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Research Article

Student Awareness and Perception of Food Chemical Safety: Identifying Risks and Knowledge Gaps

Marta Milagros M. Manaog[1], Dolly P. Maroma[2], Allen N. Maroma[2]*

[1]Graduate School, Bulacan State University, Philippines
[2]Graduate School/ College of Industrial Technology, Bulacan State University, Philippines

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**Corresponding author:*
E-mail:
maromaallen15@gmail.com

ABSTRACT

Chemical in food have become a growing concern, especially among youths exposed to processed and artificial food products. Understanding students' awareness and perception of chemical safety in food is crucial for effective risk communication, policy development, and promoting informed consumer choices. Therefore, this descriptive study was conducted. It aimed to analyze the extent to which students understand the safety of chemicals in food, their perceived risks, and how external influences shape their food consumption decisions. One hundred fifty (150) Senior High School students from two strands participated in this study and were selected using stratified random sampling. A survey questionnaire was used to examine variables related to awareness, perceptions, external influences, knowledge of regulations, and decision-making concerning food chemicals. Descriptive statistics (frequency counts, percentages, and mean scores) are reported for each item. Inferential tests (chi-square, t-test, and ANOVA) were used where relevant to determine relationships and/or differences among subgroups (e.g., HE A, HE B, HUMMS A, and HUMMS B). The study revealed that no significant relationship exists between awareness of food chemicals and actual food consumption decisions. Furthermore, no significant differences in awareness scores were observed across academic strands, nor were significant differences in decision-making found between male and female students. Researchers conclude that schools should expand access to nutritious meal options within cafeterias, ensuring that students have viable alternatives to chemically processed snacks and beverages.

Keywords*: Additives, Food Chemicals, Food Safety Awareness, Preservatives, Processed Food*

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Introduction

Food safety has emerged as a critical global concern, particularly in the wake of rising health risks associated with the consumption of chemically processed food. The increasing reliance on food additives, preservatives, and chemical enhancers in modern food production has led to both widespread consumer benefits and heightened public apprehensions regarding their long-term health effects (Harshitha et al., 2024). These substances, ranging from natural preservatives to synthetic compounds, are extensively used to enhance flavor, prolong shelf life, and maintain food quality. However, the potential adverse effects of prolonged exposure to such chemicals have fueled debates among health professionals, regulatory bodies, and consumers. The growing concern over food safety is particularly relevant for adolescents, who constitute one of the most vulnerable consumer groups due to their dietary preferences and consumption patterns (Trasande et al., 2018).

In the Philippine context, there has been a dramatic shift in food consumption behavior over recent decades, with a significant increase in the intake of processed, convenience, and fast food products. The proliferation of chemically treated food items has raised urgent questions regarding consumer awareness and perception of food chemical safety, particularly among senior high school students who are actively shaping their eating habits (Manalili et al., 2017). Studies indicate that Filipino adolescents exhibit a growing preference for commercially available food products containing artificial flavor enhancers, synthetic colorants, and chemical stabilizers, often without a clear understanding of the potential health risks posed by these additives (Rathi et al., 2020). For example, monosodium glutamate (MSG), a widely used food additive in fast food and processed snacks, has been linked to allergic reactions and neurological symptoms in certain populations (Bahna & Burkhardt, 2018). Similarly, synthetic food dyes such as Tartrazine (Yellow 5) and Allura Red (Red 40) have been implicated in behavioral changes among children, particularly in relation to attention deficit hyperactivity disorder (ADHD) symptoms (Yoo, 2024).

Despite the implementation of food safety regulations by the Philippine Food and Drug Administration (FDA), studies suggest that public awareness of food chemical risks remains limited, especially among young consumers (Manalili et al., 2017). Adolescents, in particular, are at increased risk due to their higher consumption of processed and sugary foods, coupled with limited exposure to food safety education. Research by Grados et al. (2022) highlights that insufficient knowledge about food additives and preservatives can lead to long-term health issues such as obesity, metabolic disorders, and increased cancer risk. The prevalence of diet-related illnesses among Filipino adolescents underscores the urgent need to assess their understanding of food chemical safety and to develop interventions aimed at enhancing consumer literacy in this domain.

