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Original Article

Association of Ultra-Processed Food Consumption with Obesity among Young Adults in Lucknow, Uttar Pradesh, India

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ABSTRACT

Background: Ultra-processed food (UPF) consumption is an emerging public health concern because of its potential association with overweight and obesity. This study assessed UPF consumption patterns and their association with body mass index (BMI) among young adults in Uttar Pradesh.

Methods: A cross-sectional study was conducted at T.S. Misra Medical College, Lucknow, Uttar Pradesh, from July to September 2026 among 217 participants selected through non-probability convenience sampling. Data were collected using a structured Google Forms questionnaire covering sociodemographic characteristics, UPF consumption, physical activity, recreational screen time, and sleep duration. Data were analyzed using IBM SPSS version 25. Pearson's chi-square test was used to examine associations, with $p<0.05$ considered statistically significant.

Results: Among 217 participants, 62.7% were female, while 70.0% had normal BMI, 16.1% were overweight, and 3.7% were obese. Weekly fast-food consumption was reported by 36.9%, packaged snack consumption two to three times weekly by 36.4%, and daily sugary beverage consumption by 9.7%. Gender was significantly associated with sugary beverage consumption ($p=0.019$), reconstituted meat products ($p=0.003$), and ultra-processed spreads ($p=0.034$). Age was associated with quick breakfast product consumption ($p=0.044$). However, no statistically significant associations were observed between BMI categories and any of the seven UPF categories (all $p>0.05$).

Conclusion: UPF consumption was common among the surveyed participants, with significant demographic differences in selected dietary patterns. However, no statistically significant association was identified between UPF consumption

frequency and BMI categories. Larger prospective studies with quantitative dietary assessments and adjusted analyses are needed to clarify this relationship.

Keywords: Ultra-processed foods; Obesity; Body mass index; Young adults; Dietary habits; Cross-sectional study; India.

INTRODUCTION

Obesity is a major public health concern and an important risk factor for non-communicable diseases, including type 2 diabetes mellitus, cardiovascular diseases, and certain cancers. The World Health Organization reported that approximately 2.6 billion adults worldwide were overweight in 2022, of whom more than 890 million were living with obesity [1].

Ultra-processed foods (UPFs), as classified under the NOVA system, are industrial formulations typically containing ingredients and additives not commonly used in domestic food preparation. These include packaged snacks, sugar-sweetened beverages, instant meals, confectionery, and several ready-to-eat products [2].

Evidence suggests that higher consumption of ultra-processed foods is associated with adverse health outcomes, including overweight and obesity. A systematic review and meta-analysis reported significant associations between UPF consumption and several indicators of obesity and cardiometabolic risk [3]. Furthermore, a randomized controlled trial demonstrated that an ultra-processed diet resulted in greater energy intake and weight gain compared with an unprocessed diet under controlled experimental conditions [4].

Young adulthood is an important period during which dietary habits and lifestyle behaviours may become established. Increasing consumption of convenience foods, prolonged recreational screen time, and inadequate physical activity may contribute to an unfavourable energy balance. Evidence also highlighted the growing consumption of ultra-processed foods and the need to understand their implications for population health [5,6].

However, context-specific evidence examining the relationship between different categories of ultra-processed foods and body mass index among young adults in Uttar Pradesh remains important. Therefore, the present study was undertaken at T.S. Misra Medical College, Lucknow, Uttar Pradesh, to assess ultra-processed food consumption patterns and examine their association with BMI categories among young adults.

Study Design and Setting

A questionnaire-based, cross-sectional study was conducted at T.S. Misra Medical College, Lucknow, Uttar Pradesh, India, from July to September 2026, to assess ultra-processed food (UPF) consumption patterns and their association with body mass index (BMI) among study participants.

Study Population and Sampling Technique

The study included 217 participants who completed an online questionnaire administered through Google Forms. A non-probability convenience sampling technique was used, whereby participants were recruited based on their accessibility and willingness to participate in the online survey. The final analytical sample comprised 217 completed responses.

Eligibility Criteria

The study focused on young adults and collected information on age, gender, dietary consumption patterns, and lifestyle characteristics. Age was categorized into two groups in the statistical analysis: less than 20 years and greater than 20 years.

Data Collection Tool and Procedure

Data were collected using a structured, self-administered questionnaire developed in Google Forms. The questionnaire covered socio-demographic characteristics, frequency of ultra-processed food consumption, anthropometric information, and lifestyle-related behaviours.

Ultra-processed food consumption was assessed across seven categories:

1. **Fast food and instant meals:** Burgers, French fries, frozen pizzas, and instant noodles.
2. **Packaged snacks:** Potato chips, nachos, extruded puff snacks, crackers, and salted popcorn.
3. **Sugary beverages:** Soft drinks, commercial energy or sports drinks, packaged fruit juices, and sweetened bubble tea.
4. **Sweets and confectionery:** Chocolates, candies, packaged cookies, ice cream, cakes, and doughnuts.
5. **Quick breakfast products and bars:** Sugary breakfast cereals, protein bars, and premade shakes.

