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ULTRA-PROCESSED FOOD CONSUMPTION, NUTRITION TRANSITION, AND OBESITY: EPIDEMIOLOGICAL EVIDENCE AND PUBLIC HEALTH IMPLICATIONS FOR PAKISTAN

Ali Abbas[*1], Amina Arif[2], Fatima Ali[3], Khadija Jamal[4], Faisal Sheraz[5], Maryem Hussain[6], Laiba Shafique[7], Mirza Muhammad Baqir[8]

[1]*National Institute of Food Science and Technology, University of Agriculture Faisalabad.*
[2]*Department of Food science and Nutrition, Nur international University, Lahore*
[3]*National Institute of Food Science and Technology, University of Agriculture Faisalabad.*
[4]*Department of Nutrition and Health Promotion, University of Home Economics.*
[5]*Department of Food Science and Technology, The Islamia University of Bahawalpur.*
[6]*Department of Food safety and quality management, Forman Christian college and university, Lahore.*
[7]*Department of Food nutrition and agriculture sciences, Grand Asian University Sialkot.*
[8]*Department of Human Nutrition and Dietetics, Karakoram International University, Gilgit, Pakistan*

[1]alyabbas146@gmail.com, [2]aminaarif898@gmail.com, [3]fa0864869@gmail.com, [4]khadijajamal4002@gmail.com, [5]faisal.sheraz2972@gmail.com, [6]mryem.atif@gmail.com, [7]laibashafique45@gmail.com, [8]mirzabaqir0@gmail.com

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Corresponding Author: *
Ali Abbas

Abstract

The rapid globalization of the food systems has radically altered the global dietary tendencies, leading to the increase in consumption rates of ultra-processed foods (UPFs) characterized by high energy density, low nutrient content, and use of additives. This paper examines the origin and classification of UPFs using the NOVA model, their epidemiological links with obesity around the world, as well as the nutritional change that occurs in Pakistan. As per the evidence of multiple meta-analyses and randomized controlled clinical trials, high UPF intake is always associated with increased risks of obesity, type 2 diabetes, and metabolic illnesses. Socio economic changes, urbanization and heavy marketing have compounded the twin burden of malnutrition in Pakistan, as there has been an increased shift towards processed high caloric foods at the expense of traditional diets. This tendency is caused by gender roles, cultural norms, and free regulations. To help avert the increasing health risks associated with UPF intake, the report highlights the real dire need to apply multi-sectoral policy responses including taxation, marketing restrictions and encouragement of conventional diets. The research provides an in-depth understanding of how the underdeveloped nations such as Pakistan are directly impacted on health by food processing rates by combining information that prevails around the world and that prevails locally.

1. INTRODUCTION

Ultra-processed foods (UPFs) replaced fresh or less processed meals in the second half of the 20th century, causing a profound shift in the diet of Western people (de Castro, B. A., 2025). This "nutrition transition" has subsequently expanded around the world and is now a major factor in the

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rise in non-communicable diseases (NCDs), especially the obesity epidemic.

UPFs are made primarily from food-derived ingredients and contain very little whole food. They are energy-dense, reasonably priced, and quite tasty. In addition to their low nutritional value, certain studies point to the possible carcinogenic content of ultra-processed foods, including heterocyclic amines, polycyclic aromatic hydrocarbons, and packaging pollutants as biphenyl reported by S. Shu et al. (2023). Obesity, type 2 diabetes, and cardiovascular illnesses are among the chronic diseases that are significantly influenced by diet. It has been hypothesized that the obesity pandemic and subsequent rise in other comorbidities are primarily caused by a shift in diet toward a greater consumption of energy-dense convenience foods that are higher in sugar, salt, and unhealthy fats, as well as a decrease in physical activity (Popkin and Ng, 2022).

