Letters in Food Science & Technology

Ultra-Processed Foods and Rising Metabolic Diseases in Urban India: A Narrative Review

Dr. Mohamed Afzal Pasha, Ph. D.*
Professor (Retired), Department of Chemistry, Bangalore University, Bengaluru-560056, INDIA

*Present address: Chief-Editor, ESRA Publications Pvt. Ltd., Bengaluru-560094, INDIA
e-mail: chief.editoresra@gmail.com

ARTICLE INFO

Prepared 14th October 2026, www.esrapublications.com

Edited & Published 22nd October 2026

ABSTRACT

India has an estimated 101 million adults with diabetes, 136 million with prediabetes and 315 million with hypertension, and all metabolic non-communicable diseases except prediabetes are more frequent in urban than rural areas. At the same time, ultra-processed foods (UPFs), defined by the NOVA classification as industrial formulations made largely from ingredients of exclusive industrial use, have grown rapidly in Indian markets. This narrative review examines whether the rise of UPFs is a plausible contributor to urban India's metabolic epidemic. Retail sales of UPFs grew at a compound annual rate of 13.37% between 2011 and 2021, and urban household purchases rose by 6% between 2013 and 2016. Evidence from outside India is substantial: An inpatient randomised trial showed that a UPF diet increased energy intake by about 500 kcal/day and caused weight gain, and a BMJ umbrella review found convincing evidence for associations with type 2 diabetes and cardiovascular mortality, although these are observational. Indian evidence is thinner. It consists of national survey data, purchase and sales analyses, small trials of related dietary exposures and one school-based trial that reduced adolescents' UPF intake; No large prospective Indian cohort linking NOVA-defined UPF intake to incident diabetes were found. India's metabolic risk is also strongly linked to refined staple carbohydrates, which are not UPFs. Herein, mechanisms, current policy responses, including the 2024 dietary guidelines, taxation changes and the unfinished debate on front-of-pack warning labels, and priority research gaps are outlined. UPFs are a credible and modifiable risk factor in urban India, but they are one part of a wider dietary transition.

Key words: ultra-processed foods; NOVA classification; type 2 diabetes; obesity; urban India; nutrition transition; front-of-pack labelling.

.

1. Introduction

India's metabolic disease burden is now among the largest in the world. The ICMR-INDIAB national survey of 113,043 adults aged 20 years and older in 31 states and union territories estimated that 11.4% had diabetes, 15.3% prediabetes, 35.5% hypertension, 28.6% generalised obesity, 39.5% abdominal obesity and 81.2% dyslipidaemia; this corresponds to 101 million people with diabetes and 136 million with prediabetes in 2021 [1]. All of these conditions except prediabetes were more frequent in urban than in rural areas [1].

Many factors drive this epidemic, including genetic susceptibility, physical inactivity and an ageing population. Diet is one of the most modifiable. Indian dietary habits have changed rapidly, and attention has turned to industrially formulated products that are cheap, convenient, long-lasting and hyper-palatable. The NOVA classification groups these products as ultra-processed foods [2]. This review asks three questions: how fast are UPFs growing in urban India, what is the evidence that they contribute to metabolic disease, and what should be done. It is a narrative review. Most causal evidence comes from other populations, and we say so wherever it matters.

2. What Are Ultra-Processed Foods?

NOVA classifies foods by the extent and purpose of industrial processing into four groups (Table 1). Ultra-processed foods are defined as industrial formulations of ingredients, mostly of exclusive industrial use, produced through a series of processes that include fractionation of whole foods, chemical modification, assembly of ingredients, frequent use of cosmetic additives and sophisticated packaging. They are designed to be profitable, convenient and hyper-palatable, and are liable to displace other NOVA food groups, notably unprocessed or minimally processed foods [2].

Copyright: The author © 2026. This is an open-access article distributed under Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Table 1. The NOVA food classification, with illustrative Indian examples. The definitions follow ref [2]; the examples are the author's illustration.