Given the increasing complexity of modern food systems and the pervasive role of food chemicals in daily consumption, there is a pressing need to investigate how young consumers perceive and respond to food safety concerns. Understanding senior high school students' awareness and perception of food chemicals is crucial for shaping their dietary choices, promoting informed decision-making, and strengthening educational initiatives related to food safety. By evaluating the level of knowledge among students regarding food chemicals, their perception of associated risks, and their ability to make informed dietary decisions, this study aims to provide empirical evidence that will contribute to improving food safety education and policy interventions targeted at young consumers.

The research study assessed students' knowledge of food additives, preservatives, and contaminants, their understanding of food safety regulations, and their decision-making processes when choosing food products.

The study aimed to assess the awareness, perceptions, and knowledge of senior high school students regarding the safety of chemicals in food. Specifically, it sought to answer five key research questions. First, it explored the level of awareness among senior high school students regarding the presence of chemicals in food. Second, the study

investigated their perceptions of the risks and benefits associated with food chemicals. Third, it examined how knowledgeable the students are about food safety regulations and guidelines in the Philippines. Fourth, the research aimed to identify the factors that influence the students' understanding and decision-making regarding food choices. Lastly, the study aimed to provide recommendations to improve food safety awareness among senior high school students.

This study is grounded in two established theoretical perspectives: the Health Belief Model (HBM) and Social Cognitive Theory (SCT), both of which provide a structured understanding of how students develop awareness and make decisions regarding food chemical safety. The Health Belief Model (HBM), as proposed by Abraham and Sheeran (2005), posits that individuals' health-related behaviors are influenced by their perceived susceptibility to a health risk, the perceived severity of its consequences, the perceived benefits of taking preventive action, and the perceived barriers to action. When applied to food chemical safety, this model explains how students assess the potential dangers of food additives, preservatives, and contaminants, and how these perceptions influence their dietary choices. For instance, if students believe that consuming chemically processed food increases their risk of developing health issues such as obesity, allergies, or metabolic disorders, they may be more inclined to scrutinize food labels and opt for minimally processed alternatives. Conversely, if they perceive minimal risk or encounter barriers such as limited access to healthier food options or misleading food marketing, they may continue consuming chemically altered foods despite being aware of potential health consequences.

In addition to individual perceptions, social influences play a critical role in shaping students' food safety knowledge and behaviors, which is best explained through Social Cognitive Theory (SCT). According to Li and Craig (2023), SCT emphasizes observational learning, social modeling, and environmental influences as key determinants of behavior. Within the context of food chemical safety, students are influenced not only by personal risk assessments but also by their surroundings, including family dietary habits, peer group preferences, media exposure, and school-based nutrition education. For example, students whose parents actively read food labels and prioritize natural foods are more likely to adopt similar practices, while those regularly exposed to fast-food advertising and processed snacks in school canteens may develop more permissive attitudes toward food chemicals. The theory suggests that increasing students' awareness of food safety risks through observational learning—such as school-based food safety programs, peer discussions, and social media campaigns—can significantly enhance their ability to make informed dietary decisions.

By integrating these two theoretical perspectives, this study provides a comprehensive framework for understanding the factors that shape students' knowledge, perception, and behavior regarding food chemicals. The HBM explains the cognitive processes behind food-related risk assessment, while SCT highlights the role of external influences in shaping attitudes toward food safety. Together, these theories support the need for targeted educational interventions that enhance students' ability to critically assess food chemical risks, resist misleading marketing influences, and make well-informed dietary choices. Recognizing that both personal risk perception and social learning contribute to food safety awareness, this study underscores the importance of multi-level strategies—including school-based education, parental guidance, and regulatory transparency—to improve food safety literacy among students.

Methods

This study employed a descriptive research design, utilizing a survey method to assess senior high school students' awareness, perception, and knowledge of food chemical safety. Descriptive research is appropriate for systematically describing a phenomenon, allowing the researcher to measure variables without manipulating them (Pandey & Pandey, 2015). The study aims to analyze the extent to which students understand the safety of chemicals in food, their perceived risks, and how external

influences shape their food consumption decision-making.

The survey method was chosen due to its efficiency in collecting data from a large sample while ensuring consistency and reliability in measuring students' awareness and perceptions (Rea & Parker, 2014). By using a structured questionnaire, this research will obtain quantifiable data that can be statistically analyzed to determine trends, relationships, and gaps in students' knowledge of food chemical safety.

