# Awareness and Attitude Regarding the Health Risks and the Consumption of Ultra-Processed Foods

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## ABSTRACT

*The global nutritional landscape has shifted significantly in recent decades, moving from traditional whole food diets to those dominated by processed and ultra-processed foods (UPFs). The prevalence of UPFs has led to their widespread incorporation into global food systems, raising public health concerns. This study aims to examine the relationship between awareness, attitudes, and consumption of UPFs. A sample size of 369 was determined, rounded to 400 for accuracy. Data were collected from Gulshan-e-Johar and Gulshan-e-Iqbal in Karachi, Pakistan's largest city. The statistical analysis was performed by the help of Statistical Package for Social Science (SPSS-27). The Chi-square test findings indicating a significant link between knowledge and intake of ultra-processed foods (UPFs) ($\chi^2$ = 218.738, df = 4, p <.001). This shows that changes in UPF intake are closely connected to awareness levels, rather than independent of them. Those participants have much awareness they consume less amount of ultra-processed foods. It is also observed that those participants keep positive attitude they consumed a good amount of ultra-processed foods. Mostly label reader's high consumption of ultra-processed foods were noted.*
***Keywords:*** *Ultra-Processed Foods Consumption, Awareness, Attitude, Health Risk.*

## 1.      Introduction

The worldwide nutritional landscape has changed dramatically in recent decades, with traditional diets emphasizing whole foods giving way to diets that rely more on processed and ultra-processed foods. This transition is mostly due to urbanization, globalization, and multinational food firms' aggressive marketing methods (Monteiro, C. A. et al. 2019). UPFs are industrially made items with five or more ingredients, including additives such as preservatives, emulsifiers, sweeteners, and artificial colorants, which are uncommon in home-cooked meals (Monteiro, C. A., et al. 2019).

The abundance of UPFs has resulted in their broad integration into wtreworld food systems. In nations like the United States and the United Kingdom, UPFs account for more over half of total daily calorie consumption (Monteiro, C. A., et al 2019). This trend is not limited to high-income countries; low- and middle-income countries are also seeing comparable shifts, fueled by economic development, urban expansion, and shifting lifestyles (Monteiro, C. A., et al. 2019).

The rising consumption of ultra-processed foods (UPFs) raises serious concerns about public health. Many people struggle to identify what processed or ultra-processed foods are. Misinterpretations of terminology like "low-fat," "diet," and "organic" might cause some people to assume that specific (UPFs) are healthier options. According to research, Malaysian consumers frequently fail to understand nutrition labels, indicating a lack of label literacy and a general lack of understanding of food additives, salt levels, and hidden sugars (Saad, A. M., et al., 2023). These obstacles lead to poor eating habits and reduce motivation to improve nutrition. As a result, increasing public knowledge of food labels, ingredient lists, and health warnings is critical for fostering a deeper understanding and encouraging healthy eating habits.

## 2. Literature review

Monteiro CA et al 2021 declared Ultra-processed foods, such as soft drinks, sweet or savory packaged snacks, reconstituted meat products, and pre-prepared frozen entrees, are not modified foods, but rather formulations created mostly or totally from food-derived ingredients and additives, with little if any intact Group 1 food. These formulations often comprise ingredients found in processed meals, such as sugars, oils, fats, and salt. However, ultra-processed food contain additional sources of energy and minerals that are not often employed in culinary preparations. Some of these are derived directly from foods, such as casein, lactose, whey, and gluten. Many come from the additional processing of food elements, such as hydrogenated or unesterified oils, hydrolyzed proteins, soya protein isolate, maltodextrin, invert sugar, and high-fructose corn syrup. Preservatives, antioxidants, and stabilizers are among the additives included in ultra-processed foods. Additives found solely in ultra-processed items include those designed to mimic or improve the sensory properties of meals, as well as to mask disagreeable features of the finished product. These additives include dyes and other colors, color stabilizers, flavors, flavor enhancers, non-sugar sweeteners, and processing aids such as carbonating, firming, bulking and anti-bulking, de-foaming, anti-caking, and glazing agents, emulsifiers, sequestrants, and humectants. A variety of techniques are utilized to mix the different elements and form the final result (thus the term 'ultra-processed'). Several of the processes have no domestic counterparts, such as hydrogenation and hydrolysis, extrusion and moulding, and frying pre-processing. The main goal of ultra-processing is to develop branded, handy (durable, ready-to-eat), appealing (hyper-palatable), and highly lucrative (low-cost ingredients) food items that will supplant all other food categories. Ultra-processed food products are often beautifully packaged and heavily advertised.

