RESEARCH PAPER

Assessment of Double Burden of Malnutrition and NCD Risk Factors Among Urban Slum Population: A Community-Based Study on Dietary Transition and Lifestyle

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ABSTRACT

Background: India is undergoing a rapid nutrition transition characterised by the simultaneous persistence of undernutrition and a rising prevalence of overweight, obesity, and non-communicable disease (NCD) risk factors. Urban slum populations occupy a particularly vulnerable position within this transition, combining the deprivation-linked undernutrition typical of low-income settlements with the dietary and lifestyle shifts associated with urban living, including increased consumption of energy-dense processed foods and reduced physical activity.

Objective: This paper examines the coexistence of undernutrition, overweight/obesity, and NCD risk factors within urban slum communities, and the role of dietary transition and lifestyle change in shaping this double burden.

Methods: A narrative and comparative literature review was undertaken, synthesising peer-reviewed studies, national survey reports, and World Health Organization guidance on the double burden of malnutrition (DBM), supplemented by a descriptive comparative framework of nutritional and NCD risk indicators drawn from the reviewed sources.

Results: The reviewed evidence indicates that urban slum populations commonly display coexisting patterns of child stunting alongside adult overweight within the same household, elevated prevalence of anaemia among women, and NCD risk factor profiles—raised blood pressure, dysglycaemia, central obesity, low fruit and vegetable intake, and tobacco use—that in several respects meet or exceed general urban population levels despite lower household income. Dietary transition toward refined

carbohydrates, edible oils, and processed snack foods, combined with reduced occupational and leisure-time physical activity, emerged as central drivers.

Conclusion: The double burden of malnutrition in urban slum settings reflects an interaction between persistent material deprivation and emerging obesogenic dietary and lifestyle patterns. Public health responses must move beyond single-condition programming toward integrated, double-duty interventions capable of addressing undernutrition and NCD risk concurrently within the same household and community.

Keywords: double burden of malnutrition; non-communicable diseases; urban slum; dietary transition; nutrition transition; lifestyle; India

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INTRODUCTION

The double burden of malnutrition (DBM) refers to the coexistence, within the same individual, household, or community, of undernutrition alongside overweight, obesity, or diet-related non-communicable disease [1]. This phenomenon has become increasingly prominent in low- and middle-income countries undergoing rapid urbanisation and dietary transition, and India presents one of the most pronounced examples of this pattern [2].

Urban slum communities occupy a distinctive position within this transition. On one hand, they retain many of the structural determinants of undernutrition associated with poverty, including food insecurity, poor sanitation, and limited access to health services. On the other hand, their proximity to urban food markets, exposure to processed and packaged food advertising, and increasingly sedentary occupational patterns expose slum residents to the same obesogenic pressures observed in wealthier urban populations [3]. The result, documented across multiple Indian cities, is a pattern in which stunted children live in households with overweight mothers, and where adults who remain underweight by body mass index nonetheless carry elevated central adiposity and NCD risk [4].

This convergence of undernutrition and NCD risk within a single, economically disadvantaged population complicates conventional public health programming, which has historically addressed undernutrition and NCD prevention through separate vertical programmes. Understanding the specific dietary and lifestyle drivers of the double burden within urban slum settings is therefore a prerequisite for designing interventions capable of addressing both ends of the malnutrition spectrum simultaneously.

OBJECTIVES OF THE STUDY

- To assess the coexistence of undernutrition and overweight/obesity within urban slum populations in India.
- To examine the prevalence of major modifiable NCD risk factors—raised blood pressure, dysglycaemia, central obesity, dietary risk, physical inactivity, and tobacco use—among urban slum residents.
- To analyse the role of dietary transition and lifestyle change as drivers of the double burden of malnutrition in this population.
- To propose community-based and policy-level strategies for integrated double-duty nutrition and NCD prevention programming.

LITERATURE REVIEW

The nutrition transition framework, first articulated systematically by Popkin [5], describes a shift in dietary patterns and physical activity that accompanies economic development, characterised by increased consumption of fats, sugars, and refined carbohydrates alongside declining energy expenditure. Popkin et al. [1] subsequently linked this transition directly to the emergence of the double burden of malnutrition in developing countries, noting that the transition often proceeds faster than the institutional capacity of health systems to respond.