A growing body of research indicates that the processing methods used on many of the foods found in supermarkets today may be just as harmful as consuming excessive amounts of sugar, salt, and fat (Elizabeth et al., 2020; Monteiro et al., 2013). This is in contrast to traditional nutritional epidemiology, which has concentrated on single food groups (fast food, processed meat) or specific nutrients (sugar-sweetened beverages) and their association with chronic disease (Gropper, 2023; Neuenschwander et al., 2019). This shift in focus has been made simpler by the development of the NOVA categorization system, which provides a unified framework for analyzing the relationship between food processing and public health.

2. Ultra-Processed Foods and the NOVA Classification

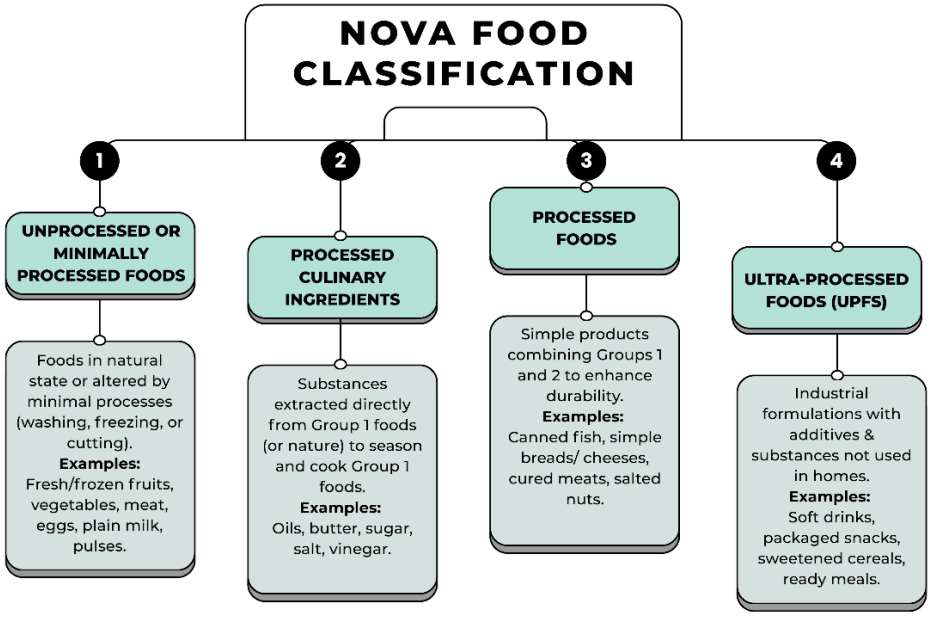

Figure 1: NOVA Food Classification

The NOVA classification method, created by researchers at the University of São Paulo in Brazil, is used to categorize all foods and food products based on the degree and intent of industrial processing (Monteiro et al., 2018). NOVA, which is not an acronym, established a new paradigm by focusing on the characteristics of the food product rather than specific nutrients.

The main characteristic of UPFs (Group 4) is the use of industrial methods such as molding and extrusion, together with food ingredients and chemicals that are purposefully made to produce long shelf-life and hyper palatability, which

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encourage overconsumption (Elizabeth et al., 2020).

3. Global Epidemiology of Ultra-Processed Food Consumption and Obesity

The global obesity epidemic's exponential growth is reflected in the rise in UPF consumption. High consumption of UPFs has been consistently and robustly linked to an increased risk of overweight and obesity, according to epidemiological research carried out on several continents.

3.1. UPF Consumption Trends

The proportion of total energy intake derived from UPFs varies globally but is substantial in many regions. In both the US and the UK, ultra-processed foods (UPFs) such fast food, soft drinks, packaged snacks, prepared meals, and sweetened cereals account for more than half of the calories consumed by adults and children. Studies by Touvier et al. (2023) and Marino et al. (2021) indicate that UPFs make up roughly 58% of the daily energy intake of people in these nations. This indicates that the majority of foods consumed in the US and the UK are highly processed rather than fresh or minimally processed, which over time may have detrimental impacts on health.

