

Fast-Food, Sugar-Sweetened Beverages, and Academic Performance: The First Study Among Junior School Students in Iraq

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Abstract

This study is the first in Iraq to investigate the relationship between fast-food and sugar-sweetened beverage consumption and academic performance among junior school students. The aim was to assess the frequency of fast-food and sugar-sweetened beverage intake among junior school students in Erbil, Iraq, and examine its association with academic achievement. Data were collected from 354 students using a dietary intake questionnaire, while

academic performance was assessed based on students' grades in English, Mathematics, and Science. Statistical analyses were performed using one-way analysis of variance (ANOVA).

Male students reported slightly higher consumption of fast food and sugar-sweetened beverages than female students. Students with the highest frequency of fast-food consumption achieved significantly lower mean scores in Mathematics, English, and Science than those with the lowest consumption levels. A similar trend was observed for sugar-sweetened beverages, with higher consumption significantly associated with poorer academic performance across all three subjects. All observed differences were statistically significant ($p < 0.001$).

In conclusion, frequent consumption of fast food and sugar-sweetened beverages was significantly and inversely associated with academic performance among junior school students. Although the cross-sectional design precludes causal inference, these findings highlight the potential adverse impact of unhealthy dietary habits on educational outcomes. Further longitudinal and prospective studies are warranted to clarify the direction and underlying mechanisms of these associations.

Keywords: adolescent school students, fast-food, soft-drink, academic performance

1. Introduction

Academic performance in junior school is a strong predictor of future educational and professional success and reflects students' acquisition of essential knowledge and skills. It is influenced by both non-modifiable factors, such as heredity and gender, and modifiable factors, including the family environment, parental education, and lifestyle behaviors (Raphael, 2011; Davies et al., 2020). Among these, diet has been recognized as a particularly important modifiable determinant of academic achievement. Evidence suggests that unhealthy dietary behaviors, including skipping breakfast and the frequent consumption of fast food, are associated with poorer academic outcomes, whereas an adequate intake of essential nutrients such as iron, B-group vitamins, and omega-3 fatty acids is positively associated with cognitive function and academic performance (Matingwina, 2018; Roostin, 2018; Kim et al., 2016; Niemeier et al., 2006; Albertson et al., 2003). As childhood and adolescence are critical periods for physical and cognitive development, nutritional status plays a central role throughout these stages (Rajan et al., 2024).

Increasing attention has been given to the effects of sugar-sweetened beverages (SSBs) and high-energy diets on students' health and academic outcomes (Naveed et al., 2020). The global shift toward westernized dietary patterns has led to increased consumption of SSBs and energy-dense foods, alongside a reduced intake of fruits, vegetables, and whole grains among school-aged children (Nyaradi et al., 2016; Rajan et al., 2024; Alqahtani et al., 2020). While these diets provide a high caloric intake, they are often nutrient-poor. Regular consumption of SSBs and high-energy foods has been linked to obesity, type 2 diabetes, metabolic syndrome, and cardiovascular disease (Li et al., 2025).

Healthy dietary practices during adolescence are associated with improved mental well-being, enhanced cognitive function, and better academic performance (Burrows et al., 2017), whereas adolescence is frequently accompanied by poorer eating behaviors (Movassagh et al., 2017;

Ahmed et al., 2023). Broader lifestyle changes driven by globalization and urbanization have further contributed to unhealthy dietary patterns, thereby increasing the long-term risk of chronic diseases (WHO, 2024). Despite growing evidence linking diet to academic outcomes, research remains limited in low- and middle-income countries, including Iraq. Regional differences in food environments and socioeconomic conditions may influence these associations, highlighting the need for context-specific studies (Havdal et al., 2021). Therefore, this study aimed to examine the association between high-energy food and sugar-sweetened beverage consumption and academic performance among 12th-grade students in Erbil City, Kurdistan Region, Iraq, using examination scores to assess academic outcomes.