6. **Reconstituted meat products:** Sausages, hot dogs, salami, ham, and commercially prepared kebab patties.
7. **Ultra-processed spreads:** Commercial mayonnaise, margarine, and chocolate-hazelnut spreads.

For each food category, participants reported their usual consumption frequency as daily, two to three times per week, weekly, monthly, or never.

Lifestyle characteristics were assessed through questions on moderate-to-vigorous physical activity lasting at least 30 minutes, recreational screen time outside work or study hours, and usual nighttime sleep duration. Physical activity was classified using the same five frequency categories as dietary consumption. Recreational screen time was categorized as less than 2 hours, 2–4 hours, 4–6 hours, and 6 or more hours per day.

Assessment of Body Mass Index

Body mass index was used to assess nutritional status and classify participants into four categories: underweight (<18.5 kg/m²), normal weight (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²), and obesity (≥30.0 kg/m²), using conventional adult BMI thresholds.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics, version 25.0. Categorical variables were summarized as frequencies and percentages. Cross-tabulation was performed to examine differences in ultra-processed food consumption and lifestyle characteristics across age groups, gender, and BMI categories. Associations between categorical variables were assessed using Pearson's chi-square test. A two-sided p-value of less than 0.05 was considered statistically significant. The reported p-values were unadjusted for multiple comparisons.

RESULTS

A total of 217 participants were included in the study, of whom 132 (60.8%) were aged above 20 years and 85 (39.2%) were below 20 years.

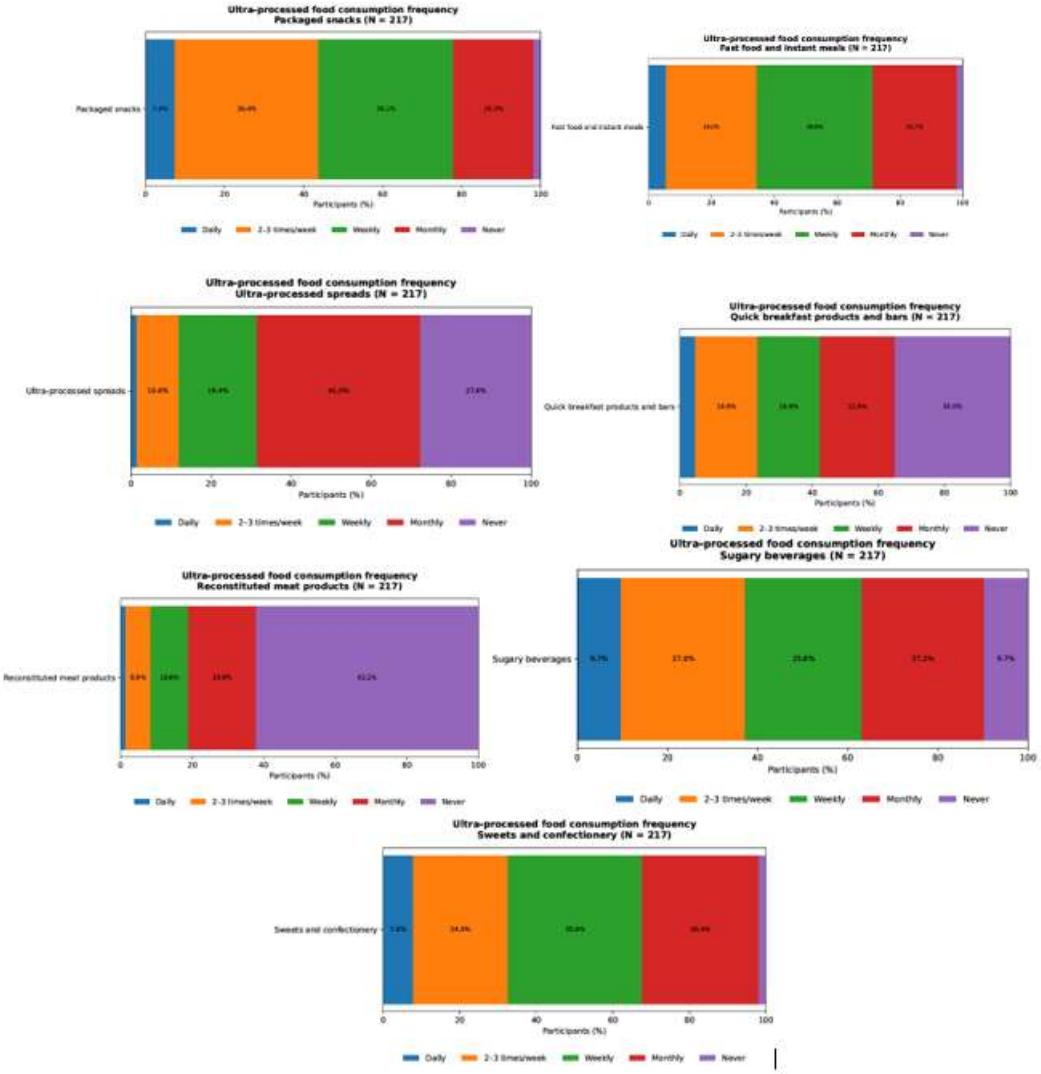
Table 1. Sociodemographic characteristics and body mass index distribution of study participants (N = 217)

Characteristics	Frequency (n)	Percentage (%)
Age group (years)		
<20	85	39.2
>20	132	60.8
Gender		
Female	136	62.7
Male	81	37.3
Body mass index (BMI) category		
Underweight	22	10.1
Normal weight	152	70.0
Overweight	35	16.1
Obese	8	3.7
Total participants	217	100.0

Females constituted the majority (136; 62.7%), while 81 (37.3%) were males. Regarding BMI, most participants had normal weight (152; 70.0%), followed by overweight (35; 16.1%), underweight (22; 10.1%), and obesity (8; 3.7%). The combined prevalence of overweight and obesity was 19.8% (43/217).

