucose/BP in many indicators. In NFHS-5 (2020–21) Phase-II Key Indicators for Uttar Pradesh, any tobacco use was 34.7% (urban) vs 47.6% (rural) in men, and 6.5% (urban) vs 9.1% (rural) in women; current alcohol use was 13.2% (urban) vs 15.1% (rural) in men and 0.3% in women in both settings (NFHS-5; MoHFW/IIPS, 2020–21). For metabolic risks in the same NFHS-5 UP table, overweight/obesity (BMI ≥25 kg/m²) among women (15–49y) was 30.6% urban vs 18.3% rural, and among men (15–49y) was 24.9% urban vs 16.2% rural (MoHFW/IIPS, 2020–21). NFHS-5 also reports random blood glucose high/very high (>140 mg/dl) or on diabetes medication as 11.3% urban vs 9.6% rural in women, and 13.2% urban vs 11.1% rural in men; and elevated blood pressure (≥140/90 or on medication) as 20.9% urban vs 17.6% rural in women and 24.8% urban vs 20.7% rural in men (MoHFW/IIPS, 2020–21). Community evidence from urban UP also supports a high hypertension burden. In urban Varanasi, a community-based study reported substantial levels of elevated blood pressure in adults (Singh et al., 2017). Recent district-level work that sampled both rural and urban settings in UP reinforces rural–urban differentials in adiposity. In Etawah district (UP), a community-based cross-sectional study included eight villages (rural) and eight wards (urban) and provides directly comparable rural vs urban overweight/obesity estimates (Raheja et al., 2025). As shown in Table 5, tobacco use is consistently higher in rural Uttar Pradesh, whereas overweight, hypertension and raised blood glucose are more prevalent in urban settings

Table5: Rural–urban distribution of selected non-communicable disease risk factors in Uttar Pradesh, India (NFHS-5, 2019–2021)

Indicator (NFHS-5 definition)	Urban	Rural	Source
Men (15+) using any tobacco (%)	34.7	47.6	MoHFW/IIPS, 2020–21
Women (15+) using any tobacco (%)	6.5	9.1	MoHFW/IIPS, 2020–21
Men (15+) consuming alcohol (%)	13.2	15.1	MoHFW/IIPS, 2020–21

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Women (15+) consuming alcohol (%)	0.3	0.3	MoHFW/IIPS, 2020–21
Women (15–49) overweight/obese BMI ≥25 (%)	30.6	18.3	MoHFW/IIPS, 2020–21
Men (15–49) overweight/obese BMI ≥25 (%)	24.9	16.2	MoHFW/IIPS, 2020–21
Women (15+) RBS >140 mg/dl or on meds (%) *(random blood sugar)*	11.3	9.6	MoHFW/IIPS, 2020–21
Men (15+) RBS >140 mg/dl or on meds (%) *(random blood sugar)*	13.2	11.1	MoHFW/IIPS, 2020–21
Women (15+) BP ≥140/90 or on meds (%)	20.9	17.6	MoHFW/IIPS, 2020–21
Men (15+) BP ≥140/90 or on meds (%)	24.8	20.7	MoHFW/IIPS, 2020–21

Health-Seeking Behavior and Care Utilization: Understanding how rural adults respond to NCD symptoms and interact with the health system is critical for effective program planning. A systematic review and meta-analysis by Haridoss et al. (2025) synthesized Indian evidence on health-seeking for NCDs and found that 72.72% of individuals sought treatment (random-effects pooled estimate), while 73.09% of treatment-seekers preferred allopathic care and 8.89% preferred alternative medicine. Private facilities (51.26%) were preferred over government facilities (33.78%). The most frequently reported barrier for not seeking care was that the illness was not considered serious (pooled proportion ≈ 0.48), followed by financial constraints (pooled proportion ≈ 0.33), indicating that low perceived severity and affordability strongly shape engagement with NCD care pathways in India (Haridoss et al., 2025). Consistent patterns are reported from rural eastern Uttar Pradesh. In the Gorakhpur Health and Demographic Surveillance System (GHDSS) cohort, Yadav et al. (2022) assessed healthcare utilisation in 120,306 individuals; among those reporting any health problem in the prior 15 days, 90% sought healthcare and formal healthcare utilisation was 79%. Use of public facilities was relatively low (37%), with most treatment sought from private providers (63%). The study further reported that utilisation of formal care varied by sociodemographic characteristics, with lower use among socially and economically disadvantaged groups, supporting the interpretation that inequities persist even when formal services are available (Yadav et al., 2022).

Qualitative evidence from a neighbouring South Asian setting provides convergent explanations for these patterns. In northern Bangladesh, Rasul et al. (2022) conducted an in-depth qualitative study in one rural and one urban union in Mithapukur, Rangpur (data collection 2015–2016) and found that people commonly delayed care until symptoms disrupted daily life; semi-qualified providers (e.g., local village doctors/drug sellers) were frequently the first point of contact, with transitions to qualified care occurring later and often in a fragmented manner. Cost concerns, distance/accessibility, perceived severity, and trust in local providers shaped care pathways, and gender roles could constrain women's access to services (Rasul et al., 2022). Taken together, the Indian pooled evidence (Haridoss et al., 2025), the large rural Uttar Pradesh cohort findings (Yadav et al., 2022), and the Bangladesh qualitative insights (Rasul et al., 2022) consistently indicate that (i) treatment seeking for chronic NCDs is substantial but incomplete, (ii) private-sector reliance is common, (iii) low perceived seriousness and financial barriers are major drivers of delayed or absent care, and (iv) socioeconomic and gender gradients influence access to formal services factors that are directly relevant to strengthening NCD screening, linkage, and continuity of care in rural North India.