2. Material and Methods

2.1 Study Design

An analytical cross-sectional observational study was conducted in 2025 among 12th-grade students, all aged 18 years, from four public secondary schools for boys and girls in Erbil City, Kurdistan Region, Iraq. The names of the participating schools have not been disclosed to preserve confidentiality.

2.2 Covariates

A descriptive analysis was performed for all variables of interest. Numerical variables are presented as means and standard deviations, along with corresponding 95% confidence intervals (95% CIs). The study sample consisted of 354 12th-grade students, who were categorized into four groups according to the weekly frequency of fast-food and sugar-sweetened beverage consumption: Group A (very low consumption, 0–1 times per week), Group B (moderate consumption, 2–3 times per week), Group C (frequent consumption, 4–5 times per week), and Group D (very frequent consumption, ≥ 6 times per week).

2.3 Variables

The variables examined in this study included the sociodemographic characteristic of gender. Lifestyle-related factors encompassed dietary behaviors, particularly fast-food consumption patterns and sugar-sweetened beverage (SSB) intake. Academic performance was assessed using students' grades in English, Mathematics, and Science.

2.4 Academic Performance

Academic performance was the primary outcome variable in this study. It was assessed using students' scores in core subjects, including Mathematics, English and Science. Scores from these subjects were considered collectively to evaluate overall academic performance.

2.5 Data Analysis

Differences in mean academic scores among the groups were assessed using analysis of variance (ANOVA), with statistical significance evaluated by the F-test; a *p-value* greater than 0.05 indicated no statistically significant difference.

3. Result

The demographic characteristics assessed in this study included students' gender. As shown in Table 1, a total of 354 students participated, of whom the majority were female (82.2%, $n = 291$), while male students accounted for 17.8% ($n = 63$). Male students reported slightly higher consumption of fast food and soft drinks compared with female students, with mean fast-food consumption scores of 4.47 and 4.01 and soft-drink consumption scores of 3.58 and 3.43, respectively.

Table 1. Respondents' distribution based on their gender ($n = 354$)

Gender	Frequency	Percentage (%)	Mean fast-food	Mean soft-drink
Female	291	82.2	4.01	3.43
Male	63	17.8	4.47	3.58

For Mathematics, students in Group D ($n = 63$) had the lowest mean score (62.1; 95% CI: 59.8–64.4), while scores progressively increased across Groups C and B, reaching the highest mean score in Group A (82.0; 95% CI: 78.2–85.8). One-way ANOVA revealed a highly significant difference among the groups ($F = 85.34$, $p < 0.001$), indicating that Mathematics performance varied significantly across fast-food consumption categories.

A similar pattern was observed for English. The mean score increased from 66.6 (95% CI: 64.0–69.2) in Group D to 83.6 (95% CI: 79.4–87.8) in Group A. The differences between the groups were statistically significant ($F = 29.47$, $p < 0.001$), suggesting a strong association between fast-food consumption categories and English academic performance.

For Science, Group D again had the lowest mean score (65.3; 95% CI: 62.8–67.8), whereas Group A had the highest mean score (83.6; 95% CI: 79.6–87.6). One-way ANOVA confirmed significant differences among the groups ($F = 42.41$, $p < 0.001$), indicating that Science performance also differed significantly across fast-food consumption categories. Overall, these results suggest an inverse association between fast-food consumption and academic performance, with higher consumption associated with lower scores across all subjects (Figure 1).

Table 2. Mean Academic Performance Scores by Fast-Food Consumption Groups. Data are presented as mean $\pm$ standard deviation (StDev) with 95% confidence intervals (CI). Differences among groups were assessed using one-way ANOVA. $p < 0.001$ indicates statistically significant differences.