Table 2. Distribution of ultra-processed food consumption patterns among study participants (N = 217)

Ultra-processed food category	Daily n (%)	2–3 times/week n (%)	Weekly n (%)	Monthly n (%)	Never n (%)
Fast food and instant meals	12 (5.5)	63 (29.0)	80 (36.9)	58 (26.7)	4 (1.8)
Packaged snacks	16 (7.4)	79 (36.4)	74 (34.1)	44 (20.3)	4 (1.8)
Sugary beverages	21 (9.7)	60 (27.6)	56 (25.8)	59 (27.2)	21 (9.7)
Sweets and confectionery	17 (7.8)	54 (24.9)	76 (35.0)	66 (30.4)	4 (1.8)
Quick breakfast products and bars	10 (4.6)	41 (18.9)	41 (18.9)	49 (22.6)	76 (35.0)
Reconstituted meat products	3 (1.4)	15 (6.9)	23 (10.6)	41 (18.9)	135 (62.2)
Ultra-processed spreads	3 (1.4)	23 (10.6)	42 (19.4)	89 (41.0)	60 (27.6)



As shown in Table 2 and charts, fast food and instant meals were most commonly consumed weekly (36.9%), while packaged snacks were predominantly consumed two to three times per week (36.4%). Sugary beverages had the highest daily consumption (9.7%), followed by sweets and confectionery (7.8%) and packaged snacks (7.4%). Weekly consumption of sweets and confectionery was reported by 35.0% of participants. In contrast, reconstituted meat products were never consumed by 62.2%, while 35.0% reported never consuming quick breakfast products and bars. Ultra-processed spreads were most frequently consumed monthly (41.0%).

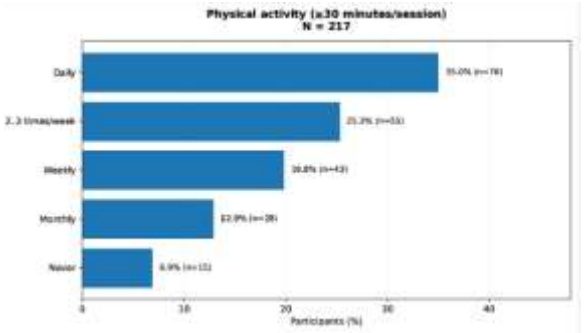


Table 3. Distribution of physical activity, recreational screen time, and sleep duration among study participants (N = 217)

Lifestyle characteristics	Frequency (n)	Percentage (%)
Physical activity (≥30 minutes/session)		
Daily	76	35.0
2–3 times/week	55	25.3
Weekly	43	19.8
Monthly	28	12.9
Never	15	6.9
Daily recreational screen time		
Less than 2 hours	12	5.5
2–4 hours	73	33.6
4–6 hours	89	41.0
6 hours or more	43	19.8
Nighttime sleep duration		
2–4 hours	2	0.9
4–6 hours	95	43.8
6- 8 hours	95	43.8
More than 8 hours	25	11.5

As shown in Table 3 and charts, 35.0% of participants reported daily moderate-to-vigorous physical activity, while 25.3% engaged in such activity two to three times per week and 6.9% reported no physical activity. Regarding recreational screen time, the largest proportion (41.0%) spent 4–6 hours daily on screens, while 19.8% reported six or more hours. For sleep duration, 43.8% reported sleeping 4–6 hours per night, another 43.8% reported sleeping 6-8 hours, and 11.5% reported sleeping more than eight hours.

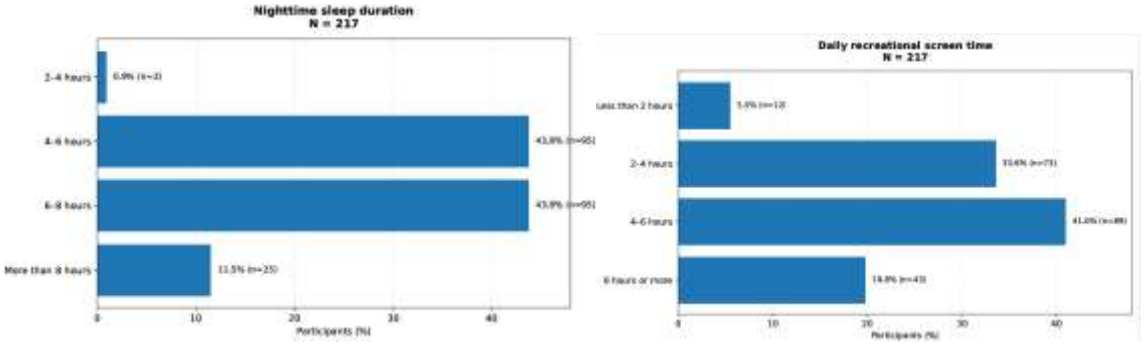


Table 4. Association of age groups with ultra-processed food consumption and lifestyle characteristics among study participants (N = 217)