Discussion:

Our review synthesizes evidence demonstrating that non-communicable diseases (NCDs) and their risk factors are highly prevalent across India, with a substantial and growing burden extending into rural North India. National burden estimates from the India State-Level Disease Burden Initiative show that NCDs accounted for 61.8% of all deaths by 2016, with marked increases in key metabolic risks such as raised blood pressure and fasting plasma glucose between 1990 and 2016, confirming a major epidemiological transition (Dandona et al., 2017). This shift reflects population ageing, rapid urbanization of lifestyles, and behavioral changes that parallel global trends. Consistent with this, national systematic reviews identify tobacco use, unhealthy diets, and physical inactivity as dominant drivers of rising NCD prevalence in India (Nethan et al., 2017).

Importantly, evidence indicates that rural risk profiles are converging with urban patterns. Community-based studies from rural Uttar Pradesh illustrate entrenched behavioral risks: in Barabanki district, a WHO-STEPS–based survey documented high prevalence of smoked and smokeless tobacco use, extremely low fruit and vegetable intake, and hypertension affecting nearly one-third of adults (Agarwal et al., 2017). Similar findings have been reported from rural blocks of Gautam Budh Nagar district, where substantial tobacco use, hypertension, and diabetes were observed despite limited awareness and screening (Srivastav et al., 2017). These observations align with broader national and regional data

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showing that rural populations are no longer relatively protected from NCD risk exposure.

The dual burden of malnutrition further complicates rural NCD profiles. The Comprehensive National Nutrition Survey (CNNS) demonstrated the coexistence of adolescent thinness alongside emerging overweight and obesity at the national level (MoHFW et al., 2019). Complementary rural studies from eastern and central India have reported high prevalences of hypertension and diabetes even in populations with relatively modest mean BMI, suggesting early metabolic risk accumulation and an earlier onset of chronic disease compared with many high-income settings (Kinra et al., 2010; Misra et al., 2014).

Health-seeking behavior represents an additional and critical constraint. A recent systematic review and meta-analysis reported that approximately 73% of individuals with NCDs in India sought treatment, leaving a substantial minority untreated; among those seeking care, most preferred modern allopathic medicine, yet private providers were used more frequently than public facilities, primarily due to perceived quality, accessibility, and shorter waiting times (Haridoss et al., 2025). Financial constraints, low perceived seriousness of illness, and distance to facilities were consistently identified barriers. These national patterns are echoed in rural North India: data from the Gorakhpur Health and Demographic Surveillance System show that although most individuals with health problems sought care, the majority relied on private providers, with lower utilisation of formal care among women and socioeconomically disadvantaged households (Yadav et al., 2022). Together, these findings suggest that survey-measured prevalence likely underestimates the true burden of NCDs, as delayed diagnosis, fragmented care pathways, and suboptimal treatment adherence remain common.

Across the literature, several consistent themes emerge. First, India is undergoing a rapid epidemiological transition in which NCDs coexist with residual communicable disease burdens, placing strain on health systems (Dandona et al., 2017; Nethan et al., 2017). Second, rural–urban differences in NCD risk are narrowing, particularly for behavioral risks such as tobacco use and poor diet, while metabolic conditions such as hypertension are increasingly prevalent in rural communities (Agarwal et al., 2017; Srivastav et al., 2017). Third, strong social gradients persist: male sex, older age, lower socioeconomic status, and lower educational attainment are consistently associated with higher risk exposure and poorer access to care (Kinra et al., 2010; Haridoss et al., 2025; Yadav et al., 2022). Finally, health-system constraints including workforce shortages, out-of-pocket expenditure, transportation barriers, and limited continuity of care contribute to delayed diagnosis and inadequate long-term control of chronic conditions, particularly in rural settings (Sinha & Pati, 2017; Yadav et al., 2022). The reviewed evidence supports the interpretation that effective NCD control in rural North India requires locally generated risk-factor data, robust primary-care engagement, and health-seeking pathways that address financial and sociocultural barriers, as emphasized in evaluations of national NCD programmes and primary-care strengthening efforts in India (Sinha & Pati, 2017; Haridoss et al., 2025).

Conclusion: This review demonstrates that non-communicable diseases and their major risk factors are firmly established across India, including in rural North India, where populations were previously considered relatively protected. National burden estimates and community-based studies consistently show high and rising prevalence of behavioural risks particularly tobacco use and poor diet alongside substantial levels of metabolic abnormalities such as hypertension, overweight, and diabetes. Evidence from rural Uttar Pradesh indicates that these risks are comparable to those observed in many urban settings, reflecting a clear convergence of rural and urban NCD risk profiles. The coexistence of undernutrition with emerging overweight and obesity further underscores the complexity of the NCD landscape in rural India, where early-life deprivation may coexist with later-life cardiometabolic risk. Health-seeking behaviour studies reveal that although a majority of individuals with NCDs seek treatment, a significant proportion remain undiagnosed or untreated. Preference for private and informal providers, delayed care-seeking driven by low perceived severity of disease, financial constraints, and persistent gender and socioeconomic inequalities contribute to fragmented and suboptimal long-term management.

Taken together, the reviewed evidence indicates that the true burden of NCDs in rural North India is likely underestimated by routine surveillance. Addressing this gap requires sustained community-level risk-factor surveillance, improved awareness of asymptomatic chronic conditions, and stronger linkage between screening and continuous care at the primary-health-care level. As India continues its epidemiological transition, strengthening evidence-informed, equitable approaches to NCD prevention and management in rural settings will be essential to reduce avoidable morbidity and mortality and to narrow existing health inequities.

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