Performance %	Fast-Food	Sample Size	Mean	StDev	95% CI		F-Value	p-Value
					Lower Limit	Upper Limit		
Math	D	63	62.1	8.8	59.8	64.4	85.34	0.001
	C	179	64.3	8.9	62.9	65.7		
	B	88	80.7	10.8	78.7	82.7		
	A	24	82.0	10.4	78.2	85.8		
English	D	63	66.6	10.4	64.0	69.2	29.47	0.001
	C	179	69.8	10.5	68.2	71.3		
	B	88	78.5	10.4	76.3	80.7		
	A	24	83.6	10.6	79.4	87.8		
Science	D	63	65.3	9.4	62.8	67.8	42.41	0.001
	C	179	67.7	10.1	66.2	69.1		
	B	88	78.5	10.1	76.4	80.6		
	A	24	83.6	10.2	79.6	87.6		

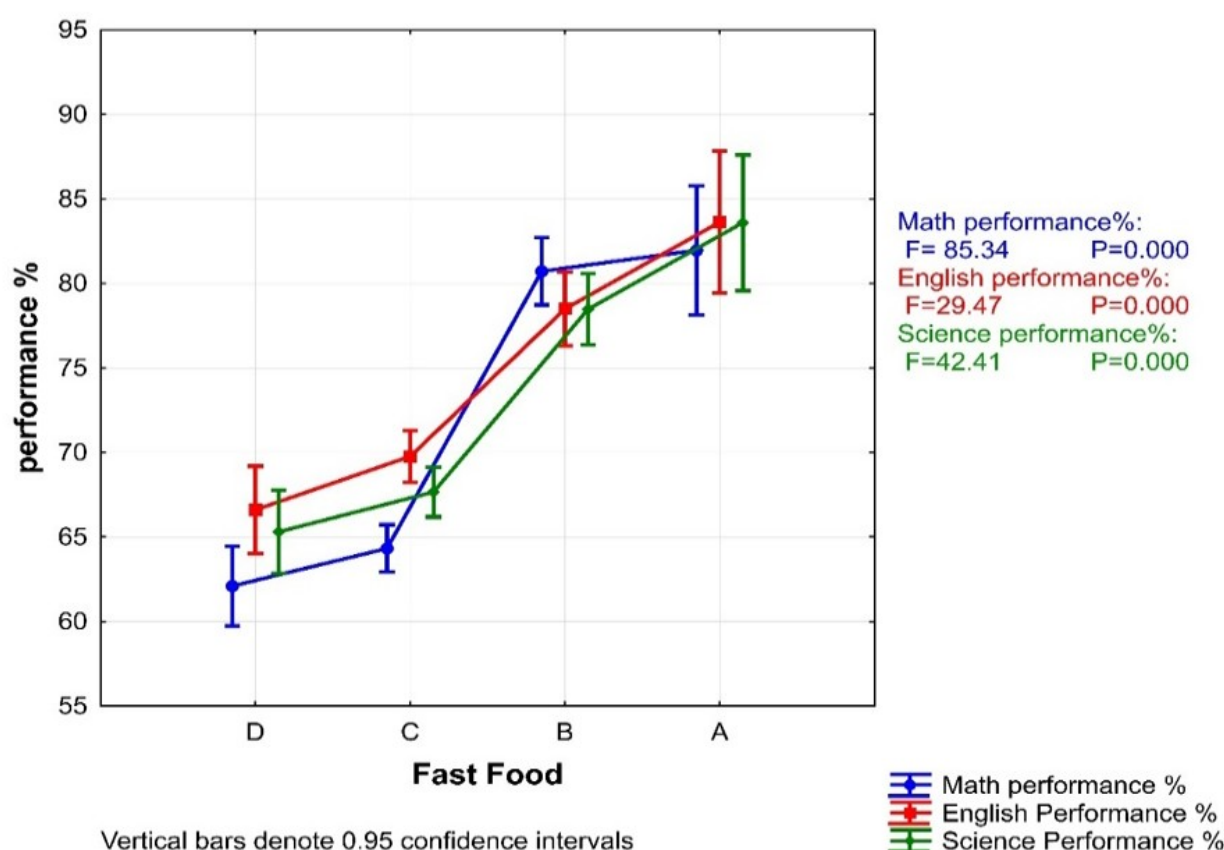


Figure 1. Comparison of mean academic performance in Mathematics, English, and Science across fast-food consumption groups (A–D)