Ultra-processed foods (UPFs) nevertheless make up a significant amount of people's diets, making up over 36% of their daily caloric intake, even in nations like France that are recognized for having healthier, more traditional diets. This increasing dependence on UPFs is associated with an increased risk of chronic conditions like diabetes, obesity, and heart disease (Julia et al., 2018). In other words, the detrimental health effects of rising UPF consumption are being observed even in countries with strong culinary traditions focused on natural and fresh products.

People in developing and recently industrialized nations are beginning to consume more ultra-processed foods (UPFs) more quickly than in the past. UPFs are now more readily available, more affordable, and more convenient than fresh fruits, vegetables, and other natural foods as cities increase (urbanization) and international food corporations enter new markets (globalization of food systems). Popkin and Ng (2022) claim that this quick change in eating patterns is changing diets in these countries and causing an increase in health issues including obesity and chronic illnesses.

3.2. Evidence Linking UPFs to Weight Gain

Multiple meta-analyses of prospective cohort studies provide compelling evidence of the UPF-obesity link. According to an umbrella review, found strong and consistent evidence that people who eat more ultra-processed foods (UPFs) have a higher risk of dying from any cause (all-cause mortality). The review also showed that those with greater UPF intake are 1.4 times more likely to develop Type 2 diabetes compared to those who consume less. In simple terms, eating a lot of UPFs can significantly increase the chances of developing serious health problems and may shorten lifespan (Lv et al., 2024).

This means that in a carefully controlled experiment (randomized controlled trial), researchers found that when people were allowed to eat as much as they wanted (ad libitum), those who followed a diet made up of ultra-processed foods (UPFs) ended up eating about 500 more calories every day than those who ate minimally processed foods. As a result, the participants on the UPF diet gained a noticeable amount of weight in just two weeks. This study (Hall et al., 2019) provides direct evidence that ultra-processed foods can lead to overeating and rapid weight gain, even over a short period.

The risk of being overweight or obese increases dramatically for every 10% increase in ultra-processed foods (UPFs) in an individual's diet, according to long-term research (prospective studies). In other words, over time, even a slight increase in UPF consumption can have a significant effect on an individual's body weight. This demonstrates the substantial correlation between increased UPF consumption and the risk of obesity and weight gain (Liang et al., 2025).

3.3. Mechanisms of Action

The mechanisms by which UPFs drive weight gain and obesity are multi-faceted and extend beyond simply high caloric content:

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3.3.1 Hyperpalatability and Energy Density: According to Elizabeth et al. (2020), UPFs are scientifically manufactured with optimal combinations of fat, sugar, and salt to achieve a "bliss point," which makes them seductive and promotes overeating and quick consumption.

3.3.2 Satiety and Fiber Deficiency: They frequently lack protein and fiber, which are essential nutrients for encouraging fullness. The body's capacity to communicate fullness is hampered and calorie intake is accelerated as a result of decreased chewing effort and digestion (Hall et al., 2019).

3.3.3 Food Matrix Disruption: The food matrix, which is their natural structure, is broken down through significant industrial processing. The body absorbs nutrients like sugars and fats in the digestive system more quickly and easily as a result of this disturbance. Because of this, consuming these highly processed foods may result in abrupt increases in insulin and blood sugar levels (also referred to as glycemic and insulin-emic responses). These quick gains may eventually lead to weight gain and an increased risk of metabolic disorders like diabetes. (Zhao et al., 2019).

3.3.4 Additives and Gut Microbiome: The population of beneficial bacteria that live in our intestines is known as the gut microbiome, and researchers are looking into how some additives that are frequently present in ultra-processed foods (UPFs), such emulsifiers and artificial sweeteners, can harm it. These substances may upset the delicate balance of intestinal flora, resulting in inflammation, issues with metabolism, and difficulties controlling weight. In other words, by changing intestinal health, the chemicals added to UPFs to enhance texture, taste, or shelf life may also be linked to health problems like obesity and metabolic illnesses. (Whelan et al., 2024).