NOVA group	Definition	Indian examples
1. Unprocessed or minimally processed	Foods as obtained from plants or animals, with minimal processing such as cleaning, drying or pasteurisation [2]	Fresh vegetables and fruit, rice, whole-wheat atta, pulses, millets, milk, eggs, fresh fish
2. Processed culinary ingredients	Substances from group 1 or from nature, used in kitchens to prepare and cook foods [2]	Cooking oils, ghee, sugar, jaggery, salt
3. Processed foods	Group 1 foods made more durable or palatable by adding group 2 ingredients [2]	Salted nuts, pickles, simple cheese, freshly made bread
4. Ultra-processed foods	Industrial formulations, often with cosmetic additives, designed to be convenient, profitable and hyper-palatable [2]	Instant noodles, packaged chips and namkeen, sweet biscuits, sweetened beverages, ready-to-eat mixes, breakfast cereals

Applying NOVA in India raises practical problems. A mapping study found that India has no uniform definition of UPFs, so terms such as junk food, fast food, instant food and foods high in fat, sugar and salt are used interchangeably. A scan of the labels of 375 brands in an online grocery retailer confirmed 81 food items as ultra-processed [3]. The concept itself is also contested. Its proponents argue that the evidence is already sufficient to advise avoiding UPFs [4], whereas critics argue that the category is a blunt instrument that groups together foods of very different nutritional value and that identical dishes may be classified differently depending on whether they are made at home or in a restaurant [5].

3. The Rise of Ultra-Processed Foods in Urban India

Globally, sales of UPFs are highest in high-income regions but growing rapidly in Asia, the Middle East and Africa, a change linked to the industrialisation of food systems, globalisation and the market power of transnational food corporations [6]. In Asia, the grocery retail sector is considered the most important driver of food-system change and rising UPF sales [7].

In India, a report by the World Health Organization and ICRIER found that UPF retail sales value grew at a compound annual rate of 13.37% between 2011 and 2021. Growth slowed from 12.65% in 2019 to 5.50% in 2020 during the pandemic and rebounded by 11.29% in 2020–21. The leading categories were chocolate and sugar confectionery, salty snacks, beverages, ready-made and convenience foods, and breakfast cereals, and salty snack sales rose at 16.78% a year [8]. A household panel covering 58,878 urban households found that three-quarters purchased more than ten processed food groups. UPF purchases averaged 6.4 kg per person in 2016, 6% more than in 2013, and purchases of sweet snacks and ready-to-eat foods grew in every consumption cluster [9]. Per capita sales of packaged and processed foods rose from US$26.3 in 2010 to US$59.8 in 2020 at constant prices, as cited in that study [9] (Figure 1).

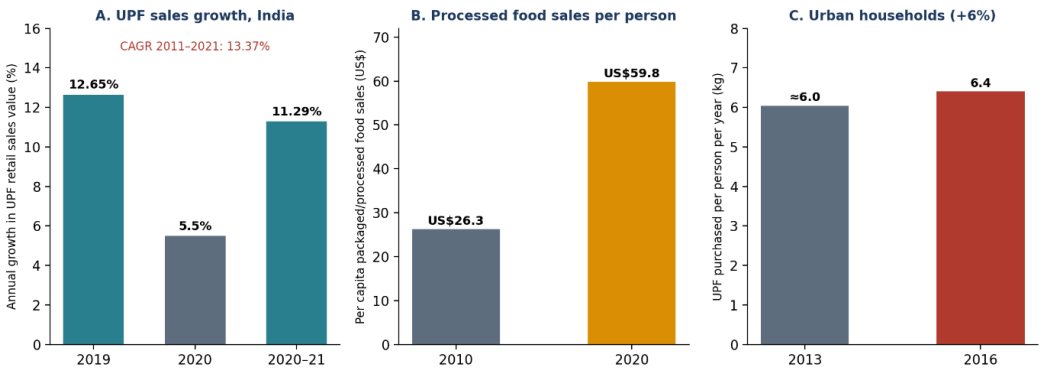


Figure 1. Growth of ultra-processed food (UPF) sales and purchases in India: (A). Year-on-year growth in UPF retail sales value [8]. (B). Per capita packaged and processed food sales at constant 2020 prices [9]. (C). UPF purchased per person in urban households; the 2013 value is derived from the reported 6% growth to 6.4 kg in 2016 [9]. Graphs are prepared from published values.

Two cautions apply. The absolute quantity of UPFs purchased remains low compared with other middle- and high-income countries, so the problem lies in the pace of change rather than the current level. And household panels measure purchases, not consumption, and exclude out-of-home eating [9]. Averages also hide inequality, because the highest-purchasing tenth of urban households bought more than three times as much processed food as the lowest group [9].