Furthermore, the study employed a stratified random sampling technique. This method ensures that students are proportionally selected from each grade level, allowing for a balanced dataset across different age groups. Stratified sampling was particularly useful for this study because food safety awareness may vary by age. Therefore, a total of 150 students will be selected as respondents. These students will be distributed proportionally across the two strands in senior high school to maintain an accurate representation of the population.

The questionnaire is comprised of a 5-point Likert scale (e.g., Strongly Agree to Strongly Disagree) to ensure comprehensive data collection. The instrument is comprised of six sections that deal with: the demographic information of the respondents; the awareness of food chemicals; perception of food chemical risks; the influence of parents, media, and peers; the knowledge of food safety regulations; and the decision making on food consumption.

Results and Discussion

The data are organized into six sections: (1) demographic profile, (2) awareness of food chemicals (Section B), (3) perception of food chemical risks (Section C), (4) influence of parents, media, and peers (Section D), (5) knowledge of food safety regulations (Section E), and (6) decision-making on food consumption (Section F). Descriptive statistics (frequency counts, percentages, and mean scores) are reported for each item. Where relevant, inferential tests (chi-square, t-test, and ANOVA) are used to determine relationships and/or differences among subgroups (e.g., HE A, HE B, HUMMS A, and HUMMS B).

Table 1. Age Distribution of Respondents (N = 150)

Age	HE A (f)	HE B (f)	HUMMS A (f)	HUMMS B (f)	Total (f)	% of Total
17	15	12	15	14	56	37.3%
18	14	15	14	12	55	36.7%
19	5	5	7	8	25	16.7%
20	3	6	2	3	14	9.3%
Total	**37**	**38**	**38**	**37**	**150**	**100%**

The age distribution of the 150 respondents, as shown in Table 1, indicates that the majority fall within the younger age groups. Specifically, 37.3% (56 respondents) are 17 years old, while 36.7% (55 respondents) are 18 years old. Together, these two age groups make up 74% of the total respondents, suggesting that most participants are in their late teenage years. In contrast, only 16.7% (25 respondents) are 19 years old, and an even smaller proportion, 9.3% (14 respondents), are 20 years old, indicating a decline in the number of respondents as the age increases. Additionally, the number of respondents across the four groups — HE A, HE B, HUMMS A, and HUMMS B — is fairly balanced, with group sizes ranging from 37 to 38 respondents each. This balance suggests that the age distribution is consistent across all groups. Overall, the data reveal that the surveyed population is predominantly composed of younger respondents, with relatively fewer older participants.

Table 2. Gender Distribution of Respondents (N = 150)

Gender	HE A (f)	HE B (f)	HUMMS A (f)	HUMMS B (f)	Total (f)	% of Total
Female	19	18	22	23	82	54.7%
Male	18	20	16	14	68	45.3%
Total	37	38	38	37	150	100%

The gender distribution of the 150 respondents, as presented in the table, shows that the majority are female. A total of 82 respondents, which accounts for 54.7%, are female, while 68 respondents, representing 45.3%, are male. This indicates that there are slightly more female respondents than male respondents. The distribution is relatively balanced across the four groups — HE A, HE B, HUMMS A, and HUMMS B — with only minor variations in the number of male and female respondents per group. The data suggests a slightly higher participation of females in the survey, although both genders are adequately represented, ensuring a balanced perspective in the responses.

Table 3. Summary of Overall Means in HE & HUMMS – Awareness of Food Chemicals by Strand (Section B)

Strand	B1	B2	B3	B4	B5	Average (B1–B5)
HE A	3.216	3.135	3.135	3.270	2.973	3.146
HE B	3.132	3.132	3.053	3.105	3.026	3.090
HUMMS A	3.211	3.263	3.132	3.237	3.000	3.169
HUMMS B	3.162	3.243	3.027	3.189	3.108	3.146

Awareness Scores

The results indicate that across all strands, as indicated in Table 3 the respondents demonstrate a consciousness of food chemicals, with mean scores clustering around the neutral-to-agree range (3.0–3.3). The highest average score was observed in HUMMS A (3.169), *while* HE B had the lowest mean (3.090). The highest individual item mean was for B4 (familiarity with food contaminants) in HE A (3.270), suggesting a relatively stronger awareness of food safety risks.