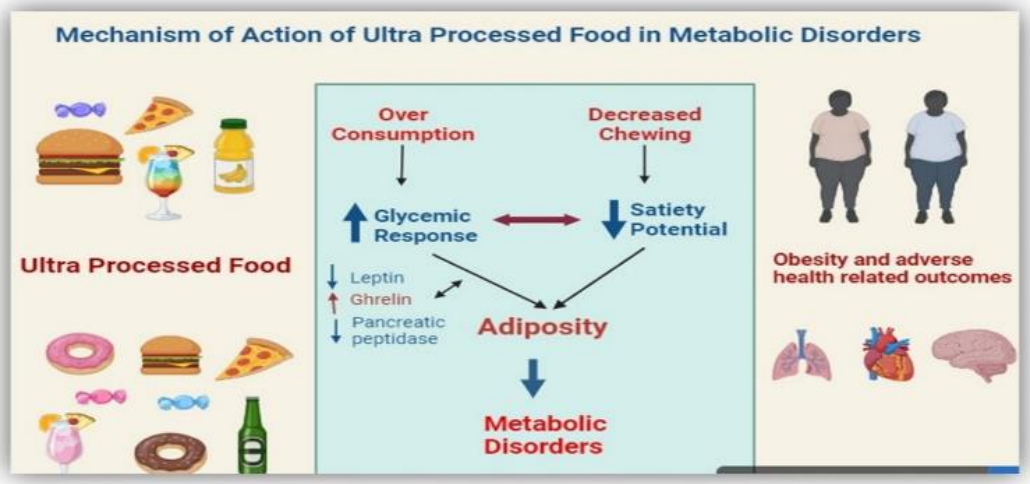

Figure 2: Ultra-processed Food in Metabolic Disorders

4 The contribution of Ultra-Processed Foods to Obesity in Pakistan.

High rates of undernutrition and stunting coexist with quickly increasing rates of overweight and obesity in Pakistan as a result of the country's fast dietary change (Gao et al., 2019). The latter development is mostly due to the penetration of UPFs.

4.1 Dietary Pattern in Pakistan

The main components of the traditional Pakistani diet include unprocessed or minimally processed foods (NOVA Group 1), such as rice, whole wheat flatbreads (roti), legumes (daal), and fresh vegetables, which are frequently made with

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processed culinary ingredients (NOVA Group 2), such as mustard oil and ghee. (Sarfaraz, 2015). However, key shifts are evident:

Urbanization and Convenience: Convenient, ready-to-eat foods are in greater demand as more people relocate to cities and family lifestyles become busier. Many people prefer ultra-processed foods (UPFs), which are quick and simple to make, over conventional, home-cooked meals since they have less time to cook at home. According to Rani et al. (2024), the consumption of processed and packaged foods in daily diets has significantly increased due to this change brought about by urbanization and contemporary life patterns.

Shift in Cereals: More refined grains like wheat and white rice are replacing traditional grains like millet, sorghum, and other coarse cereals. Simultaneously, mass-produced baked goods such as biscuits, packaged bread, and other refined grain products have become commonplace in people's diets. These items are categorized as ultra-processed foods (UPFs) under NOVA Group 4. Reynolds (2021) claims that this change reflects a transition away from conventional, nutrient-rich grains and toward more processed, unhealthy choices that worsen diet quality and raise health risks.

Rise of Commercial Snacks: a significant rise in the availability and consumption of commercial snack foods and beverages, including chips, instant noodles, soft drinks, and sugary candies. Local and international businesses that manufacture ultra-processed foods (UPFs) are primarily responsible for this expansion. According to Baker (2020), the quick growth of these UPF producers has made these snacks broadly accessible, actively promoted, and very alluring, which has led to a significant change in eating patterns and a rise in the intake of unhealthy foods globally.

4.2. How UPFs Contribute to Obesity

The mechanisms identified globally are amplified by local economic and social conditions in Pakistan:

Affordability and Marketing: Ultra-processed foods (UPFs) are often marketed and sold in ways that portray them as desirable, contemporary, and reasonably priced. These foods are frequently seen as status symbols or practical choices in nations like Pakistan, particularly among younger urban dwellers and low-income families who need to acquire the most energy for the least amount of money. UPFs become more alluring than conventional, healthier foods because they are inexpensive, easily accessible, and frequently advertised. Increased UPF consumption and obesity are mostly caused by this marketing approach and affordability. (Fatima et al., 2022).