4. The Metabolic Disease Burden

Figure 2 summarises the national prevalence of metabolic diseases in ICMR-INDIAB-17. The authors noted that diabetes appears to be stabilising in the more developed states but is still increasing in most others [1]. The very large pool of people with prediabetes (136 million) is at once a risk and an opportunity for prevention.

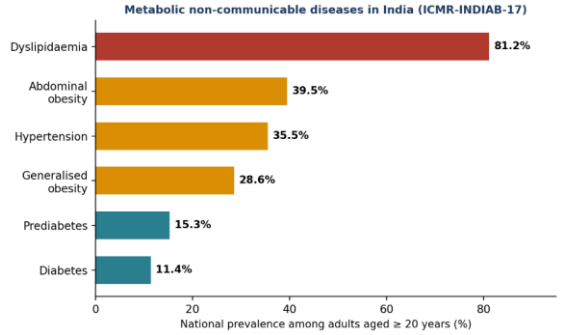


Figure 2. National prevalence of metabolic non-communicable diseases among adults in India, ICMR-INDIAB-17 [1]. All conditions except prediabetes were more frequent in urban than rural areas.

Diet is only part of the picture. A national analysis of dietary data from 18,090 adults (ICMR-INDIAB survey-21) found that Indian diets are characterised by high intakes of low-quality carbohydrates (white rice, milled whole grains and added sugar), high saturated fat and low protein. People with the highest carbohydrate intakes had higher odds of newly diagnosed type 2 diabetes (OR 1.30, 95% CI 1.14–1.47), prediabetes (OR 1.20), generalised obesity (OR 1.22) and abdominal obesity (OR 1.15) than those with the lowest [10]. This matters for interpretation: refined staple grains are not UPFs, yet they are linked to the same outcomes, so UPFs should be viewed as an additional and growing exposure within an already glycaemic-heavy diet.

5. Evidence Linking UPFs to Metabolic Disease

5.1 Randomised evidence

The strongest direct evidence is a randomised crossover trial in 20 weight-stable adults admitted to a clinical research centre. Participants received ultra-processed or unprocessed diets for 2 weeks each, with meals matched for presented calories, energy density, macronutrients, sugar, sodium and fibre, and were told to eat as much or as little as they wished. Energy intake was 508 ± 106 kcal/day higher on the UPF diet, driven by carbohydrate (+280 kcal/day) and fat (+230 kcal/day) but not protein, and participants gained 0.9 kg on the UPF diet and lost 0.9 kg on the unprocessed diet [11]. People also ate faster on the UPF diet [11]. The trial was small, short and conducted in the United States, so it shows a plausible mechanism for weight gain rather than the size of the effect in free-living Indians (Figure 3).

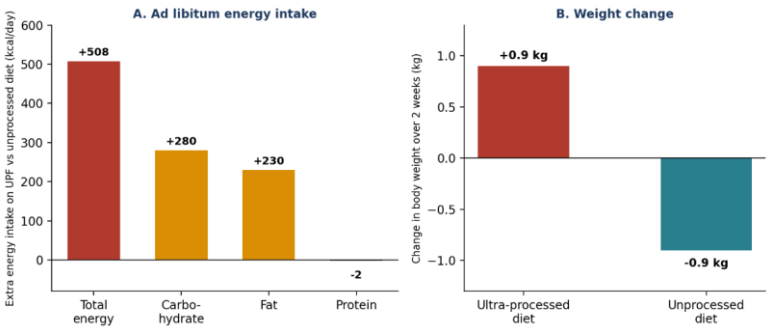


Figure 3. Results of the inpatient crossover trial of ultra-processed versus unprocessed diets (n = 20, 2 weeks per diet): (A). Extra energy intake on the ultra-processed diet. (B). Change in body weight. Redrawn from values in ref [11].

