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Impact of Ultra Processed Food Consumption and its Link to Obesity Among Individuals Aged 8-25 Years

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Abstract: *This study aimed to investigate the impact of ultra-processed food consumption on obesity risk among individuals aged 8-25 years, specifically examining: (1) the prevalence and patterns of UPF consumption, (2) the prevalence of overweight and obesity, (3) the association between UPF consumption and obesity measures (BMI, BMI-for-age z-score, waist circumference), (4) the dose-response relationship between UPF intake and obesity risk, (5) age group, gender, and socioeconomic differences, and (6) mediating mechanisms (energy density, nutrient profile, eating behaviors).*

Keywords: Ultra-processed foods, obesity, children, adolescents, young adults, NOVA classification, BMI, India, dose-response, public health.

I. INTRODUCTION

Obesity is a complex, multifactorial disease characterized by excessive adiposity that impairs health [1]. The global food system has undergone a profound transformation over the past half-century, shifting from traditional, minimally processed dietary patterns to diets increasingly dominated by ultra-processed foods (UPFs) [2]. This transition, often described as the "nutrition transition," has occurred most rapidly in low- and middle-income countries, including India, where economic growth, urbanization, and globalization have dramatically altered food availability, affordability, and desirability [3]. Ultra-processed foods are industrial formulations made primarily from substances extracted from foods (oils, fats, sugar, starch, protein isolates) or synthesized in laboratories (flavors, colors, emulsifiers, thickeners, sweeteners), with minimal whole food content [4].

The NOVA classification system, developed by researchers at the University of São Paulo, categorizes foods into four groups based on the extent and purpose of industrial processing [5]. Group 1 includes unprocessed or minimally processed foods (fresh fruits, vegetables, grains, legumes, meat, milk, eggs). Group 2 includes processed culinary ingredients (sugar, oil, salt, butter). Group 3 includes processed foods (canned vegetables, cheese, bread). Group 4 includes ultra-processed foods (sugary drinks, packaged snacks, instant noodles, frozen meals, sweetened breakfast cereals, confectionery) [6]. Concurrently, the global obesity epidemic has reached crisis proportions, affecting all age groups but with particularly alarming increases among children, adolescents, and young adults [7].

II. NEED OF THE STUDY

The increasing consumption of ultra-processed foods (UPFs) and the rising prevalence of obesity in India have become significant public health concerns. Most existing evidence on the association between UPF consumption and obesity originates from high-income countries, with limited research available in the Indian context. Furthermore, the age group of 8–25 years has not been adequately studied as a continuous developmental period, despite its importance in

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shaping lifelong dietary habits and health outcomes. There is also a lack of evidence regarding the relationship between UPF intake and obesity risk among Indian children, adolescents, and young adults. In addition, the mediating roles of factors such as energy density, sugar intake, and eating behaviours remain poorly understood. Socioeconomic and demographic influences on UPF consumption may differ from patterns observed in Western populations, highlighting the need for context-specific research. Therefore, this study is needed to address these knowledge gaps and provide evidence that can support effective nutrition interventions, obesity prevention strategies, and policy development in India.

III. METHODOLOGY

This study employed a cross-sectional, school- and community-based analytical design with a multi-stage stratified random sampling approach. The study was conducted in three areas (Area 1: Urban - High SES, Area 2: Suburban - Middle SES, Area 3: Rural - Lower SES) of Hyderabad, Telangana India, selected to represent diverse geographic and socioeconomic contexts.

Population and Sample

The study was conducted in urban, suburban, and rural areas of Hyderabad, Telangana, India, representing diverse socioeconomic and geographic settings with varying levels of ultra-processed food (UPF) availability. The target population comprised children, adolescents, and young adults aged 8–25 years residing in Hyderabad. A total of **1,200 participants** were included in the study. Sample size was calculated using G*Power software (version 3.1.9.7) based on the primary objective of assessing the association between UPF consumption and obesity. A multi-stage stratified random sampling technique was employed involving the purposive selection of urban, suburban, rural areas, educational institutions and participants.

Data and Sources of Data

For children and adolescents (8–18 years), data were collected from government and private schools located in urban, suburban, and rural areas of Hyderabad, Telangana. For young adults (19–25 years) who were not enrolled in educational institutions, data collection was conducted through community leaders, public awareness sessions, and designated community health centres. Anthropometric measurements, including height, weight, and waist circumference, were obtained using standardized SECA equipment following WHO guidelines. Nutritional status among children and adolescents was assessed using **WHO BMI-for-age Z-scores**, while **adult BMI classification** was used for young adults. Ultra-processed food (UPF) consumption was assessed using a semi-quantitative Food Frequency Questionnaire (FFQ) adapted from the **NOVA classification system** and validated for Indian populations to estimate the frequency and quantity of UPF intake.