An ANOVA test was conducted to assess if there were statistically significant differences between the mean awareness scores across the four strands. The results yielded $F = 0.688$, $p = 0.573$, indicating that there are no statistically significant differences in awareness of food chemicals among the different academic strands.

Additionally, a chi-square test was performed to examine the relationship between awareness of food chemicals and decision-making on food consumption. The test resulted in $\chi^2 = 0.427$, $p = 0.935$, suggesting no significant relationship between students' awareness levels and their decision-making regarding food safety.

A t-test for gender differences in mean awareness scores was also conducted, yielding $t = -1.871$, $p = 0.098$. Since the p-value is greater than 0.05, the results indicate no significant difference in awareness of food chemicals between male and female students.

Overall, while students demonstrate cognizance of food additives, preservatives, and contaminants, the lack of statistically significant differences suggests that academic strand and gender do not strongly influence their knowledge or concern about food chemicals. This reinforces the need for enhanced educational interventions across all student groups to improve food safety literacy and awareness. This outcome leads to the rejection of the hypothesis and underscores the importance of implementing comprehensive food safety education uniformly across all student groups, regardless of their academic background or gender.

Table 4. Perception of Food Chemical Risks (Section C)

Strand	C1 (Health Risks)	C2 (Benefits)	C3 (Long-term Exposure)	C4 (Organic vs. Processed)	C5 (GMO Harmfulness)
HE A	3.24	2.97	3.08	3.27	3.05
HE B	3.18	2.92	3.03	3.16	3.03
HUMMS A	3.18	3.08	3.08	3.16	2.97
HUMMS B	3.11	3.03	3.05	3.00	2.95

Perceived Risks

The data from Table 4 highlights the perceptions of food chemical risks among students across different strands. Overall, students exhibit a moderate level of concern regarding the health risks associated with food chemicals (C1) and the potential effects of long-term exposure (C3), with mean scores ranging from 3.08 to 3.24 and 3.03 to 3.08, respectively. This suggests that while students are aware of the possible dangers of food chemicals, their level of concern remains moderate. In contrast, perceptions regarding the benefits of food chemicals (C2) are relatively neutral, with scores ranging from 2.92 to 3.08, indicating uncertainty or a lack of understanding about the positive aspects of food chemicals.

Notably, students show a relatively stronger perception of the differences between organic and processed foods (C4), with the highest scores across all strands, ranging from 3.00 to 3.27. This suggests a growing awareness of healthier food options. However, concern about the harmfulness of genetically modified organisms (GMOs) (C5) is lower, with mean scores between 2.95 and 3.05, indicating that students perceive GMO-related risks less seriously compared to other categories.

Although there are slight variations in the mean scores across the four strands, the differences are minimal, suggesting that students across all strands have relatively similar perceptions of food chemical risks. HE A tends to show slightly higher concern in most categories, while HUMMS B tends to have slightly lower scores overall.

These findings imply that while students have a moderate understanding of the risks associated with food chemicals, their perception of the benefits and their concern about GMOs remain relatively neutral. This highlights the need for more targeted educational interventions that not only address the risks and benefits of food chemicals but also strengthen awareness about GMOs and promote informed decision-making regarding processed and organic foods.

Table 5. Influence of Parents, Media, and Peers (Section D)

Strand	D1 (Parents)	D2 (SocialMedia)	D3 (Peers)	D4 (Advertisements)	D5 (Health Experts)
HE A	3.16	3.49	3.38	3.22	3.41
HE B	3.24	3.37	3.32	3.26	3.26
HUMMS A	3.29	3.37	3.29	3.21	3.32
HUMMS B	3.34	3.47	3.21	3.32	3.34

Behavioral Influences

The data from Table 5 presents the influence of various factors—parents, social media, peers, advertisements, and health experts—on students' perceptions of food chemicals across different strands. Overall, social media (D2) exerts the highest influence on students, with mean scores ranging from **3.37 to 3.49** across all strands, indicating that students are most influenced by information from social media platforms when forming their perceptions about food chemicals. Similarly, health experts (D5) also have a notable influence, with scores ranging from **3.26 to 3.41,** suggesting that professional advice and information from health experts play a significant role in shaping students'

understanding of food safety and chemical risks.

