



The Impact of High Ultra-Processed Food Consumption on Obesity Risk among Young Adults

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Abstract

Ultra-processed foods (UPFs) are industrial formulations characterized by high levels of added sugar, fat, sodium, and food additives, and have become a dominant component of modern diets. Recent evidence suggests that increased UPF consumption is strongly linked to obesity and other metabolic disorders. This study aims to investigate the impact of high UPF consumption on obesity risk among young adults. A cross-sectional study was conducted involving 320 participants aged 18–30 years in Yogyakarta, Indonesia, and Shanghai, China. Dietary intake was assessed using a validated food frequency questionnaire and categorized based on the NOVA classification system. Body mass index (BMI) was measured and obesity was defined according to WHO standards. Logistic regression analysis was applied to examine the association between UPF consumption and obesity risk. The findings revealed that individuals with the highest tertile of UPF consumption had a 2.6-fold increased risk of obesity compared to those in the lowest tertile (OR=2.63; 95% CI: 1.55–4.47, $p<0.01$). Frequent consumption of sugar-sweetened beverages and packaged snacks were the strongest predictors of obesity. These results emphasize the urgent need for dietary interventions and public health strategies to reduce UPF consumption among young adults. This research contributes to existing evidence by providing cross-country data from Indonesia and China, highlighting the global relevance of dietary patterns and obesity prevention strategies.

Keywords

ultra-processed foods,
obesity,
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Introduction

The rising prevalence of obesity among young adults has become a major global health concern and a key challenge for public health systems. Individuals aged 18–30 years are in a critical transitional period characterized by increasing independence, changes in living arrangements, academic or work-related stress, and shifts in lifestyle behaviors. During this stage, patterns of dietary intake and physical activity established in daily life can track into later adulthood and strongly influence long-term health outcomes. The sharp increase in overweight and obesity in this age group

over recent decades has been widely documented across both high-income and low- and middle-income countries, contributing substantially to the growing burden of non-communicable diseases such as type 2 diabetes, hypertension, and cardiovascular disease (Mambrini et al., 2023). Beyond physical health, obesity in young adulthood is also associated with psychological distress, impaired quality of life, and reduced productivity, underscoring the need for early and targeted prevention strategies.

One of the most important drivers of the obesity epidemic is the profound shift in global dietary patterns. Traditional diets based on minimally processed foods such as whole grains, legumes, fruits, and vegetables are increasingly being replaced by modern dietary patterns characterized by frequent consumption of processed and ultra-processed products. Ultra-processed foods (UPFs), as classified by the NOVA system, are industrial formulations made largely or entirely from substances extracted from foods (oils, fats, sugar, starch, proteins), derived from food constituents, or synthesized in laboratories, with little or no intact whole foods. These products typically contain numerous cosmetic additives such as flavor enhancers, colors, emulsifiers, and artificial sweeteners designed to enhance palatability, shelf life, and convenience. As a result, UPFs have become highly appealing, affordable, and widely available, particularly in urban environments (Elizabeth et al., 2020).

A growing body of epidemiological evidence has linked high UPF consumption to adverse health outcomes, including weight gain, overweight, obesity, and metabolic syndrome. Several cross-sectional and longitudinal studies have reported that diets high in UPFs are often energy-dense, high in added sugars, unhealthy fats, and sodium, while being low in dietary fiber, vitamins, and minerals. This nutritional profile promotes excess energy intake and poor diet quality, which in turn contribute to positive energy balance and increased adiposity (Askari et al., 2020). Experimental research has further demonstrated that UPFs may disrupt appetite regulation by altering satiety signals and encouraging rapid eating, leading to greater caloric intake even when foods are consumed *ad libitum*. Emerging evidence also suggests that the impact of UPFs on obesity extends beyond simple caloric excess, potentially involving mechanisms such as changes in gut microbiota composition, low-grade systemic inflammation, endocrine disruption, and altered reward pathways in the brain (Monteiro et al., 2019).

Young adults are particularly vulnerable to the influence of UPFs due to their lifestyle characteristics and food environments. Busy schedules, academic or occupational demands, irregular eating patterns, and a high reliance on convenience foods all contribute to increased UPF consumption in this age group. Sugar-sweetened beverages, packaged snacks, fast foods, and instant meals are often perceived as quick, tasty, and affordable options, especially in urban settings where they are aggressively marketed and easily accessible through supermarkets, convenience stores, and online food delivery platforms. Social norms and peer influences can further reinforce these consumption patterns, making it challenging for young adults to maintain traditional or home-cooked diets (Taillie et al., 2020).