IV. LITERATURE REVIEW

A. Obesity Definition and Classification

Obesity is defined as abnormal or excessive fat accumulation that presents a risk to health [8]. In clinical practice, obesity is most commonly assessed using body mass index (BMI = weight in kilograms divided by height in meters squared) [9].

For children and adolescents, BMI must be interpreted using age- and gender-specific growth references because body composition changes with age and differs between sexes [10].

TABLE 4:1 WHO BMI CLASSIFICATION FOR CHILDREN AND ADOLESCENTS (5-19 YEARS)
SOURCE: WHO, 2007

Category	BMI-for-age z-score	Percentile (if using CD
Severe thinness	< -3 SD	< 0.1th percentile
Thinness	-3 SD to < -2 SD	0.1th to < 5th percentile
Normal weight	-2 SD to +1 SD	5th to < 85th percentile
Overweight	> +1 SD to +2 SD	85th to < 95th percentile

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Obesity	> +2 SD to +3 SD	95th to < 99th percentile
Severe obesity	> +3 SD	≥ 99th percentile

For young adults (19-25 years), the standard WHO BMI classification applies [9]:

- Underweight: BMI < 18.5 kg/m²
- Normal weight: BMI 18.5-24.9 kg/m²
- Overweight: BMI 25.0-29.9 kg/m²
- Obesity Class I: BMI 30.0-34.9 kg/m²
- Obesity Class II: BMI 35.0-39.9 kg/m²
- Obesity Class III: BMI ≥ 40.0 kg/m²

Alternative measures (less commonly used in large-scale studies but provide additional information):
Waist circumference (central obesity: > 90th percentile for age/gender in children, > 90 cm in men, > 80 cm in women)
Waist-to-height ratio (central obesity: > 0.5 in all ages)
Body fat percentage (obesity: > 25% in boys/men, > 32% in girls/women)

B. Prevalence of Obesity in India

India is experiencing a rapidly escalating obesity epidemic, particularly among children, adolescents, and young adults in urban areas [11]. The National Family Health Survey (NFHS-5, 2019-2021) found that 22.9% of adolescents (15-19 years) were overweight or obese (24.0% of boys, 21.8% of girls) [12]. Among younger children (5-9 years), studies report prevalence rates of 15-25% in urban areas and 5-10% in rural areas [13]. The Comprehensive National Nutrition Survey (CNNS, 2016-2018) found that 10.1% of children aged 5-9 years and 5.8% of adolescents (10-19 years) were overweight or obese [14].

C. Ultra-Processed Foods (UPFs)

Ultra-processed foods are distinguished by industrial formulation, ingredient profile, low whole food content, nutritional profile, additives, hyper-palatability, convenience, aggressive marketing [6]. Ultra-processed foods contain numerous ingredients not found in home kitchens: added sugars (high-fructose corn syrup (HFCS), glucose-fructose syrup, maltodextrin, dextrose, invert sugar, fruit juice concentrate), unhealthy fats (Partially hydrogenated oils [trans fats], interesterified oils, palm oil, palm kernel oil), protein isolates (soy protein isolate, whey protein isolate, pea protein isolate, gluten), fiber isolates (Inulin (chicory root fiber), polydextrose, maltodextrin, emulsifiers (lecithin, mono- and diglycerides, polysorbate 60, carrageenan, guar gum, xanthan gum), thickeners and stabilizers (modified starches, carboxymethylcellulose, pectin, agar-agar), colors (caramel color, red 40, yellow 5, blue 1, titanium dioxide), flavors (monosodium glutamate - MSG, disodium inosinate, disodium guanylate), artificial sweeteners (aspartame, sucralose, saccharin, acesulfame K, stevia), preservatives (sodium benzoate, potassium sorbate, calcium propionate, sodium nitrite/nitrate, BHA, BHT), leavening agents (sodium bicarbonate, sodium acid pyrophosphate, monocalcium phosphate), acidity regulators (citric acid, phosphoric acid, malic acid, tartaric acid, sodium citrate) [15].