Displacement of Traditional Foods: The bulk and fiber content of a conventional snack (such a handful of chickpeas or a piece of fruit) can be swiftly replaced by the calorie density of a single UPF snack (like a bag of chips or a soft drink), greatly reducing the diet's overall nutritional quality. (Safdar et al., 2013).

Prevalence of Soft Drinks: Pakistan has one of the highest per capita consumption rates of sugar-sweetened beverages in the region, a prime example of a UPF strongly linked to visceral fat accumulation and metabolic syndrome, critical antecedents to obesity (Ahmad et al., 2019).

Consequently, the prevalence of overweight and obesity in Pakistan has surged, particularly among urban and middle-to-high-income adults and adolescents (Engelgau et al., 2011).

5 Socioeconomic and Cultural Factors Affecting Ultra-Processed Consumption in Pakistan

UPF consumption in Pakistan is heavily influenced by a confluence of non-nutritional factors:

Income Gradient: Although UPFs were first used by metropolitan residents with higher incomes, their aggressive pricing and single-serving packaging have made them quite affordable for low-income populations, thereby making the least nutritious sources of calories the most affordable. (Bhagtani, et al., 2025).

Media and Advertising: Nutritional literacy initiatives are overshadowed by advertising campaigns that heavily target children and teenagers and portray UPFs as icons of modernity and happiness. (Potvin et al., 2019).

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Gender Roles and Time Poverty: UPFs provide a quick solution to the requirement for quick, ready-to-serve meals for women entering the workforce, frequently making up for less time available for traditional meal preparation (Manzoor et al., 2022). In households with limited time, UPF acceptability is heavily influenced by this convenience factor.

Lack of Regulation: The UPF industry can grow with little regulation since there is less regulatory control of food labeling, marketing aimed for youngsters, and the use of additives than in industrialized countries. (Baker et al., 2020).

6. Policy Interventions and Strategies to Reduce UPF Consumption

In order to effectively address the increasing health issues brought on by ultra-processed foods (UPFs), action must be taken at several levels, including through broad, coordinated policies including several sectors like health, agriculture, education, and commerce, in addition to individuals making better choices. By increasing access to better foods, controlling the marketing of UPFs, and motivating food firms to create more nutrient-dense options, for instance, the total food environment is to be altered. To put it another way, systemic adjustments are necessary to reduce UPF consumption rather than depending only on individual knowledge or willpower.

6.1. Economic Policies

Taxes on products defined by the NOVA classification, particularly UPFs, are a highly effective intervention:

Sugar-Sweetened Beverage (SSB) Taxes: Taxing sugar-sweetened beverages (SSBs), such as energy drinks, soft drinks, and sweetened juices, has been shown to be a successful strategy for reducing consumption. Sugary drinks become more costly as a result of these tariffs, which discourages consumers—particularly those with low incomes—from purchasing them. Governments can also utilize the money collected from these levies to support public health efforts, such campaigns to prevent diabetes and obesity or to promote healthy eating. (Gortmaker et al., 2011).

Differential Taxation: apply varying tax rates to different food goods according to their level of processing or unhealthiness. Manufacturers are incentivized to reformulate their products to make them less processed or more nutrient-dense by levying higher taxes on ultra-processed (UPF) foods, such as packaged snacks, sweets, and other sugary or fatty products, and lower taxes on healthy ones. This differential taxing approach has the potential to influence consumer and producer behavior in favor of healthier food options. (Swinburn et al., 2019).

6.2. Regulatory Measures

Front-of-Pack (FOP) Warning Labels: Healthy decisions can be made with the help of mandatory, straightforward, high-visibility FOP warning labels (such as "High in Sugar," "High in Sodium"), which are based on nutrient thresholds and don't require in-depth food expertise. (Cabrera et al., 2017).