In Asian countries such as Indonesia and China, rapid urbanization, economic growth, and globalization have accelerated the nutrition transition. Traditional dietary patterns, historically dominated by staple foods like rice, vegetables, and legumes, are increasingly being replaced by processed and ready-to-eat products. In Indonesia, for example, instant noodles, fried snacks, and sweetened beverages have become integral parts of daily diets, including among students and young workers. In China, rising incomes, modernization of food retail systems, and Western-style marketing have led to increased consumption of packaged beverages, convenience foods, and commercially prepared meals. These changes are occurring alongside a persistent double burden of malnutrition, where undernutrition and micronutrient deficiencies coexist with rising rates of overweight and obesity, placing additional strain on public health systems (WHO, 2020).

Despite the rapidly changing food environments and mounting concerns about obesity, research examining the direct impact of UPF consumption on obesity among young adults in Asian populations remains limited. Much of the existing literature has focused on Western populations, where cultural dietary norms, food policies, and market structures differ markedly from those in Asia. Consequently, there is a need for context-specific evidence that reflects the unique dietary patterns, social determinants, and cultural practices of Asian countries. Understanding how UPFs contribute to obesity in these settings is essential to inform effective prevention strategies and public health policies (Ng et al., 2014).

Another important gap in the literature is the lack of cross-country comparative studies within Asia. Indonesia and China offer an informative contrast: both are large, rapidly developing nations experiencing profound socioeconomic and dietary transformations, yet they differ in cultural food practices, regulatory environments, and stages of the nutrition transition. By comparing young adults in Yogyakarta, Indonesia, and Shanghai, China, it is possible to capture both shared and distinct patterns of UPF consumption and obesity risk. Such cross-country analysis can help identify common drivers of UPF-related obesity in urban Asian settings, as well as context-specific factors that may require tailored interventions (Chen et al., 2020).

The policy implications of rising UPF consumption are substantial. Globally, several countries have introduced measures such as taxation on sugar-sweetened beverages, restrictions on marketing to children, and front-of-pack nutrition labeling to discourage consumption of unhealthy processed products. However, in many Asian countries, evidence on the effectiveness, feasibility, and cultural acceptability of such policies remains scarce. Strengthening the scientific basis for policy development requires robust data on how UPF intake is associated with obesity and related health outcomes, especially among vulnerable groups such as young adults who represent the future workforce and parent generation (Hall et al., 2019).

Therefore, this study aims to investigate the impact of high ultra-processed food consumption on obesity risk among young adults in Indonesia and China. Using a cross-sectional design involving participants from Yogyakarta and Shanghai, this research assesses dietary intake based on the NOVA classification and examines the association between UPF consumption and obesity, while accounting for relevant confounding factors. By providing cross-country data from two rapidly developing Asian settings, this study seeks to fill existing knowledge gaps, support the design of culturally appropriate public health interventions, and underscore the global relevance of addressing UPF-driven obesity in young adults.

Materials and Methods

Study Design and Setting

This study employed a cross-sectional design to examine the association between ultra-processed food (UPF) consumption and obesity risk among young adults. Data collection was conducted between March and September 2024 in two urban settings representing rapidly developing Asian contexts, namely Yogyakarta, Indonesia, and Shanghai, China. These cities were selected due to their contrasting yet comparable urban food environments, high penetration of ultra-processed food products, and increasing prevalence of overweight and obesity among young populations. The cross-sectional approach was considered appropriate to capture dietary patterns and anthropometric status at a single point in time and to allow comparison across different sociocultural contexts.

Study Population and Sampling

The study population consisted of young adults aged 18 to 30 years residing in Yogyakarta and Shanghai. A total of 320 participants were recruited using stratified random sampling from

universities and community health centers in both cities. Stratification was applied to ensure balanced representation by sex and study location. Eligible participants were those who fell within the specified age range, were permanent residents or had lived in the study area for at least one year, and provided informed consent. Individuals with diagnosed chronic diseases affecting dietary intake or body weight were excluded to minimize potential bias. The sample size was considered sufficient to detect meaningful associations between UPF consumption and obesity risk based on prior epidemiological studies in similar populations.