5.2 Cohort and meta-analytic evidence

A BMJ umbrella review of 14 meta-analyses and 45 pooled analyses found direct associations between UPF exposure and 32 (71%) of the health parameters examined. Convincing (class I) evidence supported associations with cardiovascular disease mortality (RR 1.50, 95% CI 1.37–1.63; GRADE very low), type 2 diabetes (dose-response RR 1.12, 1.11–1.13; moderate), anxiety (OR 1.48) and common mental disorders (OR 1.53) [12] (Figure 4). Evidence for several cardiometabolic risk factors, such as blood lipids, was more limited [12]. A Lancet series published in November 2025 concluded, from more than 100 prospective studies, meta-analyses, trials and mechanistic studies, that displacement of traditional dietary patterns by UPFs is a key driver of the rising global burden of diet-related chronic disease [13].

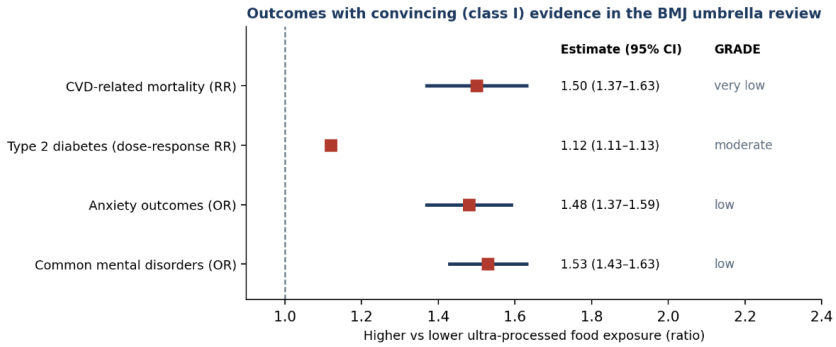


Figure 4. Outcomes with convincing (class I) evidence in the BMJ umbrella review of ultra-processed food exposure [12]. Squares show point estimates and lines 95% confidence intervals; GRADE certainty is shown on the right. All underlying studies are observational. Graph is prepared from published values.

5.3 Evidence from India

Indian evidence is thinner and indirect (Table 2). We found no large prospective Indian cohort that relates NOVA-defined UPF intake to incident diabetes, which is a major gap. What exists comes from four sources: national surveys of disease and diet [1,10], analyses of purchases and sales [8,9], small trials of related exposures, and one school-based trial. In a 12-week trial of 38 overweight or obese adults, a low-advanced glycation end product diet was associated with better insulin sensitivity and inflammatory markers than a high-AGE diet [14]. AGEs form during high-heat cooking such as frying and roasting, in traditional as well as industrial foods, so this trial informs the discussion of food processing but does not test UPFs as such. A cluster-randomised trial in 12 public schools in Chandigarh showed that an 11-session, 6-month programme reduced adolescents' UPF intake by 237 g/day (95% CI −435 to −38); parents' UPF intake did not change [15]. A nationwide survey cited in the trial report found that 36% of adolescents aged 10–19 years ate packaged salty snacks more than once a week and 22% drank sugar-sweetened beverages weekly [15].

Table 2. Key Indian studies relevant to ultra-processed foods and metabolic disease.

Study	Design and population	Key findings	Ref.
ICMR-INDIAB-17	113,043 adults, 31 states and union territories, urban and rural	Diabetes 11.4%, prediabetes 15.3%, hypertension 35.5%, generalised obesity 28.6%, abdominal obesity 39.5%, dyslipidaemia 81.2%; all but prediabetes more frequent in urban areas	[1]
ICMR-INDIAB survey-21	18,090 adults, national dietary data	Diets high in low-quality carbohydrate and saturated fat, low in protein; highest *vs* lowest carbohydrate intake: OR 1.30 for type 2 diabetes, 1.22 for generalised obesity	[10]
Tak et al., 2022	58,878 urban households, Kantar panel, 2013 and 2016	UPF purchase 6.4 kg per person in 2016 (+6%); sweet snack and ready-to-eat purchases rose in all clusters; salt purchases high	[9]
WHO–ICRIER report, 2023	Retail sales data, 2011–2021	UPF retail value CAGR 13.37%; salty snacks +16.78% a year	[8]
Ghosh-Jerath et al., 2024	Literature review and online scan of 375 brands	No uniform UPF definition in India; 81 food items confirmed as UPF	[3]
Bai et al., 2024	Randomised trial, 38 overweight or obese adults, 12 weeks	Low-AGE diet associated with better insulin sensitivity and inflammatory markers than high-AGE diet (AGE exposure, not UPF per se)	[14]
Kaur et al., 2026	Cluster-randomised trial, 12 schools, Chandigarh, grade 8	Adolescent UPF intake reduced by 237 g/day; no change in parents	[15]