### 2.1 Adverse health outcomes

Rico-Campà A, et al. 2019 discovered that high intake of ultra-processed foods (>4 servings per day) was substantially connected with a 62% greater risk of death. Furthermore, each extra serving of ultra-processed food was related with a statistically significant 18% increased risk of all-cause death.

Srour B, Fezeu LK et al. 2019 reported that in this large prospective cohort, an absolute increase of ten percent in the percentage of ultra-processed foods in the diet was associated with a 12%, 13%, and 11% statistically significant increase in the rates of overall cardiovascular, coronary heart, and cerebrovascular disease.

Lane MM, Gamage E, et al. 2022 found a cross-sectional association between higher ultra-processed food intake and increased likelihood of depressed and anxiety symptoms. Harb AA, Shechter A, et al. 2022 discovered that the data included in the current review consistently

supports a favorable relationship with high UPF intake and obesity. According to Chen Z et al. (2023), high-quality meta-evidence indicates that overall UPF intake is related with an increased risk of T2D.

## 2.2      Knowledge of ultra-processed foods

According to Robinson E. et al. (2024), demographic characteristics such as education, wealth, and age typically impact community knowledge. Robinson et al. observed that certain sociodemographic groups, such as those with higher education levels, were more likely to accurately categorize ultra-processed meals, but also more likely to mistake non-ultra-processed items for ultra-processed foods. Naghashpour et al.'s 2020 study in southwestern Iran indicated that urban families had considerably greater levels of nutritional awareness ($p < 0.05$) than rural households.

Stamatelou D et al. 2024 acknowledged that numerous research suggest that the general population has a weak awareness of what defines ultra-processed food. A survey of the Greek population found that 40% of participants were unaware of the phrase ultra-processed foods. Bolhuis D, Mosca AC, Pellegrini N. 2022 surveyed participants regarding their understanding of the NOVA food classification. An online questionnaire was completed by 277 Dutch, 204 Italian, and 181 Brazilian customers. When asked if they knew the NOVA categorization, 84% of Dutch customers said no, whereas 75% of Italians and 58% of Brazilians said yes.

## 2.3 Attitude toward ultra-processed food

Ultra-processed foods are often regarded positively due to their vast availability, low cost, and long shelf life. According to a 2024 survey conducted by the International Food Information Council, the most popular reasons people buy packaged foods are convenience (33%), taste (32%), and extended storage (29%). (26) Furthermore, a 2024 Dutch survey discovered that 51% of the 463 respondents had a neutral view regarding food processing, 23% had a favorable perspective, and 26% had a negative attitude. Those that had a positive or neutral opinion noted benefits such as palatability (flavor, texture), food security, food safety, and shelf life. In contrast, individuals with a negative view say there is a lack of openness in food processing and have low faith in the food sector.

Bolhuis DP, et al. 2024 did a study and found that, notwithstanding the convenience aspect, there is rising public concern about the health consequences of ultra-processed food. Ultra-processed foods are known to contain salt, saturated fat, "trans" fatty acids, and sugar. According to a 2024 survey, the most popular negative features of health repercussions chosen by Dutch consumers were "additives" (72%), "overweight/obesity" (70%), "cardiovascular disease" (49%), "high calorie content" (43%), "cancer" (39%), "gastro-intestinal disease" (37%), and starvation (4.7%).