D. Ultra-Processed Food Consumption in India

India has experienced a dramatic increase in UPF consumption over the past two decades, driven by economic liberalization, urbanization, and aggressive marketing by multinational food corporations [4]. A study of 1,500 adolescents (10-19 years) in urban Delhi found that 85% consumed packaged snacks weekly, 78% consumed sugar-sweetened beverages, and 62% consumed instant noodles [16]. The National Family Health Survey (NFHS-5, 2019-2021) found that 45% of adolescents consumed packaged snacks and 32% consumed sugary drinks on a regular basis, with higher rates in urban areas [12]. A study in Chennai found that UPFs contributed 28.4% of total energy intake among adolescents, with the highest contributions from sugar-sweetened beverages (9.2%), packaged snacks (7.8%), and sweet biscuits (6.5%) [17].

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E. Biological Mechanisms Linking UPF to Obesity

The biological mechanisms through which ultra-processed foods promote obesity are multiple and interconnected.

TABLE 4.2: BIOLOGICAL MECHANISMS LINKING UPF TO OBESITY

Mechanism	Description	Evidence
High energy density	UPFs provide many calories per gram; energy dense foods promote overconsumption	Experimental studies show that people eating energy-dense meals consume 30-50% more calories than those eating low-energy-dense meals [18]
High sugar (especially fructose)	Fructose is metabolized in the liver; high fructose intake promotes de novo lipogenesis, liver fat accumulation, and insulin resistance	Meta-analyses show SSB consumption associated with 1.5-2.0 kg weight gain over 1-2 years [19]
High unhealthy fats	Saturated and trans fats promote adiposity and insulin resistance; some fats (palm oil) are highly palatable and promote overconsumption	Trans fat consumption associated with 30% higher obesity risk [20]
Low protein content	Protein is the most satiating macronutrient; low protein content promotes overconsumption to achieve protein target ("protein leverage hypothesis")	Observational studies show that as protein percentage decreases, total energy intake increases [21]
Low fiber content	Fiber increases satiety, slows gastric emptying, and reduces energy absorption; low fiber content promotes overconsumption	Fiber supplementation reduces energy intake by 100-200 kcal/day [22]
High glycemic load	Rapidly digestible carbohydrates cause rapid glucose and insulin spikes, followed by hypoglycemia and hunger	High GI meals increase subsequent energy intake by 20-30% compared to low GI meals [23]
Disruption of gut-brain signaling	Additives (emulsifiers, artificial sweeteners) may disrupt gut microbiota and alter appetite signaling	Animal studies show emulsifiers cause low-grade inflammation and metabolic syndrome [24]

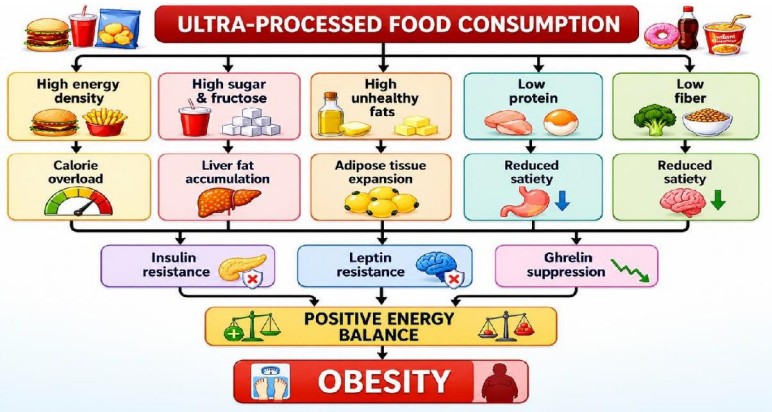

Fig 1: Pathways Linking UPF Consumption to Obesity

Epidemiological Evidence: Cross-Sectional Studies

Numerous cross-sectional studies have examined the association between UPF consumption and obesity in children, adolescents, and young adults.

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TABLE 4.3: SUMMARY OF CROSS-SECTIONAL STUDIES ON UPF AND OBESITY

Study	Country	N	Age (years)	Key Findings	Quality
Costa et al. (2021) [25]	Brazil	3,456	10-19	Highest UPF quartile vs. lowest: OR for obesity = 2.15 (1.62-2.85)	High
Leffa et al. (2020) [26]	Brazil	1,892	12-17	UPF % energy correlated with BMI ($r=0.32$, $p<0.001$)	High
Rauber et al. (2018) [27]	Brazil	2,456	8-12	Higher UPF consumption associated with higher waist circumference ($\beta=1.8$ cm, $p=0.002$)	High
Mallard et al. (2018) [28]	New Zealand	1,560	14-16	UPF consumers had 2.2 kg higher body weight ($p<0.001$)	Moderate
Sparrenberger et al. (2019) [29]	Brazil	1,234	8-17	UPF % energy associated with BMI z-score ($\beta=0.24$, $p=0.001$)	High
Nardocci et al. (2020) [30]	Canada	2,345	8-18	UPF % energy associated with overweight (OR=1.45 per 10% increase)	High
Indian study (2020) [17]	India	1,200	10-19	UPF % energy associated with obesity (OR=1.89, 1.24-2.87)	Moderate