5.4 Interpreting the evidence

Several caveats apply. First, most epidemiological associations are observational and can be confounded by overall diet quality, socioeconomic position, physical activity and reverse causation. Second, the definition of UPF is broad, and the debate over whether NOVA identifies harm beyond nutrient profiles remains open [4,5]. Third, Indian risk is also tied to refined staple carbohydrates and low protein intake [10], and traditional fried foods and sweets made at home or by street vendors are not UPFs but share many of their nutritional features. Fourth, in India UPF intake is probably concentrated in affluent urban households [9], which are also the households with the most access to health care and to health information, so the relationship between UPFs and disease may differ by income. These points argue for caution about effect sizes, not against action: the consistency of the global evidence, the direct trial evidence on energy intake, and the speed of change in India together make UPFs a reasonable target.

6. Mechanisms

Several mechanisms may link UPFs to metabolic disease (Figure 5 and Table 3). The best-supported is excess energy intake: in the inpatient trial, participants ate faster and consumed about 500 kcal/day more on the UPF diet [11]. UPFs are characteristically energy-dense and high in salt, sugar and saturated fat and low in fibre and micronutrients [12], and they displace minimally processed foods from the diet [2,13]. In India, this displacement adds to a baseline diet already high in refined carbohydrate [10]. High-temperature processing generates advanced glycation end products, which in a small Indian trial were associated with worse insulin sensitivity and inflammation [14]. Additives such as emulsifiers altered the gut microbiota and promoted low-grade inflammation and metabolic syndrome in mice, but this has not been shown in humans [16].

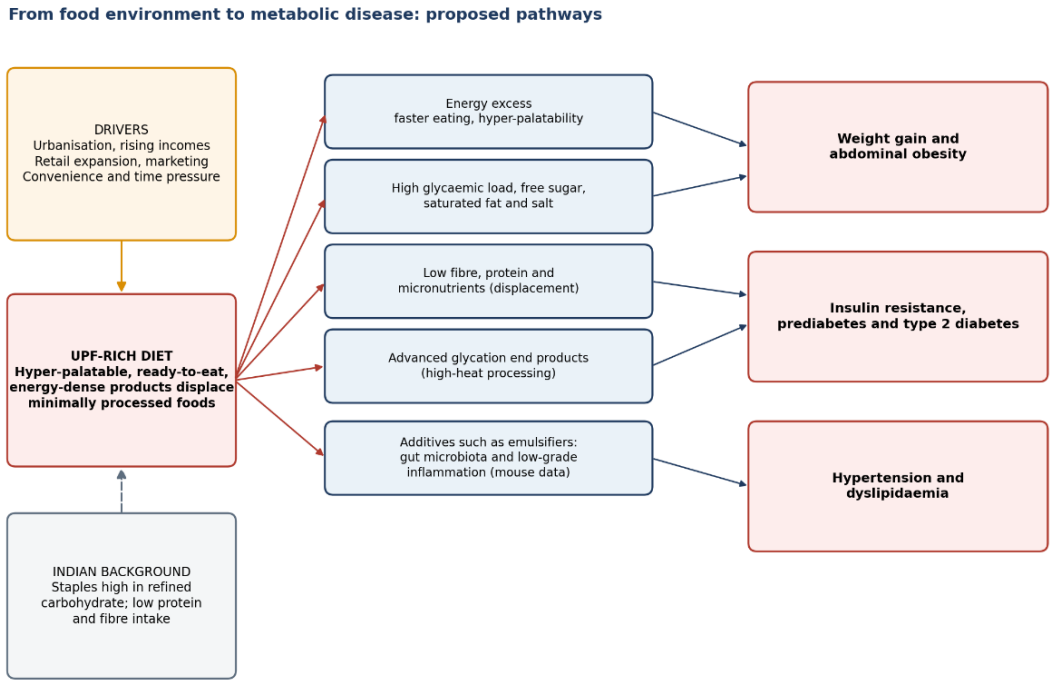


Figure 5. Proposed pathways from the changing urban food environment to metabolic disease. Solid arrows show pathways with human evidence for some steps; the emulsifier pathway rests on mouse data [16]. Scheme is prepared from refs [2,10–12,14,16].