## 2.4 Consumption of ultra-processed food

Monteiro CA, et al. (2018) observed that consumption of ultra-processed foods has grown dramatically in both developed and developing nations, indicating fundamental changes in global food systems and consumer behavior. This shift in eating patterns is intimately linked to social, cultural, and technical changes that have transformed food production and access, particularly in cities. Ultra-processed foods currently account for a sizable portion of dietary energy consumption in high-income countries, with the United States and the United Kingdom accounting for more than half.

According to Nardocci M. et al. 2019, a 2018 study in Canada found that ultra-processed meals account for over half (45%) of the daily calories consumed by Canadian adults. Men, younger

individuals, and those with less formal education are more likely to consume these meals. Julia C. et al.'s 2017 study in France discovered that ultra-processed foods accounted for 18.4% of overall food consumption and 35.9% of total calorie intake. Higher intake of ultra-processed foods was linked to male gender, younger age, lesser education, and overweight or obesity. Participants who consumed the most ultra processed foods ate less fruits and vegetables and more sweets and soft beverages.

Stamatelou D, et al. 2024 did a study on the Greek population and found that 29% of the 1026 participants indicated daily intake of ultra-processed meals. The most ultra-processed items consumed weekly by participants were packaged bread and pastries (62%), morning cereals, sugary cereal bars (49%), and packaged sweet snacks (48%).

## 3. Methodology

### 3.1 Sample size

Minimum required sample size was calculated by:

$$n = \{Z^2 \, P \, (1-P)\} \div (d^2)$$

n = 369

n = Minimum required sample size.

Z = Reliability coefficient (value from normal distribution associated with 95% confidence level is 1.96)

P = estimated population proportion. Based on a 2024 study conducted in Greece, 60% (P = 0.60) of participants had at least some knowledge of the health risks associated with UPFs consumption. (20)

d = Amount of acceptable error (0.05) The calculated sample size was increased by 10%, resulting in a final target sample size of approximately 400 participants.

### 3.2 Sample procedure

The sample was acquired via convenience sampling. This is because random sampling is unavailable owing to a lack of access to the sample frame. Thus, convenient sampling is selected. The needed sample size for this investigation was 369, which was rounded to 400 for study accuracy. The statistics were taken from the two areas Gulshan-e-Johar and Gulshan-e-Iqbal in Karachi, Pakistan's largest metropolis.

### 3.3 Inclusion criteria

Participants consisted of individuals aged 18 and above

### 3.4 Data collection instruments

The data was obtained using an interviewer-administered questionnaire with English and Urdu language options accessible to participants. The questionnaire included structured questions on socio-demographic characteristics (such as age, gender, occupation, education level, and income), as well as variables to assess knowledge and attitudes regarding the health dangers of ultra-processed food and its consumption.

### 3.5 Data collection procedure

The data gathering procedure began when the questionnaire was authorized by the Associated Dean and the supervisor. Prior to the interview, the research team educated everyone on the study and acquired informed permission. During the interview, the researcher administered the questionnaire and provided detailed explanations for any items that the participants found unclear.

### 3.6 Data entry and analysis

Descriptive statistics such as frequency and percentage were employed to depict categorical variables such as gender, occupation, education level, income, and information sources. For inferential statistics, the Pearson Chi-square test was utilized to investigate the relationship between knowledge and attitude levels, UPF consumption, and food label reading habits with various socio-demographic characteristics. It was also utilized to investigate the links between knowledge and attitude, as well as knowledge and intake of ultra-processed foods. The statistical analysis was performed by the help of Statistical Package for Social Science (SPSS-27).