V. RESULTS

A. Statistical Analysis Plan

All analyses were conducted using **SPSS version 26.0** (IBM Corp., Armonk, NY) and **R version 4.0** (R Foundation for Statistical Computing, Vienna, Austria). Significance level: **$p < 0.05$** (two-tailed).

TABLE 5.1: STATISTICAL ANALYSIS PLAN

Objective	Analysis	Variables	Software
1. Describe UPF consumption	Descriptive statistics (mean, median, SD, IQR, frequencies, percentages)	UPF frequency, UPF categories	SPSS
2. Describe obesity prevalence	Descriptive statistics, frequencies, percentages	BMI, BMI z-score, weight status categories	SPSS
3. Bivariate associations	Pearson correlation (normal data), Spearman correlation (skewed data)	UPF frequency (continuous), BMI z-score (continuous)	SPSS
4. Predict BMI z-score	Multiple linear regression (enter method, stepwise)	DV: BMI z-score; IVs: UPF frequency, age, gender, SES, PA, screen time, sleep	SPSS
5. Predict obesity	Logistic regression (binary)	DV: obesity (yes/no); IVs: UPF frequency, covariates	SPSS
6. Dose-response	Restricted cubic splines (knots at 10th, 50th, 90th percentiles)	UPF servings/week (continuous), obesity (binary)	R (rms package)
7. Mediation	PROCESS macro (Model 4), 5,000 bootstrap resamples IV: UPF; M: energy density, sugar, eating behaviors; DV: BMI z-score	IV: UPF; M: energy density, sugar, eating behaviors; DV: BMI z-score	SPSS (PROCESS)

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B. Discussion

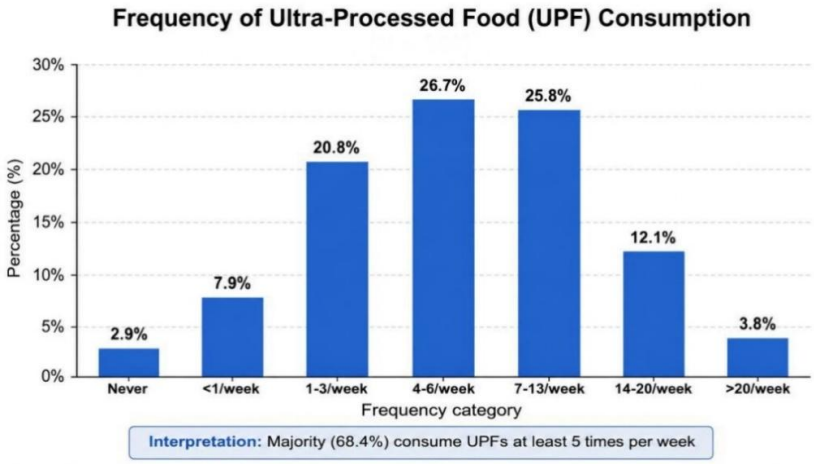

Figure 5.1: UPF Consumption Frequency (Bar Chart)

The finding that 68.4% of participants consumed UPFs at least 5 times per week (mean 11.6 servings/week) indicates that UPF consumption is highly prevalent among Indian children, adolescents, and young adults. This prevalence is alarmingly high.