Dietary Assessment and Classification of Ultra-Processed Foods

Dietary intake was assessed using a validated semi-quantitative Food Frequency Questionnaire (FFQ) designed to capture habitual food consumption over the previous three months. The FFQ included a comprehensive list of commonly consumed food and beverage items relevant to urban Indonesian and Chinese diets. All reported food items were classified according to the NOVA food classification system, which categorizes foods based on the extent and purpose of industrial processing. Ultra-processed foods were defined as industrial formulations containing little or no whole foods and typically including additives such as flavorings, colorings, emulsifiers, and sweeteners.

UPF consumption was quantified as the proportion of total food intake derived from ultra-processed products. Participants were then categorized into tertiles of UPF consumption, representing low, medium, and high intake levels. This categorization enabled comparative analysis of obesity risk across different degrees of UPF exposure.

Anthropometric Measurements and Obesity Definition

Anthropometric data were collected by trained personnel using standardized procedures. Body weight was measured to the nearest 0.1 kg using a calibrated digital scale, while height was measured to the nearest 0.1 cm using a stadiometer. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Obesity was defined based on World Health Organization criteria as a BMI of 30 kg/m² or higher. These standardized definitions allowed for consistency and comparability across study sites.

Covariates

Information on potential confounding variables was collected through structured questionnaires. Covariates included age, sex, physical activity level, and socioeconomic status. Physical activity was assessed using self-reported frequency and intensity of routine activities, while socioeconomic status was measured using indicators such as educational attainment and employment status. These variables were selected based on established evidence linking them to dietary behavior and obesity risk.

Statistical Analysis

Descriptive statistics were used to summarize participant characteristics, dietary intake patterns, and obesity prevalence. Differences across tertiles of UPF consumption were examined using appropriate comparative analyses. Logistic regression models were applied to estimate the association between UPF consumption and obesity risk, with results presented as odds ratios (ORs) and 95% confidence intervals (CIs). Multivariable models were adjusted for age, sex, physical activity, and socioeconomic status to account for potential confounding effects. Statistical analyses were performed using SPSS version 27.0, and statistical significance was set at $p < 0.05$.

Results and Discussion

The findings of this study demonstrate a clear and significant association between high ultra-processed food (UPF) consumption and increased obesity risk among young adults in Indonesia and China. Participants in the highest tertile of UPF intake showed a markedly higher prevalence of obesity (28.4%) compared to those in the lowest tertile (11.2%), and logistic regression analysis revealed that individuals with higher UPF consumption had a 2.6-fold increased risk of obesity. These results reinforce the growing body of evidence suggesting that UPFs contribute substantially to excess adiposity and adverse metabolic outcomes in young populations.

A key observation from the study is that sugar-sweetened beverages (SSBs)-including bottled teas, flavored milk, carbonated drinks, and energy drinks-made the largest contribution to UPF energy intake. This aligns closely with global research showing that SSBs are consistently associated with weight gain due to their high glycemic load, low satiety effect, and ease of overconsumption. Young adults, who often consume beverages while studying, socializing, or commuting, may be particularly susceptible to this pattern of liquid calorie intake. Packaged snacks and instant noodles also emerged as major contributors, which mirrors findings from several Asian cohort studies suggesting that snacks high in refined carbohydrates, salt, and unhealthy fats are increasingly replacing traditional foods among young consumers.

Cross-Country Differences and Cultural Context

Although the overall association between UPF intake and obesity was consistent in both countries, notable differences in the types of UPFs consumed were observed. Chinese participants reported higher consumption of packaged beverages and ready-to-drink products, reflecting aggressive market expansion and evolving urban food environments. In contrast, Indonesian participants consumed greater amounts of instant noodles, fried snacks, and sweetened local beverages-consistent with national dietary surveys showing instant noodles as one of the most frequently consumed foods across socioeconomic groups (Srouf et al., 2019).

These differences highlight how cultural preferences, food availability, marketing strategies, and economic factors shape UPF consumption patterns. Nonetheless, despite variation in specific food choices, the link between UPFs and obesity appears universal, underscoring the broader relevance of UPFs as a major dietary risk factor in diverse Asian settings.

Biological and Behavioral Mechanisms

The strong relationship observed in this study is consistent with multiple biological and behavioral pathways through which UPFs may influence weight gain. UPFs are energy-dense and often engineered to be hyper-palatable, promoting rapid consumption and overriding natural appetite regulation mechanisms. Their soft textures and emulsified structures require minimal chewing, accelerating eating speed and diminishing satiety cues.