Table 3 and Figure 2 show statistically significant differences in academic performance across sugar-sweetened beverage (soft-drink) consumption groups (Groups A–D) for Mathematics, English, and Science. In Mathematics, mean scores increased steadily from Group D (63.4 ± 8.7 ; 95% CI: 60.6–66.2) and Group C (64.5 ± 9.2 ; 95% CI: 62.6–66.3) to Group B (71.8 ± 13.3 ; 95% CI: 69.3–74.2), with the highest mean score observed in Group A (78.8 ± 12.3 ; 95% CI: 76.4–81.1). One-way ANOVA revealed a statistically significant difference among the groups ($F = 37.15$, $p < 0.001$).

A similar pattern was observed for English, with mean scores increasing from 67.7 ± 9.9 in Group D (95% CI: 64.9–70.5) and 69.1 ± 10.6 in Group C (95% CI: 67.2–70.9) to 75.1 ± 12.2 in Group B (95% CI: 72.7–77.6), reaching the highest value in Group A (78.4 ± 10.7 ; 95% CI: 76.0–80.7). These differences were statistically significant ($F = 17.77$, $p < 0.001$). In Science, students in Group D had the lowest mean score (65.3 ± 9.3 ; 95% CI: 62.4–68.1), while progressively higher scores were observed in Group C (68.2 ± 10.3 ; 95% CI: 66.4–70.0) and Group B (73.2 ± 12.6 ; 95% CI: 70.8–75.7). The highest mean score was again recorded in Group A (77.7 ± 10.8 ; 95% CI: 75.3–80.0), and the overall group differences were statistically significant ($F = 20.02$, $p < 0.001$).

Figure 2 further illustrates these findings, showing a consistent increase in mean academic scores from Group D to Group A across all three subjects, indicating an inverse association between sugar-sweetened beverage consumption and academic performance.

Table 3. Mean academic scores in Mathematics, English, and Science across soft drink consumption groups with 95% confidence intervals.

Performance %	Soft-Drink Group	Sample Size	Mean	StDev	95% CI		F-Value	p-Value
					Lower Limit	Upper Limit		
Math	D	57	63.4	8.7	60.6	66.2	37.15	0.001
	C	139	64.5	9.2	62.6	66.3		
	B	75	71.8	13.3	69.3	74.2		
	A	83	78.8	12.3	76.4	81.1		
English	D	57	67.7	9.9	64.9	70.5	17.77	0.001
	C	139	69.1	10.6	67.2	70.9		
	B	75	75.1	12.2	72.7	77.6		
	A	83	78.4	10.7	76.0	80.7		
Science	D	57	65.3	9.3	62.4	68.1	20.02	0.001
	C	139	68.2	10.3	66.4	70.0		
	B	75	73.2	12.6	70.8	75.7		
	A	83	77.7	10.8	75.3	80.0		