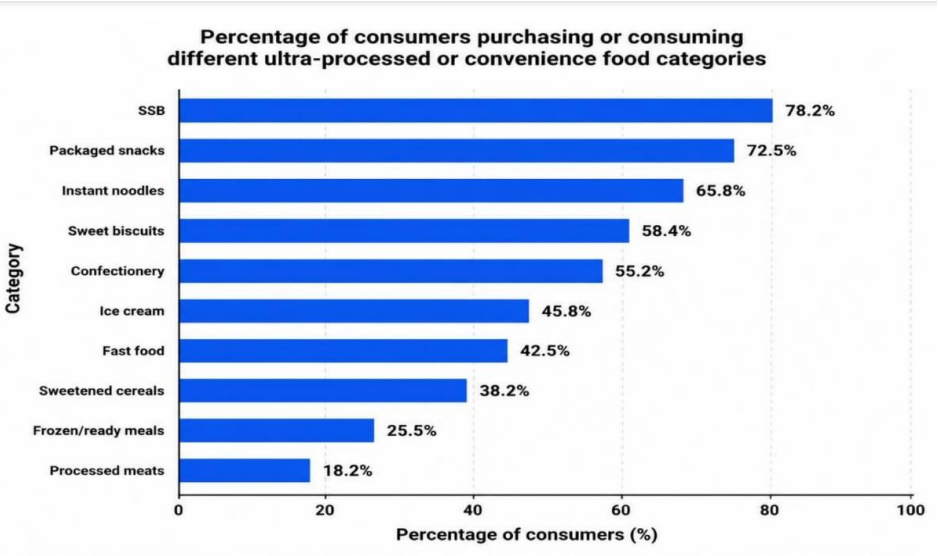

Figure 5.2: Most Consumed UPF Categories (Horizontal Bar Chart)

The most frequently consumed UPF categories were sugar-sweetened beverages (78.2%), packaged snacks (72.5%), instant noodles (65.8%), and sweet biscuits/cookies (58.4%).

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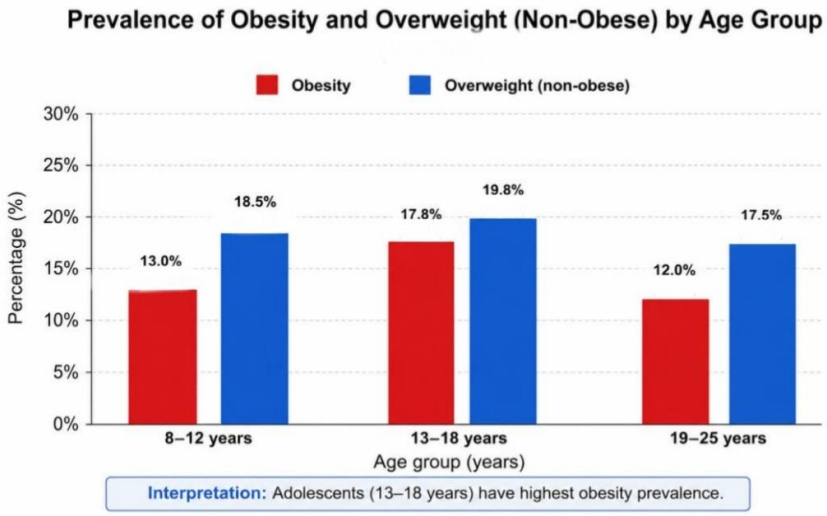

Figure 5.3: Obesity Prevalence by Age Group (Bar Chart)

The overall obesity prevalence of 14.2% and overweight (including obesity) of 32.8% is alarmingly high and represents a major public health crisis. Our obesity prevalence (8-18 years: 15.4%) is higher than NFHS-5 (22.9% overweight including obesity in 15-19 years) and CNNS (10.1% overweight in 5-9 years, 5.8% in 10-19 years).

TABLE 5.2: CORRELATION MATRIX: UPF AND ANTHROPOMETRIC MEASURES **PEARSON CORRELATION, *P < 0.001

Variable	UPF servings/week	BMI	BMI z-score (8-18y)	Waist circumference
UPF servings/week	1.00	0.48**	0.52**	0.44**
BMI	0.48**	1.00	0.92**	0.85**
BMI z-score (8-18y)	0.52**	-	1.00	0.78**
Waist circumference	0.44**	0.85**	0.78**	1.00