## 4.     Results

**Table.No:01: Age group of the participants**

| Age group (years) | Frequency (n) | Percent (%) |
|---|---|---|
| < 20.0 | 19 | 4.8 |
| 20.0 – 29.0 | 229 | 57.3 |
| 30.0 – 39.0 | 83 | 20.8 |
| 40.0 – 49.0 | 31 | 7.8 |
| 50.0 – 59.0 | 27 | 6.8 |
| 60.0+ | 11 | 2.8 |
| Total | 400 | 100.0 |

The table. No 01 shows the age groups among the 400 participants. The majority was in the 20-29 years age group, accounting for 57.3% (n=229) of the total participants. The second largest group was the 30-39 years age group, which accounted for 20.8% (n=83). 40-49 years, 50-59 years, and below 20 years age groups accounted for 7.8% (n=31), 6.8% (n=27), and 4.8% (n=19) respectively. The least being the above 60 years age group, which accounted for 2.8% (n=11).

**Table.No:02: Gender of the participants**

| Gender | Frequency (n) | Percent (%) |
|---|---|---|
| Male | 181 | 45.3 |
| Female | 219 | 54.8 |
| Total | 400 | 100.0 |

Table. No 02 shows the sex distribution among the 400 participants. Female sex accounted for 54.8% of the total participants (n=219) and male sex accounted for 45.3% (n=181).

**Table.No:03: Education level of the participants**

| Education level | Frequency (n) | Percent (%) |
|---|---|---|
| No formal education | 15 | 3.8 |
| Primary education | 28 | 7.0 |
| Secondary education | 98 | 24.5 |
| Diploma | 86 | 21.5 |
| Undergraduate | 152 | 38.0 |
| Postgraduate | 21 | 5.3 |
| Total | 400 | 100.0 |

Table. No 03 shows the education level distribution of the 400 participants. The majority was undergraduate education level, accounting for 38% (n=152) of the total participants. Second and third largest groups were secondary education level and diploma education level, which accounted for 24.5% (n=98) and 21.5% (n=86). Following them, Primary education and

postgraduate education level accounted for 7% (n=28) and 5.3% (n=21). The least being no formal education, which accounted for 3.8% (n=15).

**Table.No:04: Source of Information about Ultra-processed food (UPF)**

| Source of Information | Frequency (n) | Percent (%) |
|---|---|---|
| Facebook | 211 | 17.6 |
| YouTube | 150 | 12.5 |
| TikTok | 143 | 11.9 |
| Instagram | 135 | 11.3 |
| TV | 128 | 10.7 |
| Friends | 102 | 8.5 |
| Educational institute | 92 | 7.7 |
| Family | 86 | 7.2 |
| Radio | 84 | 7.0 |
| Newspaper | 50 | 4.2 |
| Neighbour | 19 | 1.6 |
| Total | 1200 | 100.0 |

The table. No 04 shows the sources of information on ultra-processed food (UPF) distribution among the 1200 responses from the 400 participants. The majority was Facebook, accounting for 17.6% (n=211). The second largest group was YouTube, which accounted for 11.9% (n=150). Following them, TikTok, Instagram, and TV accounted for 11.9% (n=143), 11.3% (n=135), and 10.7% (n=128) respectively. Friends accounted for 8.5% (n=102). Educational institutes, family, and radio accounted for 7.7% (n=92), 7.2% (n=86), and 7% (n=84) respectively. Newspapers accounted for 4.2% (n=50). The least being neighbors, which accounted for 1.6% (n=19).

**Table.No:05: Awareness level about Ultra-processed food (UPF)**

| Awareness | Frequency (n) | Percent (%) |
|---|---|---|
| Low | 145 | 36.3 |
| Average | 146 | 36.5 |
| High | 109 | 27.3 |
| Total | 400 | 100.0 |

Table. No 05 shows the knowledge score distribution among the 400 participants. The majority scored average, accounting for 36.5% (n=146). Followed closely by low knowledge score, which accounted for 36.3% (n=145). The least being high knowledge score, which accounted for 27.3% (n=109).

**Table. No:06: Attitude on Health Risk of Ultra-processed food (UPF)**

| Attitude on Health Risk of UPF | Frequency (n) | Percent (%) |
|---|---|---|
| Negative Attitude | 160 | 40.0 |
| Positive Attitude | 240 | 60.0 |
| Total | 400 | 100.0 |

The table. No 06 shows the attitude on health risk of UPF distribution among the 400 participants. The majority had a positive attitude, accounting for 60% (n=240) of the total participants. The minority had a negative attitude, which accounted for 40% (n=160).