Characteristics	<20 years (n=85) n (%)	>20 years (n=132) n (%)	Total (N=217) n (%)	χ^2 (df)	p-value
Fast food and instant meals				5.175 (4)	0.270
Daily	4 (4.7)	8 (6.1)	12 (5.5)		
2–3 times/week	30 (35.3)	33 (25.0)	63 (29.0)		
Weekly	31 (36.5)	49 (37.1)	80 (36.9)		
Monthly	20 (23.5)	38 (28.8)	58 (26.7)		
Never	0 (0.0)	4 (3.0)	4 (1.8)		
Packaged snacks				6.434 (4)	0.169
Daily	4 (4.7)	12 (9.1)	16 (7.4)		
2–3 times/week	37 (43.5)	42 (31.8)	79 (36.4)		
Weekly	26 (30.6)	48 (36.4)	74 (34.1)		
Monthly	18 (21.2)	26 (19.7)	44 (20.3)		
Never	0 (0.0)	4 (3.0)	4 (1.8)		

Sugary beverages				5.630 (4)	0.229
Daily	8 (9.4)	13 (9.8)	21 (9.7)		
2–3 times/week	28 (32.9)	32 (24.2)	60 (27.6)		
Weekly	24 (28.2)	32 (24.2)	56 (25.8)		
Monthly	21 (24.7)	38 (28.8)	59 (27.2)		
Never	4 (4.7)	17 (12.9)	21 (9.7)		
Sweets and confectionery				8.232 (4)	0.083
Daily	5 (5.9)	12 (9.1)	17 (7.8)		
2–3 times/week	25 (29.4)	29 (22.0)	54 (24.9)		
Weekly	36 (42.4)	40 (30.3)	76 (35.0)		
Monthly	18 (21.2)	48 (36.4)	66 (30.4)		
Never	1 (1.2)	3 (2.3)	4 (1.8)		
Quick breakfast products and bars				9.793 (4)	0.044
Daily	2 (2.4)	8 (6.1)	10 (4.6)		
2–3 times/week	15 (17.6)	26 (19.7)	41 (18.9)		
Weekly	23 (27.1)	18 (13.6)	41 (18.9)		
Monthly	22 (25.9)	27 (20.5)	49 (22.6)		
Never	23 (27.1)	53 (40.2)	76 (35.0)		
Reconstituted meat products				1.096 (4)	0.895
Daily	1 (1.2)	2 (1.5)	3 (1.4)		
2–3 times/week	5 (5.9)	10 (7.6)	15 (6.9)		
Weekly	11 (12.9)	12 (9.1)	23 (10.6)		
Monthly	15 (17.6)	26 (19.7)	41 (18.9)		
Never	53 (62.4)	82 (62.1)	135 (62.2)		
Ultra-processed spreads				0.921 (4)	0.921
Daily	1 (1.2)	2 (1.5)	3 (1.4)		
2–3 times/week	8 (9.4)	15 (11.4)	23 (10.6)		
Weekly	15 (17.6)	27 (20.5)	42 (19.4)		
Monthly	38 (44.7)	51 (38.6)	89 (41.0)		
Never	23 (27.1)	37 (28.0)	60 (27.6)		
Physical activity (≥30 minutes/session)				0.871 (4)	0.929
Daily	30 (35.3)	46 (34.8)	76 (35.0)		
2–3 times/week	21 (24.7)	34 (25.8)	55 (25.3)		
Weekly	15 (17.6)	28 (21.2)	43 (19.8)		
Monthly	12 (14.1)	16 (12.1)	28 (12.9)		
Never	7 (8.2)	8 (6.1)	15 (6.9)		
Daily recreational screen time				0.881 (3)	0.830
Less than 2 hours	5 (5.9)	7 (5.3)	12 (5.5)		
2–4 hours	29 (34.1)	44 (33.3)	73 (33.6)		
4–6 hours	32 (37.6)	57 (43.2)	89 (41.0)		
≥6 hours	19 (22.4)	24 (18.2)	43 (19.8)		
Sleep duration per night				3.834 (3)	0.280
2–4 hours	2 (2.4)	0 (0.0)	2 (0.9)		
4–6 hours	38 (44.7)	57 (43.2)	95 (43.8)		
6- 8 hours	34 (40.0)	61 (46.2)	95 (43.8)		
More than 8 hours	11 (12.9)	14 (10.6)	25 (11.5)		

As shown in Table 4, quick breakfast products and bars were the only food category showing a statistically significant association with age group ($\chi^2 = 9.793$, $p = 0.044$). Weekly consumption was higher among participants aged below 20 years (27.1%) than among those above 20 years (13.6%), whereas non-consumption was more frequent in the older age group (40.2% versus 27.1%). No statistically significant associations were observed between age group and the other six ultra-processed food categories (all $p > 0.05$). Similarly, physical activity ($p = 0.929$), recreational screen time ($p = 0.830$), and sleep duration ($p = 0.280$) did not differ significantly between age groups.