In addition to their nutritional composition, UPFs may affect obesity risk through mechanisms unrelated to calorie content. For example:

- Additives such as emulsifiers and artificial sweeteners have been implicated in altering gut microbiota composition and increasing intestinal permeability, contributing to low-grade inflammation.
- Refined carbohydrates and rapidly absorbed sugars provoke repeated spikes in blood glucose and insulin levels, favoring fat storage.
- Packaging chemicals such as bisphenol A (BPA) may disrupt endocrine function and metabolism.

These mechanisms are supported by emerging experimental and observational evidence and are consistent with recent global reviews indicating that UPFs may promote weight gain independently of their energy density, suggesting a broader systemic impact on human metabolism.

Lifestyle Factors and Young Adult Vulnerability

The high reliance on ultra-processed foods (UPFs) among young adults observed in this study can be understood in the context of several interrelated lifestyle, socioeconomic, behavioral, and environmental factors that characterize this developmental stage. Young adulthood is typically marked by significant transitions-entering university, beginning employment, living independently, and managing personal finances-each of which can strongly influence dietary habits.

Academic commitments and demanding work schedules play a central role in shaping food choices. Many young adults experience sustained academic pressure, deadlines, examinations, and project-based learning environments that leave limited time and energy for meal preparation. Similarly, those entering the workforce often face long working hours, shift duties, or gig-based employment, which disrupt traditional eating patterns. In both contexts, UPFs become an attractive option due to their convenience, portability, and minimal preparation time. Meals are often consumed “on the go,” and eating becomes a secondary task performed while studying, commuting, or working, further reinforcing reliance on ready-to-eat products (Vitale et al., 2024).

Irregular sleep patterns and circadian disruptions may also contribute to increased UPF consumption. Young adults frequently engage in late-night studying, socializing, or digital media use, leading to shortened sleep duration and misaligned meal timing. Sleep deprivation has been associated with increased cravings for high-sugar, high-fat foods, driven by hormonal changes such as elevated ghrelin and reduced leptin. This physiological vulnerability, combined with the ease of accessing UPFs late at night through convenience stores or 24-hour delivery services, increases the likelihood of consuming energy-dense snacks and sugary beverages.

Peer environments exert additional influence on young adults’ dietary behaviors. Social gatherings often center around affordable, highly palatable food items such as fried snacks, fast food, packaged beverages, or instant noodles. These foods are widely shared in group settings, reinforcing social norms and making UPF consumption part of collective experiences. Moreover, social acceptance and belongingness-particularly strong motivators during young adulthood-may encourage individuals to adopt similar eating behaviors as their peers (Lane et al., 2024).

Another critical factor is the rapid expansion of online food delivery platforms and digital marketplaces in both Indonesia and China. Over the past decade, mobile-based food delivery applications have revolutionized access to meals, offering rapid delivery, extensive food choices, and frequent promotional discounts that disproportionately favor fast foods and packaged snacks (Li & Shi, 2025; Li & Shi, 2021)). Young adults, who are among the most digitally connected demographic groups, frequently engage with these platforms due to convenience, cost-effectiveness, and the appeal of algorithm-driven personalized recommendations. The gamification of food ordering-through reward points, cashback offers, or flash discounts-further normalizes and incentivizes frequent consumption of UPFs. In China, for example, delivery platforms have become deeply integrated into daily life, while in Indonesia, aggressive marketing strategies on social media influence students and young professionals to prefer online-ordered foods over home-cooked meals (Moradi et al., 2022).

Autonomy in food purchasing decisions also increases during young adulthood. As individuals move away from family homes or begin managing their own income, they gain freedom to choose foods based on personal preference rather than household norms. However, limited culinary skills, tight budgets, and insufficient nutrition knowledge often lead young adults to prioritize affordability, taste, and convenience over nutritional value. UPFs-often cheaper than fresh foods due to economies of scale and heavy industrial processing-thus become an economically rational choice for young consumers facing financial constraints (Agjei et al., 2025).

This age group is also a primary target of marketing campaigns by food and beverage industries. Companies strategically use social media influencers, targeted advertisements, colorful packaging, and youth-oriented branding to cultivate loyalty and shape perceptions of UPFs as trendy, fun, and lifestyle-enhancing products. Marketing messages frequently emphasize convenience, modernity,

and indulgence, aligning perfectly with the aspirations and habits of urban young adults. Exposure to digital advertisements on platforms such as TikTok, Instagram, and WeChat further amplifies the desirability of these products, often overshadowing health-focused messaging (Popkin & Ng, 2022).