Marketing Restrictions: Protecting vulnerable populations requires a strict ban on UPF marketing and advertising targeted at minors on all media platforms, including digital, social media, television, and educational institutions. (Elaine Q. Borazon et al., 2024).

6.3. Food Environment and Supply Chain Strategies

Procurement Policies: In order to create a healthier default environment, government and institutional policies (schools, hospitals) must promote minimally processed foods (NOVA Group 1) in their food purchase.

Support for Traditional Diets: Healthy choices can become more competitive with low-cost UPFs by supporting or encouraging the production and consumption of traditional, minimally processed meals and bolstering local food markets (Popkin, et al., 2021).

7. Conclusion

The impact of ultra-processed foods (UPFs) in Pakistan is indicative of a developing public health problem, since they have become a significant contributor to the global obesity crisis. The NOVA categorization emphasizes how important food processing is in impacting health outcomes, going

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beyond simple nutrient composition. High UPF consumption is strongly associated with obesity, diabetes, and cardiovascular problems, according to both local and international research. UPF has taken the place of traditional, nutrient-rich meals in Pakistan due to the country's fast urbanization, changing lifestyles, and lax food regulations. Comprehensive policy action is necessary to change this trajectory. Clear front-of-pack warning labels, differential pricing on high-UPF items, and levies on sugar-sweetened beverages are examples of fiscal policies that can lower consumption and promote sector transformation. Additionally, Enhancing nutrition equity also requires supporting traditional eating practices and bolstering regional food systems. In addition to raising individual awareness, institutional changes aimed at manufacturing, marketing, and accessibility are necessary to combat obesity linked to UPF. In order to ensure long-lasting changes in nutritional health, future research should concentrate on localized interventions to adapt global policy models to South Asian contexts.

References

1. de Castro, B. A. (2025). Consumption of Ultra-Processed Foods in the US: Exploring Interventions and Associations With Adolescent Excess Weight, Healthcare Visits, and Health Policy (Doctoral dissertation, The University of North Carolina at Charlotte).
2. Shu L, Zhang X, Zhu Q, Lv X, Si C. Association between ultra-processed food consumption and risk of breast cancer: a systematic review and dose-response meta-analysis of observational studies. Front Nutr. 2023 Sep 4;10:1250361. doi: 10.3389/fnut.2023.1250361. PMID: 37731393; PMCID: PMC10507475.ju
3. Popkin, B. M., & Ng, S. W. (2022). The nutrition transition to a stage of high obesity and noncommunicable disease prevalence dominated by ultra-processed foods is not inevitable. Obesity reviews, 23(1), e13366.
4. Gropper, S. S. (2023). The role of nutrition in chronic disease. Nutrients, 15(3), 664.
5. Neuenschwander, M., Ballon, A., Weber, K. S., Norat, T., Aune, D., Schwingshackl, L., & Schlesinger, S. (2019). Role of diet in type 2 diabetes incidence: umbrella review of meta-analyses of prospective observational studies. bmj, 366.
6. Elizabeth, L., Machado, P., Zinöcker, M., Baker, P., & Lawrence, M. (2020). Ultra-processed foods and health outcomes: a narrative review. Nutrients, 12(7), 1955.
7. Monteiro, C. A., Moubarac, J. C., Cannon, G., Ng, S. W., & Popkin, B. (2013). Ultra-processed products are becoming dominant in the global food system. Obesity reviews, 14, 21-28.
8. Monteiro, C. A., Cannon, G., Moubarac, J. C., Levy, R. B., Louzada, M. L. C., & Jaime, P. C. (2018). The UN Decade of Nutrition, the NOVA food classification and the trouble with ultra-processing. Public health nutrition, 21(1), 5-17.
9. Elizabeth, L., Machado, P., Zinocker, M., Baker, P., & Lawrence, M. (2020). Ultra-Processed Foods and Health Outcomes: A Systematic Review of the Evidence. Current Developments in Nutrition, 4(8), 1-13.
10. Marino M, Puppo F, Del Bo' C, Vinelli V, Riso P, Porrini M, Martini D. A Systematic Review of Worldwide Consumption of Ultra-Processed Foods: Findings and Criticisms. Nutrients. 2021 Aug 13;13(8):2778. doi: 10.3390/nu13082778. PMID: 34444936; PMCID: PMC8398521.
11. Touvier, M., da Costa Louzada, M. L., Mozaffarian, D., Baker, P., Juul, F., & Srour, B. (2023). Ultra-processed foods and cardiometabolic health: public health policies to reduce coCite
12. Julia C, Martinez L, Allès B, Touvier M, Hercberg S, Méjean C, Kesse-Guyot E. Contribution of ultra-processed foods in the diet of adults from the French NutriNet-Santé study. Public Health Nutr. 2018 Jan;21(1):27-37. doi: 10.1017/S1368980017001367.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