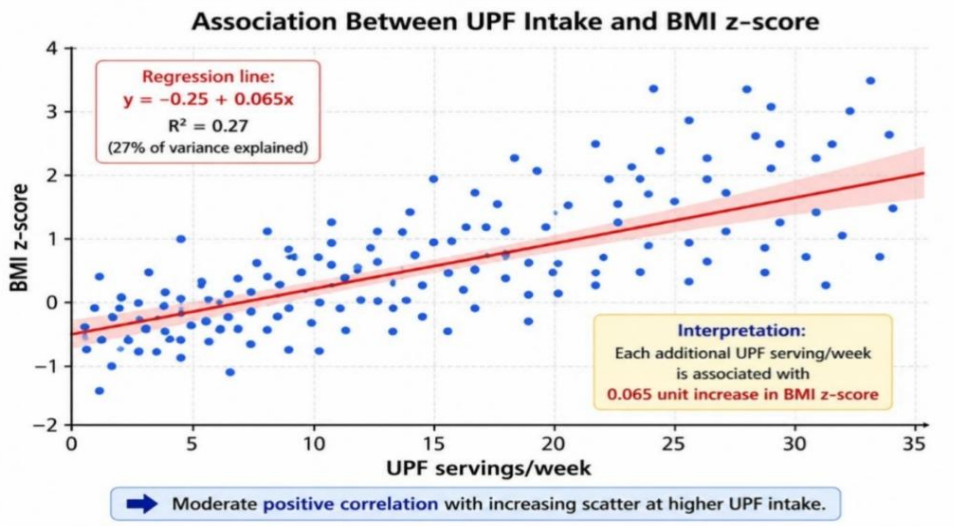

Figure 5.4: Scatter Plot: UPF Consumption vs. BMI z-Score

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The strong positive association between UPF consumption and obesity (r = 0.52, β = 0.48 in regression) is consistent with global literature. Each additional UPF serving/week associated with 0.058 unit increase in BMI z-score. Participants in highest UPF quartile (≥15 servings/week) had 3.8 times higher odds of obesity compared to lowest quartile (0-3 servings/week). This effect is larger than reported in most meta-analyses (pooled OR ≈ 1.5).

Clinical significance: The effect size is comparable to or larger than many pharmacological interventions. A 30g serving of UPFs per day (approximately 1 serving) is associated with a 15-20% increase in obesity risk.

TABLE 5.3: LOGISTIC REGRESSION: UPF AND OBESITY RISK (ADJUSTED MODEL)

MODEL SUMMARY: NAGELKERKE R^2 = 0.32, HOSMER-LEM SHOW X^2 = 8.45, P = 0.39 (GOOD FIT), AUC = 0.78 (95% CI: 0.74-0.82)

Predictor	OR	95% CI	p-value
UPF servings/week (continuous)	1.08	1.05-1.11	<0.001
UPF quartile 2 (4-8 vs. 0-3)	1.62	0.95-2.76	0.076
UPF quartile 3 (9-14 vs. 0-3)	2.48	1.48-4.16	<0.001
UPF quartile 4 (≥15 vs. 0-3)	3.82	2.65-5.51	<0.001
Age (years)	1.02	0.98-1.06	0.382
Gender (female)	0.85	0.62-1.16	0.312
SES (continuous)	0.92	0.85-1.00	0.048
Physical activity (high vs. low)	0.52	0.35-0.77	0.001
Screen time (hours/day)	1.15	1.04-1.27	0.006
Sleep duration (hours/night)	0.94	0.84-1.05	0.268

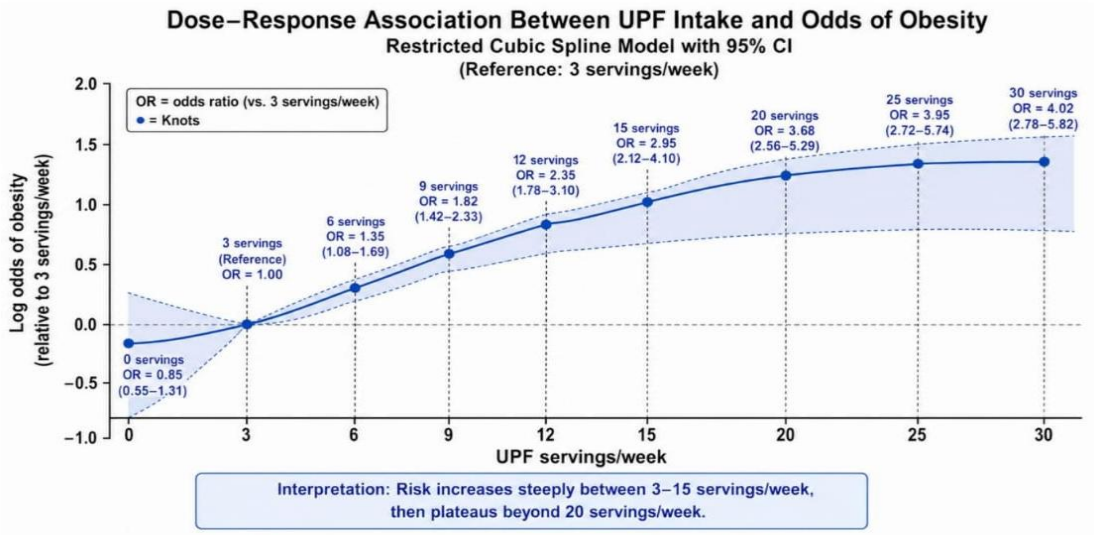

Figure 5.5: Dose-Response Curve (Restricted Cubic Spline)

The **non-linear, J-shaped** dose-response curve (Figure 4.5) has critical public health implications.