Table 3. Proposed mechanisms linking ultra-processed foods to metabolic disease and the strength of the evidence.

Mechanism	Evidence	Strength and caveat	Ref.
Energy overconsumption	Randomised crossover trial: +508 kcal/day, faster eating, weight gain of 0.9 kg in 2 weeks	Human RCT; small and short	[11]
Poor nutrient profile	Higher energy, salt, sugar and saturated fat; lower fibre and micronutrients	Descriptive; varies within the UPF category	[12]
Displacement of minimally processed foods	National food surveys and sales data	Strong for diet quality; indirect for disease	[2,13]
Refined carbohydrate load	Highest vs lowest carbohydrate intake linked to type 2 diabetes (OR 1.30) in India	Observational; refined grains are not UPFs	[10]
Advanced glycation end products	Low-AGE vs high-AGE diet, 12 weeks, 38 adults	Small RCT; AGEs arise in many cooked foods	[14]
Emulsifiers and microbiota	Mice: low-grade inflammation and metabolic syndrome	Preclinical only	[16]

7. Policy Responses in India

The 2024 Dietary Guidelines for Indians, issued by ICMR-NIN, set out 17 guidelines, state that 56.4% of the disease burden in India is attributable to unhealthy diets, and advise minimising the consumption of ultra-processed foods and foods high in fat, sugar and salt [17].

Regulation has moved more slowly. A public-interest case on front-of-pack labelling has been before the Supreme Court, which urged the Food Safety and Standards Authority of India (FSSAI) in February 2026 to examine warning labels. In September 2026, FSSAI told the court that it would consider warning labels for products high in even one nutrient of concern rather than two or more [18]. On 28 September 2026 the court reserved its order, questioning FSSAI's proposed 365-day voluntary compliance period; FSSAI's proposal centred on a red hexagonal warning [19]. The position may have changed since these reports, and readers should check the latest orders.

Taxation changes in September 2025 sent mixed signals. From 22 September 2025, sugar-sweetened aerated and caffeinated drinks were placed in the 40% GST slab, but GST on packaged namkeen, bhujia, sauces, pasta, instant noodles, chocolates and cornflakes was cut from 12% or 18% to 5% [20]. The WHO–ICRIER report recommended a nutrient-based tax model with higher taxes on products high in fat, sugar and salt and lower taxes on healthier and reformulated options [8]. School-based programmes are a promising complement, as shown by the Chandigarh trial [15]. Table 4 and Figure 6 summarise the options.

Table 4. Policy levers for ultra-processed foods in India, as reported to October 2026.

Lever	Position in India	Comment	Ref.
Dietary guidelines	ICMR-NIN 2024: 17 guidelines; minimise UPFs and foods high in fat, sugar and salt; 56.4% of disease burden attributed to unhealthy diets	Advisory; not binding	[17]
Front-of-pack labelling	Supreme Court pressing FSSAI; FSSAI to consider warnings for any single nutrient of concern; order reserved on 28 September 2026; proposed red hexagon and 365-day voluntary period	Outcome pending; check latest orders	[18,19]
Taxation	Sweetened aerated and caffeinated drinks at 40% GST from 22 September 2025; many packaged snacks and instant foods cut to 5%	Mixed incentives; nutrient-based design suggested	[8,20]
School programmes	Cluster-randomised trial in Chandigarh reduced adolescent UPF intake	Single-city trial; scale-up untested	[15]
Surveillance and definitions	No uniform Indian UPF definition; 81 UPF items mapped	Needed for monitoring and regulation	[3]