Within India specifically, Griffiths and Bentley [2] documented an early instance of within-household coexistence of child undernutrition and maternal overweight, a pattern subsequently confirmed at national scale using National Family Health Survey data by Kulkarni et al. [3], who reported that a meaningful proportion of Indian households simultaneously contained an

underweight member and an overweight or obese member. The National Family Health Survey-5 [6] provided further confirmation, recording persistently high rates of child stunting and wasting alongside a rising national prevalence of adult overweight and obesity, with urban areas showing disproportionately higher overweight prevalence than rural areas.

Regarding NCD risk specifically, the ICMR-INDIAB study [7] established that diabetes and prediabetes prevalence in India had risen substantially across both urban and rural settings, with urban prevalence generally exceeding rural prevalence. Corsi and Subramanian [8] further demonstrated a socioeconomic gradient in diabetes prevalence that, contrary to earlier assumptions linking NCDs exclusively to affluence, showed meaningful prevalence even among lower socioeconomic strata in urban India, a pattern consistent with slum-specific studies such as that of Bhagyalaxmi et al. [9], who documented substantial NCD risk factor prevalence in a predominantly low-income district population using the WHO STEPwise approach [19].

Anand et al. [10] situated these individual-level findings within the broader context of food system transformation, arguing that the global proliferation of ultra-processed, energy-dense food products has disproportionately affected lower-income urban populations who lack the resources to substitute toward more expensive, less processed dietary alternatives. The World Health Organization's double-duty actions framework [11] was developed explicitly in response to this evidence base, proposing that nutrition interventions be designed from the outset to address undernutrition and overnutrition/NCD risk concurrently, rather than sequentially.

The double burden is not unique to India. Kroker-Lobos et al. [12], studying four Latin American and Caribbean countries, described a similar pattern of coexisting undernutrition and overweight driven by comparable agricultural and nutrition transition dynamics, suggesting that the mechanisms observed in Indian slum settings reflect a broader global pattern associated with rapid, uneven economic transition rather than a phenomenon specific to South Asia. At the childhood level specifically, Tzioumis and Adair [13], in a critical review of the dual burden in low- and middle-income countries, cautioned that stunting and overweight can coexist within the same child across the life course, not only across different household members, complicating the interpretation of standard anthropometric indicators. Ramachandran and Snehalatha [14] further documented a broader rising burden of obesity across Asian populations at comparatively lower body mass index thresholds than Western populations, a finding with direct relevance to the interpretation of overweight and central obesity data among urban slum adults in India.

At the sub-national level, Menon et al. [15] used district-level decomposition analysis to show that the geographical burden of child stunting in India is shaped as much by household-level factors, including maternal nutrition and sanitation access, as by state-level averages, reinforcing the relevance of community-based, household-focused analysis of the kind undertaken in this paper. Aggregate global data compiled by international agencies [16,17,18] similarly confirm that India remains among the countries carrying the largest absolute burden of both child undernutrition and adult NCD risk factors simultaneously, underscoring the scale of the challenge documented at the community level.

Despite this substantial literature, comparatively few studies focus specifically on the intersection of dietary transition, lifestyle change, and the double burden within urban slum communities as a distinct population, as opposed to urban populations in general. This paper addresses that comparative gap.

MATERIALS AND METHODS

Study Design

This paper employs a narrative-analytical review design, synthesising peer-reviewed literature, national survey reports, and international agency guidance relevant to the double burden of malnutrition and NCD risk factors in urban slum populations.

Data Sources

Sources consulted include peer-reviewed epidemiological studies on nutrition transition and NCD risk in India; national survey reports, including the National Family Health Survey and the ICMR-INDIAB study; World Health Organization technical guidance on double-duty nutrition actions and the WHO STEPwise approach to NCD risk factor surveillance [19]; and comparative urban health literature addressing slum-specific dietary and lifestyle patterns.

Analytical Framework

A descriptive comparative framework was constructed to summarise reported ranges of

nutritional and NCD risk factor indicators among urban slum populations relative to general urban populations, drawing on patterns reported across the sources above.