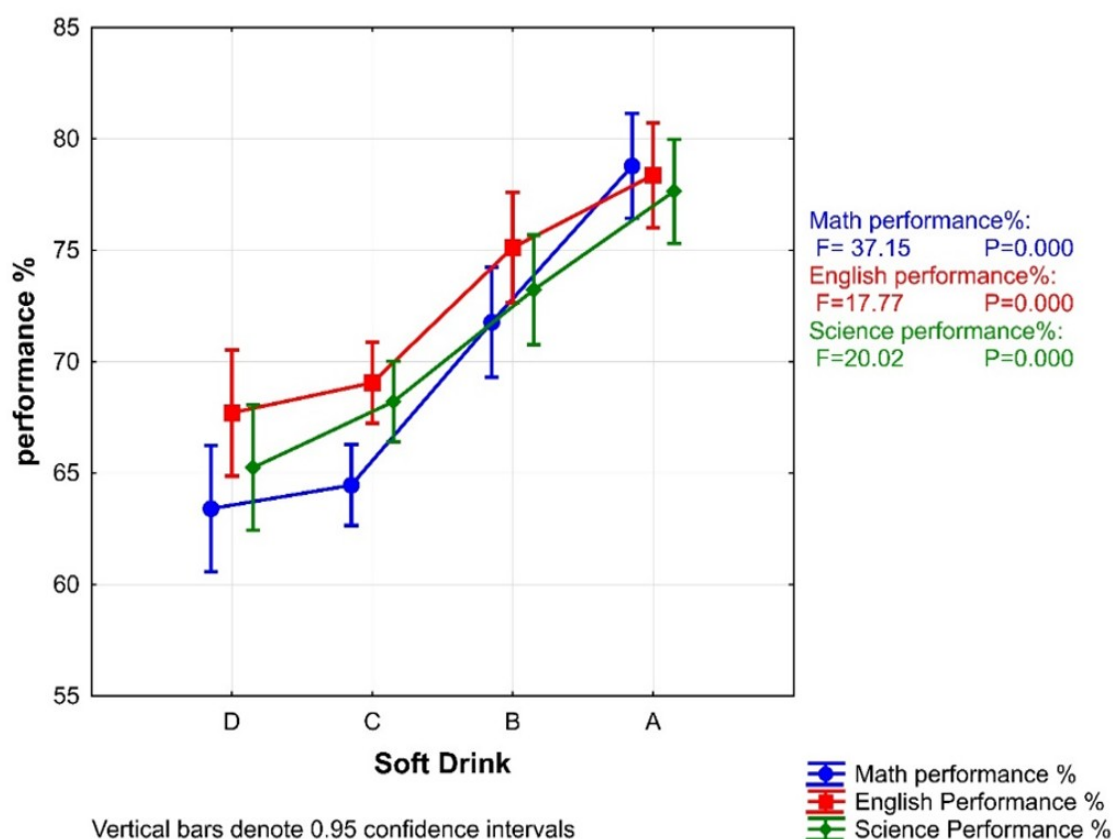


Figure 2. Mean academic performance in Mathematics, English, and Science across soft-drink consumption groups (with 95% confidence intervals)

4. Discussion

This study represents the first investigation in Iraq to examine the association between fast-food and sugar-sweetened beverage (SSB) consumption and academic performance among school students, providing valuable baseline evidence for understanding dietary behaviors and educational outcomes in the region. The findings demonstrate a significant association between the consumption of fast food and carbonated soft drinks and academic performance among 12th-grade students in public schools in Erbil City, Kurdistan Region, Iraq. The observed relationship between unhealthy dietary patterns and lower academic achievement may be explained by a combination of biological and behavioral mechanisms. Diets characterized by high levels of saturated fats and added sugars have been associated with impaired attention, memory, and executive function, which are essential cognitive processes for effective learning and academic success (Kim et al., 2016; Ren et al., 2022; Naveed et al., 2020). In addition, frequent consumption of soft drinks and fast food may contribute to fluctuations in blood glucose levels, which may be associated with fatigue, reduced concentration, and impaired cognitive performance during school hours (Benton, 2010; Ahmed et al., 2023). Furthermore, unhealthy dietary behaviors frequently coexist with sedentary lifestyles, inadequate sleep patterns, and insufficient intake of essential nutrients, all of which may negatively influence academic outcomes, as highlighted by the World Health Organization (2024) and supported by previous studies (Al Dweik et al., 2022;

Burrows et al., 2017). These findings emphasize the potential importance of promoting healthier dietary practices within school environments to support adolescent health and educational outcomes.