**Table.No;7: Consumption of Ultra-processed food (UPF)**

| Consumption of UPF | Frequency (n) | Percent (%) |
|---|---|---|
| **Low Consumption** | 18 | **4.5** |
| **Moderate Consumption** | 321 | **80.3** |
| **High Consumption** | 61 | **15.3** |
| **Total** | **400** | **100.0** |

Table. No 07 shows the consumption of UPF distribution among the 400 participants. The majority had a moderate consumption, accounting for 80.3% (n=321). The second largest group had a high consumption, which accounted for 15.3% (n=61). The minority had a low consumption, which accounted for 4.5% (n=18).

**Tabl.No:08: Food Label Reading Habit**

| Food Label Reading Habit | Frequency (n) | Percent (%) |
|---|---|---|
| **Never** | 93 | **23.1** |
| **Sometimes** | 202 | **50.6** |
| **All the time** | 105 | **26.3** |
| **Total** | **400** | **100.0** |

The table. No 08 shows the food label reading habit distribution among the 400 participants. The majority who sometimes read food label, accounting for 50.6% (n=202) of the total participants. 105 participants read food label all the time, which accounted for 26.3%. The minority who never read food label accounted for 23.1% (n=93).

**Table.No:09: Cross tabulation of awareness and consumption of UPFs**

| Awareness | | Consumption | | | Total |
|---|---|---|---|---|---|
| | | Low consumption | Moderate consumption | High consumption | |
| Low | Observed | 17 | 128 | 0 | 145 |
| | Expected | 6.2 | 116.7 | 22.1 | 145.0 |
| Average | Observed | 0 | 146 | 0 | 146 |
| | Expected | 6.2 | 117.5 | 22.3 | 146.0 |
| High | Observed | 0 | 48 | 61 | 109 |
| | Expected | 4.6 | 87.7 | 16.6 | 109.0 |
| Total | Observed | 17 | 322 | 61 | 400 |
| | Expected | 17.0 | 322.0 | 61.0 | 400.0 |

Table No. 09 According to the cross-tabulation, participants with low or average awareness of ultra-processed foods (UPFs) consume more moderately, with essentially no high consumption, contrary to expectations. In contrast, those with high awareness report much higher levels of high consumption than expected, as well as lower-than-expected moderate consumption. This demonstrates an unexpected trend: greater awareness of UPFs is associated with increased high consumption, whereas low awareness is mostly associated with moderate consumption.

**Table.No;10: Chi-Square Tests of awareness and consumption of UPFs**

|  | Value | Df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 218.738ᵃ | 4 | .000 |
| Likelihood Ratio | 222.149 | 4 | .000 |
| Linear-by-Linear Association | 146.098 | 1 | .000 |

Table No. 10 displays chi-square test findings indicating a significant link between knowledge and intake of ultra-processed foods (UPFs) ($\chi^2$ = 218.738, df = 4, p <.001). The Pearson Chi-Square and Likelihood Ratio support the substantial association, while the Linear-by-Linear Association ($\chi^2$ = 146.098, p <.001) shows a definite trend between the two variables. This shows that changes in UPF intake are closely connected to awareness levels, rather than independent of them.

**Table.No:11: Cross tabulation of attitude and consumption of UPFs**

|  |  | Consumption | | | Total |
|---|---|---|---|---|---|
|  |  | Low consumption | Moderate consumption | High consumption |  |
| Negative attitude | Observed | 17 | 143 | 0 | 160 |
|  | Expected | 6.8 | 128.8 | 24.4 | 160.0 |
| Positive attitude | Observed | 0 | 179 | 61 | 240 |
|  | Expected | 10.2 | 193.2 | 36.6 | 240.0 |
| Total | Observed | Observed | 322 | 61 | 400 |
|  | Expected | 17.0 | 322.0 | 61.0 | 400.0 |

The cross-tabulation findings are shown in a table. No 11 demonstrates that persons with a negative attitude toward ultra-processed foods (UPFs) are mostly clustered in the moderate consumption category (143 observed vs. 128.8 anticipated), with no cases of high consumption despite an expected 24. Conversely, people with a favorable attitude about UPFs had a higher-than-anticipated frequency of high consumption (61 vs. 36.6), as well as somewhat fewer moderate consumers than predicted. Overall, the trend suggests that a favorable attitude about UPFs is related with increased consumption, whereas a negative attitude is associated with moderate intake and a lack of high consumption.