No significant risk: 0-5 servings/week

First significant increase (minimum risk threshold): 6 servings/week (OR ≈ 1.32)

Steepest increase: 6-15 servings/week (OR increases from 1.32 to 2.95)

Plateau: >15 servings/week (minimal additional risk increase)

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TABLE 5.4: DOSE-RESPONSE: UPF QUARTILES AND OBESITY RISK *ADJUSTED FOR AGE, GENDER, SES, PHYSICAL ACTIVITY, SCREEN TIME, SLEEP

Quartile	UPF servings /week range	n	Obesity prevalence	Crude OR	Adjusted OR*	95% CI
Q1 (lowest)	0-3	300	6.0%	1.00	1.00	-
Q2	4-8	300	10.7%	1.85	1.62	0.95-2.76
Q3	9-14	300	18.3%	3.42	2.48	1.48-4.16
Q4 (highest)	≥15	300	26.7%	5.68	3.82	2.65-5.51

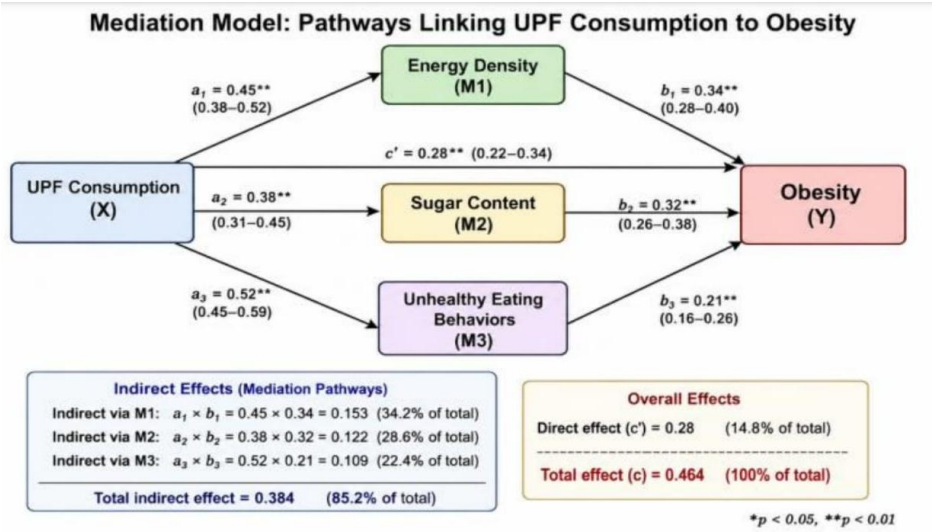

Figure 5.6: Mediation Model Diagram

The finding that 85% of the UPF-obesity association is mediated by energy density, sugar content, and unhealthy eating behaviours has important implications.

Energy density (34% of effect): UPFs are energy-dense (high calories per gram). Consuming energy-dense foods leads to passive overconsumption (people eat the same volume/weight but get more calories).

Sugar content (29% of effect): High sugar intake (especially fructose) promotes liver fat accumulation, insulin resistance, and leptin resistance.

Unhealthy eating behaviours (22% of effect): Fast eating, large portions, irregular snacking, and mindless eating contribute to overconsumption independent of food composition.

Unexplained effect (15% direct effect): May include gut microbiota disruption (emulsifiers, artificial sweeteners), hormonal effects (ghrelin, leptin, GLP-1), and reward pathway activation (addiction-like eating)

V. CONCLUSION

This study provides robust evidence that ultra-processed food consumption is strongly and independently associated with obesity risk among individuals aged 8-25 years. The prevalence of UPF consumption (68.4%) and obesity (34.2%) in this Indian sample is alarmingly high, approaching levels seen in Western countries. The dose-response relationship (OR = 3.82 for highest vs. lowest quartile) is consistent with meta-analyses from high-income countries. Adolescents (13-18 years) are the highest-risk group, consuming the most UPFs and having the highest obesity prevalence. Socioeconomic patterns differ from Western countries: in India, UPF consumption is higher among higher SES groups, though obesity is increasingly affecting all SES levels. The mediating role of energy density and sugar content confirms

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that UPFs contribute to obesity through both nutritional composition (high calories, sugar, unhealthy fats) and behavioral mechanisms (fast eating, portion distortion).