Table 5. Association of gender with ultra-processed food consumption and lifestyle characteristics among study participants (N = 217)

Characteristics	Female (n=136) n (%)	Male (n=81) n (%)	Total (N=217) n (%)	χ^2 (df)	p-value
Fast food and instant meals				2.896 (4)	0.575
Daily	5 (3.7)	7 (8.6)	12 (5.5)		
2–3 times/week	41 (30.1)	22 (27.2)	63 (29.0)		
Weekly	50 (36.8)	30 (37.0)	80 (36.9)		
Monthly	38 (27.9)	20 (24.7)	58 (26.7)		
Never	2 (1.5)	2 (2.5)	4 (1.8)		
Packaged snacks				7.090 (4)	0.131
Daily	7 (5.1)	9 (11.1)	16 (7.4)		
2–3 times/week	52 (38.2)	27 (33.3)	79 (36.4)		
Weekly	51 (37.5)	23 (28.4)	74 (34.1)		
Monthly	25 (18.4)	19 (23.5)	44 (20.3)		
Never	1 (0.7)	3 (3.7)	4 (1.8)		
Sugary beverages				11.763 (4)	0.019
Daily	9 (6.6)	12 (14.8)	21 (9.7)		
2–3 times/week	31 (22.8)	29 (35.8)	60 (27.6)		
Weekly	40 (29.4)	16 (19.8)	56 (25.8)		
Monthly	39 (28.7)	20 (24.7)	59 (27.2)		
Never	17 (12.5)	4 (4.9)	21 (9.7)		
Sweets and confectionery				4.448 (4)	0.349
Daily	9 (6.6)	8 (9.9)	17 (7.8)		
2–3 times/week	39 (28.7)	15 (18.5)	54 (24.9)		
Weekly	43 (31.6)	33 (40.7)	76 (35.0)		
Monthly	43 (31.6)	23 (28.4)	66 (30.4)		
Never	2 (1.5)	2 (2.5)	4 (1.8)		
Quick breakfast products and bars				5.053 (4)	0.282
Daily	5 (3.7)	5 (6.2)	10 (4.6)		
2–3 times/week	23 (16.9)	18 (22.2)	41 (18.9)		
Weekly	24 (17.6)	17 (21.0)	41 (18.9)		
Monthly	29 (21.3)	20 (24.7)	49 (22.6)		
Never	55 (40.4)	21 (25.9)	76 (35.0)		
Reconstituted meat products				16.364 (4)	0.003
Daily	0 (0.0)	3 (3.7)	3 (1.4)		
2–3 times/week	6 (4.4)	9 (11.1)	15 (6.9)		
Weekly	10 (7.4)	13 (16.0)	23 (10.6)		
Monthly	24 (17.6)	17 (21.0)	41 (18.9)		
Never	96 (70.6)	39 (48.1)	135 (62.2)		
Ultra-processed spreads				10.423 (4)	0.034
Daily	0 (0.0)	3 (3.7)	3 (1.4)		
2–3 times/week	13 (9.6)	10 (12.3)	23 (10.6)		
Weekly	21 (15.4)	21 (25.9)	42 (19.4)		

Monthly	61 (44.9)	28 (34.6)	89 (41.0)		
Never	41 (30.1)	19 (23.5)	60 (27.6)		
Physical activity (≥30 minutes/session)				7.900 (4)	0.095
Daily	40 (29.4)	36 (44.4)	76 (35.0)		
2–3 times/week	33 (24.3)	22 (27.2)	55 (25.3)		
Weekly	32 (23.5)	11 (13.6)	43 (19.8)		
Monthly	21 (15.4)	7 (8.6)	28 (12.9)		
Never	10 (7.4)	5 (6.2)	15 (6.9)		
Daily recreational screen time				6.574 (3)	0.087
Less than 2 hours	4 (2.9)	8 (9.9)	12 (5.5)		
2–4 hours	50 (36.8)	23 (28.4)	73 (33.6)		
4–6 hours	58 (42.6)	31 (38.3)	89 (41.0)		
≥6 hours	24 (17.6)	19 (23.5)	43 (19.8)		
Sleep duration per night				12.395 (3)	0.006
2–4 hours	0 (0.0)	2 (2.5)	2 (0.9)		
4–6 hours	63 (46.3)	32 (39.5)	95 (43.8)		
6- 8 hours	64 (47.1)	31 (38.3)	95 (43.8)		
More than 8 hours	9 (6.6)	16 (19.8)	25 (11.5)		

As shown in Table 5, statistically significant associations with gender were observed for sugary beverage consumption ($p = 0.019$), reconstituted meat products ($p = 0.003$), ultra-processed spreads ($p = 0.034$), and sleep duration ($p = 0.006$). Daily sugary beverage consumption was higher among males than females (14.8% vs. 6.6%). Similarly, weekly consumption of reconstituted meat products (16.0% vs. 7.4%) and ultra-processed spreads (25.9% vs. 15.4%) was higher among males. In contrast, non-consumption of reconstituted meat products was more frequent among females (70.6% vs. 48.1%). Sleeping more than eight hours was reported by 19.8% of males compared with 6.6% of females. No statistically significant gender differences were observed for the remaining food categories, physical activity, or recreational screen time (all $p > 0.05$).