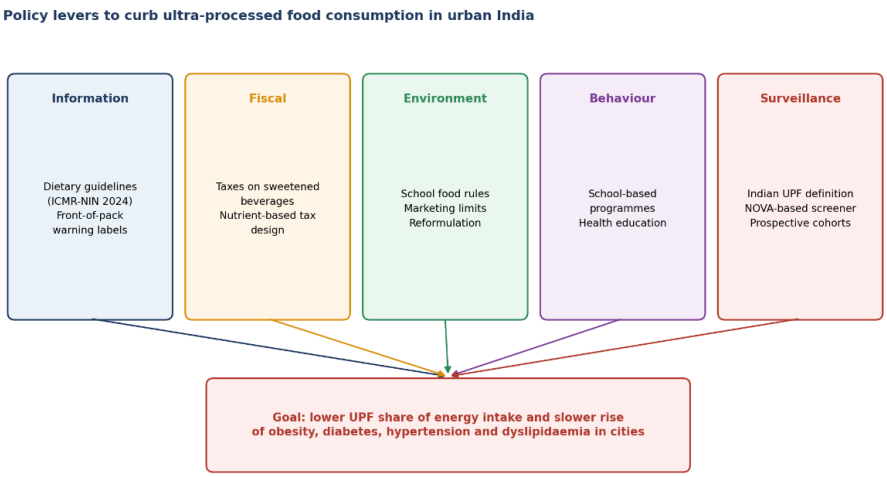


Figure 6. Policy levers to reduce ultra-processed food consumption in urban India, based on refs [3,8,15,17].

8. Research Gaps

Four gaps stand out. First, India needs prospective cohorts that measure UPF intake using NOVA-based tools and follow participants to incident diabetes, hypertension and cardiovascular disease; the mapping study [3] provides a starting list of Indian UPF categories. Second, purchase data should be complemented by individual-level dietary surveys that capture out-of-home eating, as current panels do not [9]. Third, trials are needed in Indian adults, not only adolescents, and should distinguish UPFs from refined staples and from home-fried foods [10,14]. Fourth, the analysis should separate harmful from neutral or beneficial products within the UPF category, which the NOVA debate has highlighted [5]. Evaluations of labelling and taxation, including the effect of the 2025 GST changes, will also be needed.

9. Conclusions

Ultra-processed foods are growing quickly in urban India, where metabolic disease is already most frequent. Global evidence, including a randomised feeding trial and large meta-analyses, supports a causal contribution to weight gain and associations with type 2 diabetes, but Indian evidence is limited and indirect, and India's metabolic risk is closely tied to refined staple carbohydrates. A balanced reading is that UPFs are a credible, modifiable and growing risk factor that deserves action now, through clear labelling, coherent taxation, school programmes and better surveillance, while research tests how large the Indian effect is. Action on UPFs should be part of, not a substitute for, a wider shift toward diets richer in minimally processed foods, pulses and vegetables.

Declarations

Use of Artificial Intelligence (AI): Artificial intelligence (AI) tools were used to assist in organizing, refining and presenting the information discussed in this narrative review. The use of these tools was intended to support the clarity, coherence and readability of the manuscript. The author has prepared, reviewed and edited the manuscript, the appropriate interpretation of the cited literature, the integrity of the scholarly content, and the final version submitted for publication. AI tools are not credited as authors.

Funding: No specific financial support was received from any public, commercial, or non-profit funding agency for the preparation of this narrative review.

Conflict of Interest: The author declares no conflict of interest that could have influenced the preparation, interpretation, or publication of this manuscript.

Ethics Approval: Not applicable. This article is a narrative review based on previously published literature and does not involve original research with human participants or animals.

Data Availability: No new datasets were generated or analyzed for this review. The information discussed in the manuscript is derived from previously published research and other sources cited in the text and reference list.

Consent to Participate and Consent to Publish: Not applicable, as this manuscript does not report original research involving human participants or identifiable personal information.

Author Note

This narrative review examines the increasing consumption of ultra-processed foods in urban India and discusses their potential associations with metabolic health concerns, including obesity, type 2 diabetes, cardiovascular risk factors, and related non-communicable diseases. It aims to synthesize relevant published literature, highlight dietary and lifestyle changes associated with urbanization, and discuss the implications for food science, nutrition education, public health awareness and future research.