Limitations of Method

As a narrative-analytical review, this paper does not present primary survey data collected through original field enumeration. The indicator ranges presented in the Results section are descriptive syntheses of patterns reported in the cited literature and should be read as illustrative of direction and approximate magnitude rather than as site-specific measured prevalence for any single named settlement.

RESULTS

Coexistence of Undernutrition and Overweight

Table 1 summarises reported ranges of key nutritional indicators reflecting the double burden pattern among urban slum populations. Child stunting and wasting persist at levels comparable to, or exceeding, rural averages in several studies, while adult overweight and obesity prevalence among the same populations approaches levels observed in wealthier urban groups. Anaemia among women and adolescent girls remains markedly elevated, reflecting continued micronutrient deficiency despite rising overall caloric intake.

Table 1. Nutritional indicators reflecting the double burden among urban slum populations

Nutritional Indicator	Approximate Prevalence Range (Adults)	Approximate Prevalence Range (Children/Adolescents)
Underweight / Undernutrition	15%–22%	Stunting 25%–35%; Wasting 15%–20%
Overweight / Obesity	20%–30%	8%–15%
Anaemia (Women/Adolescent girls)	45%–58%	40%–55%
Co-existence of stunting and overweight within same household	Not applicable	10%–18% of households

The co-existence of household-level stunting and overweight, reported in the final row of Table 1, is the clearest quantitative expression of the double burden phenomenon: households in which a young child is stunted while an adult member, typically the mother, is simultaneously overweight or obese. This pattern is consistent with a household food environment shaped by both economic constraint on diet quality for children and increasing access to energy-dense, low-nutrient foods for adults.

NCD Risk Factor Profile

Table 2 presents reported NCD risk factor prevalence among urban slum adults compared with general urban populations. Contrary to the assumption that NCD risk rises uniformly with affluence, several risk factors—including raised blood pressure, tobacco use, and low fruit and vegetable intake—were reported at levels equal to or higher than the general urban population, despite lower average household income in slum settings.

Table 2. NCD risk factor prevalence: urban slum adults versus general urban population

Risk Factor	Prevalence – Urban Slum Adults	Prevalence – General Urban Population
Raised blood pressure (≥140/90 mmHg)	25%–32%	20%–28%
Raised blood glucose / diabetes	12%–18%	10%–16%
Central/abdominal obesity	30%–40%	28%–38%
Low fruit and vegetable intake	60%–75%	45%–60%
Physical inactivity	30%–40%	35%–45%
Current tobacco use	28%–35%	18%–25%

The elevated prevalence of low fruit and vegetable intake and tobacco use among slum populations is particularly notable, as both are modifiable behavioural risk factors closely linked to affordability and local food/retail environment rather than to physical inactivity alone, which was reported at comparatively similar or slightly lower levels than the general urban population, possibly reflecting continued manual occupational activity among slum residents.

Policy and Programmatic Context in India

India's existing nutrition and NCD architecture has historically operated through parallel rather than integrated programme structures. The Integrated Child Development Services (ICDS) scheme and the Poshan Abhiyaan (National Nutrition Mission) primarily target maternal and child undernutrition, focusing on growth monitoring, supplementary nutrition, and micronutrient supplementation for children under six years and pregnant or lactating women. The National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) [20], by contrast, targets adult NCD screening and management through a separate delivery platform based largely at primary health centres and, more recently, Health and Wellness Centres under Ayushman Bharat.

This structural separation creates a practical gap for urban slum households in which both undernutrition and NCD risk are present simultaneously. A frontline worker visiting a household under the ICDS platform is typically oriented toward assessing the nutritional status of the child and mother during pregnancy or lactation, but is not routinely equipped or mandated to screen the same household's adult members, including fathers or grandparents, for blood pressure or blood glucose. Conversely, NPCDCS screening camps, where they reach slum populations at all, rarely incorporate child growth monitoring into the same encounter. The result is that a single household may be simultaneously enrolled, in a fragmented way, in two separate government programmes without either capturing the double burden pattern present within it.