Table 6. Association of body mass index (BMI) categories with ultra-processed food consumption and lifestyle characteristics among study participants (N = 217)

Characteristics	**BMI (<18.5 kg/m²) (n=22) n (%)**	**BMI (18.5–24.9 kg/m²) (n=152) n (%)**	**BMI (25.0–29.9 kg/m²), (n=35) n (%)**	**BMI (≥30.0 kg/m²) (n=8) n (%)**	**Total (N=217) n (%)**	**χ^2 (df)**	**p-value**
Fast food and instant meals						6.425 (12)	0.893
Daily	1 (4.5)	9 (5.9)	2 (5.7)	0 (0.0)	12 (5.5)		
2–3 times/week	8 (36.4)	44 (28.9)	8 (22.9)	3 (37.5)	63 (29.0)		
Weekly	5 (22.7)	55 (36.2)	16 (45.7)	4 (50.0)	80 (36.9)		
Monthly	7 (31.8)	42 (27.6)	8 (22.9)	1 (12.5)	58 (26.7)		
Never	1 (4.5)	2 (1.3)	1 (2.9)	0 (0.0)	4 (1.8)		
Packaged snacks						9.206 (12)	0.685
Daily	2 (9.1)	12 (7.9)	2 (5.7)	0 (0.0)	16 (7.4)		
2–3 times/week	9 (40.9)	50 (32.9)	17 (48.6)	3 (37.5)	79 (36.4)		
Weekly	7 (31.8)	53 (34.9)	12 (34.3)	2 (25.0)	74 (34.1)		
Monthly	3 (13.6)	35 (23.0)	3 (8.6)	3 (37.5)	44 (20.3)		
Never	1 (4.5)	2 (1.3)	1 (2.9)	0 (0.0)	4 (1.8)		
Sugary beverages						19.470 (12)	0.078
Daily	5 (22.7)	10 (6.6)	4 (11.4)	2 (25.0)	21 (9.7)		
2–3 times/week	5 (22.7)	45 (29.6)	7 (20.0)	3 (37.5)	60 (27.6)		
Weekly	4 (18.2)	35 (23.0)	16 (45.7)	1 (12.5)	56 (25.8)		

Monthly	6 (27.3)	45 (29.6)	7 (20.0)	1 (12.5)	59 (27.2)		
Never	2 (9.1)	17 (11.2)	1 (2.9)	1 (12.5)	21 (9.7)		
Sweets and confectionery						5.761 (12)	0.928
Daily	3 (13.6)	12 (7.9)	1 (2.9)	1 (12.5)	17 (7.8)		
2–3 times/week	4 (18.2)	39 (25.7)	10 (28.6)	1 (12.5)	54 (24.9)		
Weekly	10 (45.5)	50 (32.9)	13 (37.1)	3 (37.5)	76 (35.0)		
Monthly	5 (22.7)	48 (31.6)	10 (28.6)	3 (37.5)	66 (30.4)		
Never	0 (0.0)	3 (2.0)	1 (2.9)	0 (0.0)	4 (1.8)		
Quick breakfast products and bars						10.705 (12)	0.554
Daily	2 (9.1)	7 (4.6)	1 (2.9)	0 (0.0)	10 (4.6)		
2–3 times/week	4 (18.2)	28 (18.4)	8 (22.9)	1 (12.5)	41 (18.9)		
Weekly	5 (22.7)	28 (18.4)	8 (22.9)	0 (0.0)	41 (18.9)		
Monthly	1 (4.5)	39 (25.7)	7 (20.0)	2 (25.0)	49 (22.6)		
Never	10 (45.5)	50 (32.9)	11 (31.4)	5 (62.5)	76 (35.0)		
Reconstituted meat products						5.386 (12)	0.944
Daily	0 (0.0)	2 (1.3)	1 (2.9)	0 (0.0)	3 (1.4)		
2–3 times/week	1 (4.5)	11 (7.2)	3 (8.6)	0 (0.0)	15 (6.9)		
Weekly	4 (18.2)	15 (9.9)	4 (11.4)	0 (0.0)	23 (10.6)		
Monthly	3 (13.6)	28 (18.4)	8 (22.9)	2 (25.0)	41 (18.9)		
Never	14 (63.6)	96 (63.2)	19 (54.3)	6 (75.0)	135 (62.2)		
Ultra-processed spreads						8.487 (12)	0.746
Daily	0 (0.0)	2 (1.3)	1 (2.9)	0 (0.0)	3 (1.4)		
2–3 times/week	3 (13.6)	13 (8.6)	6 (17.1)	1 (12.5)	23 (10.6)		
Weekly	4 (18.2)	32 (21.1)	4 (11.4)	2 (25.0)	42 (19.4)		
Monthly	9 (40.9)	66 (43.4)	13 (37.1)	1 (12.5)	89 (41.0)		
Never	6 (27.3)	39 (25.7)	11 (31.4)	4 (50.0)	60 (27.6)		
Physical activity (≥30 minutes/session)						9.908 (12)	0.624
Daily	9 (40.9)	54 (35.5)	12 (34.3)	1 (12.5)	76 (35.0)		
2–3 times/week	3 (13.6)	39 (25.7)	11 (31.4)	2 (25.0)	55 (25.3)		
Weekly	7 (31.8)	27 (17.8)	7 (20.0)	2 (25.0)	43 (19.8)		
Monthly	2 (9.1)	19 (12.5)	5 (14.3)	2 (25.0)	28 (12.9)		
Never	1 (4.5)	13 (8.6)	0 (0.0)	1 (12.5)	15 (6.9)		
Daily recreational screen time						6.395 (9)	0.700
Less than 2 hours	2 (9.1)	9 (5.9)	1 (2.9)	0 (0.0)	12 (5.5)		
2–4 hours	6 (27.3)	51 (33.6)	12 (34.3)	4 (50.0)	73 (33.6)		
4–6 hours	8 (36.4)	65 (42.8)	15 (42.9)	1 (12.5)	89 (41.0)		
≥6 hours	6 (27.3)	27 (17.8)	7 (20.0)	3 (37.5)	43 (19.8)		
Sleep duration per night						5.127 (9)	0.823
2–4 hours	0 (0.0)	1 (0.7)	1 (2.9)	0 (0.0)	2 (0.9)		
4–6 hours	10 (45.5)	64 (42.1)	16 (45.7)	5 (62.5)	95 (43.8)		
6- 8 hours	9 (40.9)	67 (44.1)	16 (45.7)	3 (37.5)	95 (43.8)		
More than 8 hours	3 (13.6)	20 (13.2)	2 (5.7)	0 (0.0)	25 (11.5)		