13. Popkin, B. M., & Ng, S. W. (2022). The nutrition transition to a stage of high obesity and noncommunicable disease prevalence dominated by ultra-processed foods is not inevitable. Obesity reviews, 23(1), e13366.
14. Lv, J. L., Wei, Y. F., Sun, J. N., Shi, Y. C., Liu, F. H., Sun, M. H., ... & Zhao, Y. H. (2024). Ultra-processed food consumption and metabolic disease risk: an umbrella review of systematic reviews with meta-analyses of observational studies. Frontiers in nutrition, 11, 1306310.
15. Hall, K. D., Ayuketah, A., Brychta, R., Cai, H., Cassimatis, T., Chen, K. Y., ... & Zhou, M. (2019). Ultra-processed diets cause excess calorie intake and weight gain: an inpatient randomized controlled trial of ad libitum food intake. Cell metabolism, 30(1), 67-77.
16. Liang, S., Zhou, Y., Zhang, Q., Yu, S., & Wu, S. (2025). Ultra-processed foods and risk of all-cause mortality: an updated systematic review and dose-response meta-analysis of prospective cohort studies. Systematic reviews, 14(1), 53.
17. Elizabeth, L., Machado, P., Zinöcker, M., Baker, P., & Lawrence, M. (2020). Ultra-processed foods and health outcomes: a narrative review. Nutrients, 12(7), 1955.
18. Hall, K. D., Ayuketah, A., Brychta, R., Cai, H., Cassimatis, T., Chen, K. Y., ... & Zhou, M. (2019). Ultra-processed diets cause excess calorie intake and weight gain: an inpatient randomized controlled trial of ad libitum food intake. Cell metabolism, 30(1), 67-77.
19. Zhao, L. G., Zhang, Q. L., Liu, X. L., Wu, H., Zheng, J. L., & Xiang, Y. B. (2019). Dietary protein intake and risk of type 2 diabetes: a dose–response meta-analysis of prospective studies. European journal of nutrition, 58(4), 1351-1367.
20. Whelan, K., Bancil, A. S., Lindsay, J. O., & Chassaing, B. (2024). Ultra-processed foods and food additives in gut health and disease. Nature Reviews Gastroenterology & Hepatology, 21(6), 406-427.
21. Gao, L., Bhurtyal, A., Wei, J., Akhtar, P., Wang, L., & Wang, Y. (2020). Double burden of malnutrition and nutrition transition in Asia: a case study of 4 selected countries with different socioeconomic development. Advances in Nutrition, 11(6), 1663-167
22. Sarfraz, J. (2015). Food and eating practices in multigenerational, Pakistani, Muslim families living in Edinburgh; a qualitative study.
23. Rani, R., Karmakar, P., Kaur, S., & Davis, C. Nutrition and Other Associated Benefits of Ready-to-Eat Foods. In Recent Advances in Ready-to-Eat Food Technology (pp. 162-183). CRC Press.
24. Reynolds, A. (2023). 23 Food Groups. Essentials of Human Nutrition 6e, 393.
25. Baker, P., Machado, P., Santos, T., Sievert, K., Backholer, K., Hadjikakou, M., ... & Lawrence, M. (2020). Ultra-processed foods and the nutrition transition: Global, regional and national trends, food systems transformations and political economy drivers. Obesity Reviews, 21(12), e13126.
26. Fatima, K., Bano, A., Dojki, S. S., Shams, N., Khan, S., Erum, S., & Ayub, B. (2022). Trends and Factors contributing Ultra Processed Food Consumption among pregnant women visiting tertiary care private center in Karachi: A Cross-sectional study. Journal of Nurses and Midwives Pakistan, 2(1), 24-34.
27. Safdar, N. F., Bertone-Johnson, E., Cordeiro, L., Jafar, T. H., & Cohen, N. L. (2013). Dietary patterns of Pakistani adults and their associations with sociodemographic, anthropometric and life-style factors. Journal of nutritional science, 2, e42.
28. Ahmed, A., Imran, A., R. Wei, C., Nadeem, R., Shankar, A., Balaji, J., ... & Befa Kinki, A. (2024). Contribution of ultra-processed foods to increased obesity and non-communicable diseases. Cogent Food & Agriculture, 10(1), 2438405.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