Urban health delivery adds a further layer of complexity, since India's primary healthcare architecture was historically designed around rural Sub-Centres, PHCs, and CHCs, with urban primary care infrastructure developing considerably later through the National Urban Health Mission [21] and, subsequently, urban Health and Wellness Centres. Slum populations, despite residing within municipal boundaries, have frequently experienced weaker primary care coverage than either their rural or more affluent urban counterparts, a gap that compounds the double burden risk documented in this review by limiting opportunities for early detection of both undernutrition and NCD risk factors.

DISCUSSION

The pattern documented in this review is consistent with the broader nutrition transition literature: urban slum populations are not simply lagging behind wealthier urban groups in a linear progression from undernutrition to overnutrition, but are instead experiencing both processes concurrently. This has direct implications for programme design. Interventions targeting only child undernutrition risk overlooking the maternal and adult NCD risk present in the same household, while interventions targeting only NCD risk factors among adults risk overlooking continued child undernutrition in the same setting.

Dietary transition appears to operate through a specific mechanism in slum settings: constrained household budgets favour the substitution of traditional, nutrient-dense but time- and cost-intensive foods with cheaper, calorie-dense, processed alternatives, including refined grains, edible oils, and packaged snacks. This substitution increases caloric density without proportionately improving micronutrient adequacy, producing simultaneous risk of both micronutrient deficiency and excess caloric intake. Lifestyle factors, including reduced leisure-time physical activity linked to space constraints in dense urban settlements and increased screen-based sedentary behaviour, compound this dietary shift.

These findings support the World Health Organization's double-duty actions framework [11], which explicitly calls for nutrition programmes designed to address undernutrition and overnutrition/NCD risk within a single intervention architecture, rather than through parallel, uncoordinated vertical programmes.

A further dimension worth noting is the role of intergenerational transmission. Wells et al. [22] argue that early-life undernutrition, including intrauterine growth restriction and childhood stunting, is itself a risk factor for later-life metabolic disease, through mechanisms including altered fat distribution and reduced insulin sensitivity following periods of catch-up growth. If this pathway operates within urban slum populations, it implies that today's undernourished children may constitute

tomorrow's adult NCD burden, independent of any further deterioration in dietary quality. This intergenerational framing strengthens the case for early, integrated intervention rather than sequential, life-stage-separated programming, since undernutrition in early life and NCD risk in adulthood may be causally linked rather than merely co-occurring by coincidence of shared environment.

Recommendations

- Integrate growth monitoring for children with NCD risk factor screening for adult household members during community-based health worker visits in slum settings.
- Strengthen regulation of the marketing and availability of ultra-processed, energy-dense foods in and around urban slum settlements.
- Expand subsidised access to fresh fruit, vegetables, and pulses through targeted public distribution or urban nutrition support schemes.
- Incorporate NCD risk factor screening (blood pressure, blood glucose) into existing maternal and child health outreach platforms operating in slum communities.
- Design community-level physical activity promotion adapted to the spatial constraints typical of dense urban settlements.
- Train frontline health workers (ASHA/ANM) to recognise and counsel on double burden patterns within individual households, rather than treating undernutrition and NCD risk as unrelated conditions.

Limitations of the Study

This paper is a narrative-analytical review and does not present original primary data collected from a specific slum community. The indicator ranges presented in Tables 1 and 2 are descriptive syntheses of patterns reported in the cited literature and are intended to illustrate the direction and approximate scale of the double burden phenomenon rather than to represent measured prevalence in any specific, named settlement. Findings may vary considerably across cities and states given India's heterogeneous urban slum contexts, and dedicated primary field research is recommended to generate site-specific prevalence estimates.

CONCLUSION

Urban slum populations in India exemplify the double burden of malnutrition in its most concentrated form, combining persistent undernutrition and micronutrient deficiency with a rapidly emerging profile of NCD risk factors driven by dietary transition and lifestyle change. Addressing this burden effectively requires moving beyond single-condition nutrition and NCD programming toward integrated, household-level, double-duty interventions that recognise undernutrition and overnutrition as two expressions of the same underlying food and lifestyle environment.

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