**Table.No:12: Chi-Square Tests of attitude and consumption of UPFs**

|  | Value | Df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 68.776ᵃ | 2 | .000 |
| Likelihood Ratio | 96.056 | 2 | .000 |
| Linear-by-Linear Association | 68.011 | 1 | .000 |

Table 12 shows a significant relationship between attitude and intake of ultra-processed foods (UPFs) ($\chi^2$ = 68.776, df = 2, p <.001). The Pearson Chi-Square and Likelihood Ratio support the substantial association, and the Linear-by-Linear Association ($\chi^2$ = 68.011, p <.001) shows a definite directional trend. This implies that people's sentiments regarding UPFs are strongly related to their consumption levels, with favorable attitudes resulting in increased consumption.

**Table.No:13: Cross tabulation of food label and consumption of UPFs**

|  |  | Consumption | | | Total |
|---|---|---|---|---|---|
|  |  | Low consumption | Moderate consumption | High consumption |  |
| Never | Observed | 17 | 76 | 0 | 93 |
|  | Expected | 4.0 | 74.9 | 14.2 | 93.0 |
| Some times | Observed | 0 | 202 | 0 | 202 |
|  | Expected | 8.6 | 162.6 | 30.8 | 202.0 |
| All times | Observed | 0 | 44 | 61 | 105 |
|  | Expected | 4.5 | 84.5 | 16.0 | 105.0 |
| Total | Observed | 17 | 322 | 61 | 400 |
|  | Expected | 17.0 | 322.0 | 61.0 | 400.0 |

Table No. 13 demonstrates that those who never read food labels are primarily moderate users of UPFs (76 observed vs. 74.9 anticipated), with no high consumption despite an estimated 14.2. Those that read labels are almost entirely concentrated in the moderate consumption category (202 observed vs. 162.6 anticipated), with no high consumption despite an estimated 30.8. Individuals who read food labels at all times report much more high consumption (61 observed vs. 16.0 anticipated) and fewer moderate consumers than expected. Overall, the data indicate that regular food label readers are more likely to consume high UPF levels, whereas non-readers and occasional readers tend to fall into the moderate range, with little to no high consumption.

**Table.No:14: Chi-Square Tests of food label and consumption of UPFs**

|  | Value | Df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 256.488[a] | 4 | .000 |
| Likelihood Ratio | 245.245 | 4 | .000 |
| Linear-by-Linear Association | 162.251 | 1 | .000 |

The chi-square test findings in table 14 demonstrate a very significant connection between food label reading habits and intake of ultra-processed foods (UPFs) ($\chi^2$ = 256.488, df = 4, p <.001). The Pearson Chi-Square and Likelihood Ratio support the substantial association, and the Linear-by-Linear Association ($\chi^2$ = 162.251, p <.001) indicates a definite trend. This implies that the frequency with which food labels are read is substantially related to UPF consumption behaviors, with constant label readers exhibiting significantly different consumption behaviours than non-readers or occasional readers.

**Conclusion**

The present study is conducted to observe the association of ultra-processed foods consumptions with awareness and attitude regarding health risks and consumption of ultra-processed foods. This study revealed that there is association between the awareness of regarding health risks of ultra-processed foods. Those participants have much awareness they consume less amount of ultra-processed foods. It is also observed that those participants keep positive attitude they consumed a good amount of ultra-processed foods. Mostly label reader's high consumption of ultra-processed foods were noted.

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