29. Engelgau, M. M. (2011). Capitalizing on the demographic transition: tackling noncommunicable diseases in South Asia. World Bank Publications.
30. Bhagtani, D., Adams, J., Imamura, F., Lahiri, A., Pradeepa, R., Mahmood, S., ... & Forouhi, N. G. (2025). Quantification of regional variation in ultra-processed food consumption and its sociodemographic correlates across Bangladesh, India, Pakistan, and Sri Lanka: insights from the South Asia Biobank. The Lancet Regional Health-Southeast Asia, 39.
31. Potvin Kent, M., Pauzé, E., Roy, E. A., De Billy, N., & Czoli, C. (2019). Children and adolescents' exposure to food and beverage marketing in social media apps. Pediatric obesity, 14(6), e12508.
32. Manzoor, M., Nawaz, S., Ahmad, A., Khursheed, K., & Ata, S. (2022). GENDER ROLE AND SOCIO-ECONOMIC LIMITATIONS FOR WOMEN IN FOOD ACCESSIBILITY AT HOUSEHOLD LEVEL IN PUNJAB, PAKISTAN. Journal of Agricultural Research (JAR)., 60(2), 167-172.
33. Baker, P., Machado, P., Santos, T., Sievert, K., Backholer, K., Hadjikakou, M., ... & Lawrence, M. (2020). Ultra-processed foods and the nutrition transition: Global, regional and national trends, food systems transformations and political economy drivers. Obesity Reviews, 21(12), e13126.
34. Gortmaker, S. L., Swinburn, B. A., Levy, D., Carter, R., Mabry, P. L., Finegood, D. T., ... & Moodie, M. L. (2011). Changing the future of obesity: science, policy, and action. The Lancet, 378(9793), 838-847.
35. Swinburn, B. A., Kraak, V. I., Allender, S., Atkins, V. J., Baker, P. I., Bogard, J. R., ... & Dietz, W. H. (2019). The global syndemic of obesity, undernutrition, and climate change: the Lancet Commission report. The lancet, 393(10173), 791-846.
36. Cabrera, M., Machín, L., Arrúa, A., Antúnez, L., Curutchet, M. R., Giménez, A., & Ares, G. (2017). Nutrition warnings as front-of-pack labels: influence of design features on healthfulness perception and attentional capture. Public health nutrition, 20(18), 3360-3371.
37. Borazon, E. Q., Magracia, M. R., Ong, G. R., Gillott, B. K., Mackay, S., Swinburn, B., & Karupaiah, T. (2024). Children's exposure to unhealthy food advertising on Philippine television: content analysis of marketing strategies and temporal patterns. Global Health Action, 17(1), 2427445.
38. Popkin, B. M., Barquera, S., Corvalan, C., Hofman, K. J., Monteiro, C., Ng, S. W., ... & Taillie, L. S. (2021). Towards unified and impactful policies to reduce ultra-processed food consumption and promote healthier eating. The lancet Diabetes & endocrinology, 9(7), 462-470.