As shown in Table 6, no statistically significant association was observed between BMI categories and the consumption frequency of any of the seven ultra-processed food groups (all $p > 0.05$). Sugary beverage consumption showed the lowest p-value ($\chi^2 = 19.470$, $p = 0.078$), with weekly consumption reported by 45.7% of participants in overweight (BMI 25.0–29.9 kg/m²) compared with 23.0% in normal weight (BMI 18.5–24.9 kg/m²). Weekly fast-food consumption was reported

by 45.7% of participants in overweight (BMI 25.0–29.9 kg/m²) and 50.0% in obese (BMI ≥30.0 kg/m²), although the overall association was not significant ($p = 0.893$). Similarly, no significant associations were observed between BMI categories and physical activity ($p = 0.624$), recreational screen time ($p = 0.700$), or sleep duration ($p = 0.823$).

DISCUSSION

The present cross-sectional study, conducted among 217 participants in Uttar Pradesh, examined the consumption patterns of seven categories of ultra-processed foods (UPFs) and their associations with body mass index (BMI), age, gender, and lifestyle characteristics. The principal finding was that none of the seven UPF categories showed a statistically significant association with BMI in the reported Pearson chi-square analyses. However, several differences in consumption patterns were observed across age and gender groups. These findings highlight the importance of examining individual dietary behaviours while recognizing the limitations of questionnaire-based assessments of UPF exposure.

The prevalence of overweight and obesity in the present study was 16.1% and 3.7%, respectively, giving a combined prevalence of 19.8%. Most participants (70.0%) had a normal BMI. Although obesity was relatively uncommon in this sample, the presence of overweight in approximately one-sixth of participants indicates the relevance of preventive dietary interventions during early adulthood. The comparatively small number of participants with obesity ($n = 8$) also limited the statistical power to detect differences across BMI categories.

Regarding dietary patterns, fast food and instant meals were consumed weekly by 36.9% of participants, while 36.4% consumed packaged snacks two to three times per week. Sugary beverages had the highest daily consumption among the seven assessed food categories (9.7%). In contrast, 62.2% reported never consuming reconstituted meat products. These variations demonstrate that UPF consumption was not uniform across food categories. Monteiro et al. described the NOVA classification and emphasized the importance of identifying industrial formulations according to their ingredients and processing characteristics rather than treating all packaged foods as nutritionally equivalent [2].

An important finding was the absence of a statistically significant association between BMI categories and consumption frequency for fast foods ($p = 0.893$), packaged snacks ($p = 0.685$), sugary beverages ($p = 0.078$), sweets and confectionery ($p = 0.928$), quick breakfast products ($p = 0.554$), reconstituted meat products ($p = 0.944$), and ultra-processed spreads ($p = 0.746$). Sugary beverages demonstrated the lowest p-value, but the association did not reach the conventional 0.05 significance threshold. These findings should not be interpreted as evidence that UPF consumption has no relationship with obesity, particularly because the analyses were unadjusted and several contingency-table cells had low expected frequencies.