Peers (D3) also contribute to shaping students' perceptions, with mean scores ranging from **3.21 to 3.38,** reflecting a moderate influence. Parental influence (D1) shows relatively consistent scores, between **3.16 and 3.34,** indicating that while parents play an influential role, their impact is slightly less pronounced than that of social media and health experts. Advertisements (D4) demonstrate a slightly lower but still moderate influence, with mean scores ranging from **3.21 to 3.32,** suggesting that promotional materials also affect students' decision-making and awareness.

Across the strands, HUMMS B reports the highest influence from parents (3.34) and advertisements (3.32), while HE A exhibits the strongest influence from social media (3.49) and health experts (3.41). The results suggest that all these factors contribute moderately to shaping students' perceptions, but social media remains the dominant source of influence across strands.

These findings imply that future educational interventions should consider leveraging social media platforms and expert-driven content to effectively enhance students' knowledge of food chemical risks. Additionally, engaging parents, peers, and advertisements in promoting accurate and reliable information can further strengthen students' awareness and decision-making regarding food safety.

Table 6. Knowledge of Food Safety Regulations (Section E)

Strand	E1 (FDA Regulations)	E2 (Labeling)	E3 (Handling & Storage)	E4 (Foodborne Risks)	E5 (Hygiene)
HE A	3.11	3.38	3.24	3.27	3.35
HE B	3.16	3.42	3.29	3.32	3.38
HUMMS A	3.21	3.47	3.32	3.34	3.42
HUMMS B	3.14	3.37	3.27	3.29	3.37

Food Safety Regulations Awareness

The data from Table 6 illustrates the respondents' knowledge of food safety regulations, including awareness of FDA regulations, food labeling, proper handling and storage, foodborne risks, and hygiene practices. Across all strands, the highest scores were consistently observed in knowledge of food labeling (E2) and hygiene (E5), with mean values ranging from **3.37 to 3.47** for labeling and **3.35 to 3.42** for hygiene. These results suggest that students are relatively more knowledgeable about understanding food labels and maintaining proper hygiene practices.

Handling and storage (E3) also yielded moderate scores, with means ranging from **3.24 to 3.32,** indicating that students have a fair understanding of safe food handling procedures. Similarly, awareness of foodborne risks (E4) shows comparable scores, ranging from **3.27 to 3.34,** suggesting that respondents are mindful of potential food safety hazards. Knowledge of FDA regulations (E1) displayed slightly lower but still moderate scores, with mean values between **3.11 and 3.21,** indicating that while students are aware of the existence of food safety regulations, their familiarity with specific guidelines set by the FDA is relatively less developed.

Among the strands, HUMMS A demonstrated the highest overall knowledge scores, particularly in food labeling (3.47) and hygiene (3.42), indicating stronger comprehension in these areas. HE B followed closely, with consistently higher scores across all dimensions, reflecting a well-rounded understanding of food safety regulations. HE A and HUMMS B reported slightly lower but still moderate scores, suggesting comparable levels of awareness.

These findings imply that while students exhibit a reasonable understanding of food safety practices and regulations, targeted interventions to enhance knowledge, particularly regarding FDA regulations and handling/storage procedures, could further strengthen their food safety literacy. Integrating practical applications and real-life scenarios into educational programs can

reinforce this knowledge and encourage better compliance with food safety guidelines.

Table 7. Decision-Making on Food Consumption (Section F)

Strand	F1 (Prioritize Safety)	F2 (Avoid Additives)	F3 (Choose Organic)	F4 (Follow Safety Practices)	F5 (Consider Regulations)
HE A	3.27	3.24	3.08	3.30	3.27
HE B	3.22	3.29	3.16	3.34	3.30
HUMMS A	3.26	3.21	3.12	3.29	3.26
HUMMS B	3.21	3.18	3.05	3.27	3.24

Choices in Food Consumption

The data from Table 7 highlights the decision-making tendencies of students regarding food consumption, focusing on five key dimensions: prioritizing safety (F1), avoiding additives (F2), choosing organic options (F3), following safety practices (F4), and considering regulations (F5). Across all strands, the highest scores were recorded for the **following safety practices (F4),** with mean values ranging from **3.27 to 3.34,** suggesting that students demonstrate a relatively stronger commitment to adhering to food safety guidelines. This indicates that respondents prioritize safe food handling practices to minimize health risks.