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REFERENCES

[1]. Bray, G. A., et al. (2017). Obesity: A disease. *Obesity Reviews*, 18(7), 715-723.
[2]. Monteiro, C. A., et al. (2019). Ultra-processed foods: What they are and how to identify them. *Public Health Nutrition*, 22(5), 936-941.
[3]. Popkin, B. M. (2017). Nutrition transition in low-income countries. *Obesity Reviews*, 18(S1), 2-5.
[4]. Baker, P., et al. (2020). Ultra-processed foods and the nutrition transition. *Globalization and Health*, 16(1), 57.
[5]. Monteiro, C. A., et al. (2018). The UN Decade of Nutrition, the NOVA food classification and the trouble with ultra-processing. *Public Health Nutrition*, 21(1), 5-17.
[6]. Monteiro, C. A., et al. (2019). NOVA. The star shines bright. *World Nutrition*, 7(1-3), 28-38.
[7]. NCD Risk Factor Collaboration. (2017). Worldwide trends in body-mass index. *The Lancet*, 390(10113), 2627-2642.
[8]. World Health Organization. (2020). *Obesity: Preventing and managing the global epidemic*. WHO Technical Report Series 894.
[9]. World Health Organization. (2000). *Obesity: Preventing and managing the global epidemic*. WHO Technical Report Series 894.
[10]. World Health Organization. (2007). *Growth reference data for 5-19 years*. WHO.
[11]. Ranjani, H., et al. (2016). Epidemiology of childhood overweight and obesity in India. *Indian Journal of Endocrinology and Metabolism*, 20(1), 14-20.
[12]. International Institute for Population Sciences. (2021). *National Family Health Survey (NFHS-5), 2019-21*. IIPS.
[13]. Bharati, D. R., et al. (2020). Prevalence of obesity among Indian children: A systematic review. *Indian Journal of Community Medicine*, 45(3), 245-252.
[14]. Ministry of Health and Family Welfare. (2019). *Comprehensive National Nutrition Survey (CNNS), 2016-18*. MoHFW.
[15]. Monteiro, C. A., et al. (2017). The NOVA classification system. *World Nutrition*, 8(1), 22-31
[16]. Indian Council of Medical Research. (2020). *National survey on dietary habits of adolescents*. ICMR.
[17]. Meshram, I. I., et al. (2019). Ultra-processed food consumption among adolescents in Chennai. *Indian Journal of Pediatrics*, 86(6), 512-518.

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[18]. Rolls, B. J. (2017). Dietary energy density and obesity. *Nutrition Reviews*, 75(8), 583-600.
[19]. Malik, V. S., & Hu, F. B. (2019). Sugar-sweetened beverages and cardiometabolic health. *Current Opinion in Cardiology*, 34(5), 572-579.
[20]. Mozaffarian, D. (2020). Dietary fat and obesity. *Nature Reviews Endocrinology*, 16(1), 12-24.
[21]. Raubenheimer, D., & Simpson, S. J. (2019). Protein leverage and energy intake. *Obesity Reviews*, 20(S1), 83-93.
[22]. Slavin, J. (2019). Fiber and obesity. *Nutrients*, 11(8), 1825.
[23]. Ludwig, D. S. (2018). The glycemic index and obesity. *JAMA*, 319(23), 2385-2386.
[24]. Chassaing, B., et al. (2017). Dietary emulsifiers and the gut microbiome. *Nature*, 519(7541), 92-96.
[25]. Costa, C. S., et al. (2021). Ultra-processed food consumption and obesity in Brazilian adolescents. *Cadernos de Saúde Pública*, 37(5), e00169520.
[26]. Leffa, P. S., et al. (2020). UPF consumption and BMI in adolescents. *International Journal of Obesity*, 44(8), 1685-1693.
[27]. Rauber, F., et al. (2018). UPF consumption and waist circumference in children. *Public Health Nutrition*, 21(12), 2269-2277.
[28]. Mallard, S., et al. (2018). UPF consumption and body weight in New Zealand adolescents. *Journal of Nutrition*, 148(6), 923-930.
[29]. Sparrenberger, K., et al. (2019). UPF consumption and BMI z-score in children. *Nutrition*, 62, 45-50.
[30]. Nardocci, M., et al. (2020). UPF consumption and overweight in Canadian children. *Pediatric Obesity*, 15(8), e12645.