References

1. Anjana RM, et al.; ICMR-INDIAB Collaborative Study Group. Metabolic non-communicable disease health report of India: The ICMR-INDIAB national cross-sectional study (ICMR-INDIAB-17). *Lancet Diabetes Endocrinol*., **2023**;11(7):474–489.
2. Monteiro CA, Cannon G, Levy RB, Moubarac JC, Louzada MLC, Rauber F, et al. Ultra-processed foods: What they are and how to identify them. *Public Health Nutr*., **2019**;22(5):936–941. doi:10.1017/S1368980018003762
3. Ghosh-Jerath S, Khandpur N, Kumar G, Kohli S, Singh M, Bhamra IK, et al. Mapping ultra-processed foods (UPFs) in India: A formative research study. *BMC Public Health*, **2024**;24. doi:10.1186/s12889-024-19624-1
4. Monteiro CA, Astrup A. Does the concept of "ultra-processed foods" help inform dietary guidelines, beyond conventional classification systems? YES. *American J Clin Nutr*., **2022**;116(6). doi:10.1093/ajcn/nqac122
5. Astrup A, Monteiro CA. Does the concept of "ultra-processed foods" help inform dietary guidelines, beyond conventional classification systems? NO. *American J Clin Nutr*., **2022**;116(6).
6. Baker P, Machado P, Santos T, Sievert K, Backholer K, Hadjikakou M, et al. Ultra-processed foods and the nutrition transition: Global, regional and national trends, food systems transformations and political economy drivers. *Obes Rev*., **2020**;21(12):e13126. doi:10.1111/obr.13126
7. Baker P, Friel S. Food systems transformations, ultra-processed food markets and the nutrition transition in Asia. *Global Health*, **2016**;12:80.
8. Mukherjee A, Mukhopadhyay D, Mukherjee E, et al. The growth of ultra-processed foods in India: An analysis of trends, issues and policy recommendations. New Delhi: World Health Organization Country Office for India, in collaboration with ICRIER; **2023**. ISBN 978-92-9021-067-2.
9. Tak M, Law C, Green R, Shankar B, Cornelsen L. Processed foods purchase profiles in urban India in 2013 and 2016: A cluster and multivariate analysis. *BMJ Open*, **2022**;12(10):e062254. doi:10.1136/bmjopen-2022-062254
10. Anjana RM, Sudha V, Abirami K, et al. Dietary profiles and associated metabolic risk factors in India from the ICMR-INDIAB survey-21. *Nat Med*. **2025** (published online 30 September 2025).
11. Hall KD, Ayuketah A, Brychta R, Cai H, Cassimatis T, Chen KY, et al. Ultra-processed diets cause excess calorie intake and weight gain: An inpatient randomized controlled trial of ad libitum food intake. *Cell Metab*., **2019**;30(1):67–77.e3. doi:10.1016/j.cmet.2019.05.008
12. Lane MM, Gamage E, Du S, Ashtree DN, McGuinness AJ, Gauci S, et al. Ultra-processed food exposure and adverse health outcomes: Umbrella review of epidemiological meta-analyses. *BMJ*., **2024**;384:e077310. doi:10.1136/bmj-2023-077310
13. Monteiro CA, Louzada MLC, Steele-Martinez E, Cannon G, Andrade GC, Baker P, et al. Ultra-processed foods and human health: The main thesis and the evidence. *Lancet*, **2025**;406(10520):2667–2684. doi:10.1016/S0140-6736(25)01565-X
14. Bai MR, Abirami K, Gayathri R, Vedantham S, Shobana S, Nagarajan LP, et al. Effect of low *vs* high dietary-advanced glycation end products on insulin-sensitivity and inflammatory-markers among overweight/obese Asian-Indian adults – A randomised controlled trial. *Int J Food Sci Nutr*., **2024**;75(8):835–845. doi:10.1080/09637486.2024.2405121
15. Kaur S, Kumar R, Kaur M, et al. School-based behaviour change intervention to reduce ultra-processed food consumption among adolescents: Evidence from a cluster-randomised controlled trial in India. *BMJ Glob Health*, **2026**;11(1):e020799.
16. Chassaing B, Koren O, Goodrich JK, Poole AC, Srinivasan S, Ley RE, et al. Dietary emulsifiers impact the mouse gut microbiota promoting colitis and metabolic syndrome. *Nature*, **2015**;519(7541):92–96. doi:10.1038/nature14232
17. ICMR-National Institute of Nutrition. Dietary Guidelines for Indians-2024. Hyderabad: ICMR-NIN; **2024**.
18. Bakshi GK. Will consider warning labels on foods high in any single nutrient of concern: FSSAI revises stand in Supreme Court. *LiveLaw*, 10 September **2026**.

19. Supreme Court reserves order on front-of-pack warning labels for packaged foods. *Arogya Legal*, 29 September **2026**.
20. Lakshmikumaran & Sridharan Attorneys. Impact of GST rate changes on the FMCG sector. New Delhi; 15 September **2025**.