Prioritizing safety (F1) and **considering regulations (F5)** also showed high scores, with mean values between **3.21 and 3.30,** reflecting that students place significant importance on ensuring food safety and complying with regulatory standards. Scores for **avoiding additives (F2)** were moderate, with mean values ranging from **3.18 to 3.29,** indicating that while students exhibit some caution regarding the consumption of food additives, their concern is less pronounced compared to safety and regulatory considerations.

Choosing organic options (F3) received the lowest mean scores, with values ranging from **3.05 to 3.16,** suggesting that students exhibit a relatively lower tendency to prefer organic foods over processed alternatives. This may indicate that while students are aware of organic food options, their decision-making is less influenced by this factor compared to other dimensions.

Among the strands, HE B demonstrated the highest overall decision-making scores, particularly in **following safety practices (3.34) and considering regulations (3.30),** suggesting a stronger inclination toward safe and regulated food choices. HE A followed closely, with consistently high scores across all dimensions, reflecting balanced decision-making practices. HUMMS A and HUMMS B reported slightly lower but comparable scores, indicating an understanding of food safety considerations in their consumption choices.

Overall, students demonstrate a fair understanding of food chemical safety, with the highest awareness in hygiene and labelling, and lowest in regulatory knowledge. Social media emerges as a key influence, and findings reveal no statistically significant gender or strand-based disparities, suggesting a need for universally applicable educational interventions.

These findings suggest that while students demonstrate a reasonable level of awareness and consideration for food safety practices, there is potential to enhance their decision-making by increasing awareness about the benefits of choosing organic options and reducing the consumption of food additives. Integrating educational modules on the advantages of organic food and the risks associated with additives could further improve informed decision-making in food consumption.

Conclusions

Based on the findings, several key conclusions can be drawn:

The study reveals that while students exhibit moderate awareness of food chemicals, their understanding lacks depth, especially regarding health implications and regulatory frameworks. Their perceptions of risk are often

shaped by fragmented or unverified information, resulting in inconsistent or uninformed judgments about food safety. Notably, students' reliance on social media as a primary source of information indicates a significant shift in influence away from traditional authorities like parents and formal education. Furthermore, despite claiming to prioritize food safety, students' actual consumption behaviors reflect a disconnect between awareness and practice. These gaps underscore the need for comprehensive, behaviorally grounded educational interventions and more effective communication strategies that align knowledge with practical decision-making.

Recommendations

Based on the findings and conclusions cited from the study, the following recommendations are hereby made.

To effectively address the gaps identified in students' understanding and behavior regarding food safety, schools should integrate applied food safety modules into their curricula. These modules must go beyond theoretical instruction and include practical components such as case studies, laboratory activities, and real-world scenarios that explore food chemicals, their associated risks, and relevant safety regulations. This will equip students with a scientific and contextual understanding of food safety issues.

In addition, there is a strong need to implement digital media literacy programs that specifically target food-related content. Given the influence of social media on adolescents, schools should provide structured sessions where students can learn to critically assess online food information, identify credible sources, and recognize marketing strategies used in digital platforms. Activities like fact-checking viral claims or evaluating influencer content can make these sessions engaging and impactful.

Parental involvement must also be strengthened to reinforce safe eating habits at home. This can be achieved through parent-student collaborative learning activities, including take-home modules and interactive mobile applications. Community-based workshops facilitated by schools and local government units (LGUs) can further empower parents with the knowledge and tools needed to guide their children in making healthier food choices.

Government regulatory bodies, such as the Food and Drug Administration (FDA) and the Department of Health, should revise current food labeling policies to enhance transparency. Labels must clearly identify chemical additives and provide accessible explanations of their potential health effects, perhaps through visual symbols or scannable QR codes linked to educational resources. Nationwide awareness campaigns should accompany these initiatives to teach consumers, especially the youth, how to interpret food labels effectively.

Furthermore, to address economic barriers to healthy eating, schools and policymakers should collaborate to make nutritious, minimally processed food options more accessible and appealing to adolescents. This includes subsidizing healthy school meals, removing heavily processed snacks from canteens, and establishing "food safety corners" that guide students in making informed dietary decisions.

Finally, further research is recommended to deepen the understanding of adolescent food safety perceptions and decision-making behaviors. Future studies should focus on how students respond to new food technologies such as genetically modified organisms (GMOs), nanotechnology, and ultra-processed foods. These findings can inform the development of more nuanced and effective interventions for food safety education and health promotion.

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