The findings differ from those reported by Nardocci et al. in a Canadian cross-sectional study involving 19,363 adults, which identified an association between greater dietary contribution from UPFs and obesity [7]. Similarly, Pagliai et al., in a systematic review and meta-analysis, reported associations between higher UPF consumption and adverse health outcomes, including overweight and obesity [3]. Differences in study population, sample size, dietary assessment methods, and statistical adjustment may contribute to the variation between these findings and the present study. Importantly, those investigations assessed overall dietary exposure to UPFs, whereas the present study examined the reported frequency of consumption of individual food categories without quantifying portion sizes or their contribution to total energy intake.

Experimental evidence also supports the biological plausibility of a relationship between UPF consumption and weight gain. Hall et al., in a randomized controlled inpatient trial involving 20 adults, demonstrated that participants consumed approximately 508 additional kilocalories per day during an ultra-processed diet compared with an unprocessed diet, resulting in greater weight gain over the intervention period [4]. This suggests that dietary processing and associated food characteristics may influence energy intake beyond the frequency with which particular food products are consumed. Consequently, the absence of a significant association in the present study may partly reflect the inability of frequency-based questionnaire responses to capture total dietary energy exposure.

Age-related analysis revealed a statistically significant association between age group and consumption of quick breakfast products and bars ($p = 0.044$). Weekly consumption was higher among participants below 20 years (27.1%) than among those above 20 years (13.6%), whereas non-consumption was more common in the older group (40.2% versus 27.1%). No significant age-related associations were identified for the other six UPF categories. The observed difference may reflect variation in dietary preferences or convenience-oriented eating patterns; however, these explanations were not directly evaluated. Furthermore, this isolated association should be interpreted cautiously because multiple comparisons were performed.

Gender-related differences were more prominent. Significant associations were observed for sugary beverages ($p = 0.019$), reconstituted meat products ($p = 0.003$), and ultra-processed spreads ($p = 0.034$). Daily sugary beverage consumption was higher among males (14.8%) than females (6.6%), while weekly consumption of reconstituted meat products was also higher among males (16.0% versus 7.4%). These findings indicate differences in the types and frequency of UPFs consumed by male and female participants. However, the study did not establish whether these differences were associated with total energy intake or independently influenced BMI.

Lifestyle characteristics also deserve consideration. Daily moderate-to-vigorous physical activity was reported by 35.0% of participants, while 19.8% reported recreational screen time of six hours or more per day. Neither physical activity ($p = 0.624$) nor recreational screen time ($p = 0.700$) showed a statistically significant association with BMI categories. Sleep duration was significantly associated with gender ($p = 0.006$), although no significant association was observed with BMI ($p = 0.823$). Interpretation of the sleep findings requires caution because the questionnaire category labelled “less than 8 hours” overlaps with the shorter sleep-duration categories.

The broader public health relevance of UPF consumption extends beyond obesity alone. Srour et al. and Beslay M et al., in the French NutriNet-Santé prospective cohort, reported that greater UPF consumption was associated with an increased risk of cardiovascular disease [8,9]. Schnabel et al. also reported an association between higher UPF consumption and all-cause mortality among middle-aged French adults [10]. More recently, Lane et al., in an umbrella review incorporating 45 pooled analyses and nearly 9.9 million participants, identified associations between higher UPF exposure and multiple adverse health outcomes, although the strength and certainty of evidence varied across outcomes [6]. These findings support continued attention to dietary quality and UPF exposure even when a small cross-sectional study does not identify statistically significant associations with BMI.

Overall, the present findings suggest that consumption of UPFs was common among the surveyed participants, with meaningful variation across food categories and demographic groups. However, the available data did not establish a statistically significant relationship between the frequency of individual UPF categories and BMI. Future studies incorporating quantitative dietary assessment, larger and more representative samples, and adjustment for potential confounding factors would help clarify these relationships in young adults in Uttar Pradesh.

Strengths of the Study

The present study assessed seven categories of ultra-processed foods (UPFs) among 217 participants, providing a comprehensive overview of their consumption patterns. The inclusion of BMI, demographic characteristics, physical activity, screen time, and sleep duration enabled the examination of dietary and lifestyle-related associations among young adults.

Limitations of the Study

The cross-sectional design prevented causal interpretation, while convenience sampling and the relatively small sample size limited generalizability. Self-reported dietary information was subject to recall bias, and the absence of portion-size and total energy-intake measurements restricted accurate assessment of UPF exposure. Furthermore, unadjusted analyses, low expected cell frequencies in BMI-related chi-square tests, multiple comparisons, and overlapping sleep-duration categories may have affected the reliability of certain findings.

CONCLUSION

The present study demonstrated frequent consumption of several UPF categories among young adults, with overweight and obesity prevalences of 16.1% and 3.7%, respectively. Although significant gender-related differences were observed in selected dietary patterns, no statistically significant association was identified between UPF consumption frequency and BMI categories. These findings warrant cautious interpretation because of methodological and statistical limitations. Larger prospective studies are needed to establish the relationship between UPF consumption and obesity and to guide evidence-based preventive interventions.

Recommendations

Institution-based nutrition education, availability of affordable healthy food alternatives, and awareness regarding UPF consumption should be strengthened. Future research should involve larger representative samples, validated dietary assessment tools, quantitative estimation of UPF intake, and multivariable analyses. Longitudinal studies are recommended to clarify the relationship between UPF consumption and subsequent weight gain.

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