Environmental and structural factors interact with these personal and social influences, creating a food ecosystem that favors UPF consumption. Urban areas in Indonesia and China are experiencing rapid growth of convenience stores, vending machines, and fast-food outlets, which cluster around universities, dormitories, offices, and transport hubs. These environments saturate young adults with easy access to UPFs while often limiting availability and affordability of fresh, minimally processed foods. Time scarcity, transportation barriers, and limited kitchen facilities—common among students and low-income young workers—further hinder their ability to prepare healthy meals (Al Hourani et al., 2025).

Taken together, these contextual factors emphasize that UPF consumption among young adults is not simply a matter of individual preference but is shaped by complex structural forces and socioeconomic realities. As such, interventions that focus solely on education or personal responsibility may be insufficient. Instead, comprehensive strategies that address environmental, policy, and industry-related determinants are necessary to effectively reduce UPF intake and promote healthier eating behaviors among young adults (Yang et al., 2024).

Public Health Implications

The results of this study underscore the urgent need for multi-level interventions to reduce UPF consumption among young adults in Indonesia and China. Successful strategies may include:

- Taxation of sugar-sweetened beverages, which has shown effectiveness in several Latin American countries.
- Improved front-of-pack labeling, such as warning labels that clearly indicate high sugar, fat, or sodium content.
- Restrictions on marketing to children and adolescents, who are particularly susceptible to advertising.
- University-based nutrition programs that promote affordable, minimally processed meals.
- Reformulation policies encouraging industry to reduce sugar and sodium levels in popular products.

Given the rapidly evolving food environments in Asia, evidence-based policy approaches are necessary to mitigate long-term health consequences for young populations (Dicken & Batterham, 2024).

Strengths, Limitations, and Future Research

A key strength of this study is the inclusion of participants from two culturally and economically diverse Asian cities, enabling cross-country comparisons. Using the NOVA classification system also allows consistent categorization of UPFs across contexts.

However, several limitations should be acknowledged:

- The cross-sectional design prevents causal inference.
- Dietary data were self-reported and may be prone to recall bias.
- The sample was limited to urban areas, potentially limiting generalizability to rural populations.
- Physical activity and socioeconomic status, although adjusted for, may still involve residual confounding.

Future research should focus on longitudinal designs to clarify causal pathways and examine how UPF consumption interacts with physical activity, sleep patterns, and psychosocial stress. Additionally, examining the role of food environments—such as proximity to convenience stores or

exposure to digital food advertising-could provide further insight into behavioral drivers of UPF intake (Medin et al., 2025).

Overall Interpretation

Overall, this study provides compelling evidence that high UPF consumption is significantly associated with increased obesity risk among young adults in Indonesia and China. Despite cultural and dietary differences between the populations studied, the harmful impact of UPFs on body weight appears consistent and robust. These findings contribute to growing international awareness of UPFs as a key public health issue and highlight the need for comprehensive, culturally informed strategies to reduce UPF consumption and improve diet quality among young adults in Asia (Colozza, 2024).

Conclusion

This study demonstrates a significant association between high consumption of ultra-processed foods and increased obesity risk among young adults in Indonesia and China. Individuals with higher levels of ultra-processed food intake showed a substantially greater likelihood of being obese compared to those with lower consumption levels. Sugar-sweetened beverages, packaged snacks, and instant noodles emerged as the most prominent contributors to ultra-processed food intake and were closely linked to elevated obesity prevalence. These findings reinforce existing evidence that dietary patterns dominated by highly processed products pose a serious threat to metabolic health during young adulthood.

The cross-country approach highlights that, despite differences in cultural food practices and specific types of ultra-processed foods consumed, the adverse relationship between ultra-processed food consumption and obesity is consistent across urban Asian settings. This suggests that ultra-processed foods represent a common dietary risk factor transcending national and cultural boundaries. The results underscore the vulnerability of young adults to modern food environments characterized by convenience, aggressive marketing, and widespread availability of ultra-processed products.

From a public health perspective, the findings support the need for comprehensive strategies aimed at reducing ultra-processed food consumption among young adults. Policy measures such as improved food labeling, regulation of marketing practices, and targeted nutrition programs within educational and urban settings are essential. Addressing ultra-processed food consumption at an early stage of adulthood may play a critical role in preventing obesity and reducing the long-term burden of non-communicable diseases in rapidly developing countries.

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