The findings are consistent with developmental perspectives indicating that individuals aged 17–18 years are in late adolescence, a developmental stage characterized by increasing autonomy, greater independence in food choices, and increased susceptibility to lifestyle-related behaviors. This period provides an important opportunity for establishing healthy dietary and lifestyle habits that may contribute to long-term health throughout adolescence and adulthood (Fatikhani and Setiawan, 2019). In the present study, female students represented a larger proportion of participants than male students. This difference was primarily related to the sampling distribution, as data were collected from three girls' schools and only one boys' school, resulting in a higher proportion of female participants in the study sample. Gender-stratified analysis was not performed because of the unequal distribution of participants between male and female students; therefore, future studies with balanced gender representation are recommended to further investigate potential gender-specific differences.

The present findings indicate that a large proportion of students reported dietary behaviors characterized by frequent consumption of fast food and sugar-sweetened beverages. As shown in Table 1 and Figure 1, fast-food consumption demonstrated a significant inverse association with academic performance in Mathematics, English, and Science. Students with lower fast-food consumption achieved higher mean scores across all assessed subjects, whereas students with higher consumption frequencies demonstrated lower academic performance. Group A consistently showed the highest academic scores, whereas Group D showed the lowest scores. According to one-way ANOVA results, these differences were statistically significant across all subjects ($p < 0.001$). The observed graded pattern suggests that lower frequency of fast-food consumption was associated with better academic performance. These findings may reflect the potential influence of dietary quality on cognitive processes, including attention, memory, and energy regulation, which are important components of successful academic achievement.

Our findings are consistent with previous research by Kim et al. (2016), who reported that consumption of fast food (OR = 0.83; 95% CI: 0.72–0.96), soft drinks (OR = 0.42; 95% CI: 0.38–0.46), instant noodles (OR = 0.62; 95% CI: 0.55–0.70), and confectionery products (OR = 0.86; 95% CI: 0.80–0.93) were associated with poorer academic performance. Similarly, previous studies have shown that students consuming fast food more frequently achieved lower scores in attention and memory assessments, while inadequate intake of essential nutrients was associated with increased fatigue and reduced concentration (Nikalansooriya et al., 2025; Kim et al., 2016). These associations may be influenced by multiple interacting factors, including peer behaviors, emotional well-being, socioeconomic conditions, and exposure to food marketing through mass media, which can substantially shape adolescents' dietary choices.

Globally, consumption of carbonated soft drinks has increased substantially, particularly among children and adolescents in low- and middle-income countries, partly due to the expansion of the beverage industry and increased availability of energy-dense products (Wang et al., 2016). Maintaining a balanced diet from early childhood through adolescence is essential for reducing the risk of chronic diseases, including cardiovascular and metabolic disorders, throughout the life course (Weihrauch-Blüher et al., 2019). Previous research has identified carbonated soft drinks as a major component of unhealthy dietary patterns commonly referred to as “junk food” consumption (Burrows et al., 2017). In the present study, higher SSB consumption was associated with lower academic performance in Mathematics, English, and Science. Students in Group A consistently achieved higher scores compared with students in Groups B, C, and D, suggesting an inverse association between SSB consumption frequency and academic outcomes.

These findings are supported by previous studies. A Norwegian study reported that diets characterized by frequent consumption of unhealthy foods, including soft drinks, sweets, chocolate, chips, and fast food, were associated with difficulties in mathematical learning among adolescents (Ren et al., 2022). Similarly, Sánchez-Hernando et al. (2021) reported an inverse association between SSB consumption and academic grades among middle school students in Aragón, Spain ($r = -0.205$). Research among Australian school-aged children also demonstrated that higher SSB intake was associated with poorer performance in reading, writing, grammar, punctuation, and numeracy (Nyaradi et al., 2016). Furthermore, a study among adolescents in Chongqing, China, identified a significant relationship between frequent soft-drink consumption and lower academic achievement (Cai et al., 2021). Previous evidence, including findings published in PLOS Global Public Health, has also indicated that higher soft-drink consumption is associated with poorer academic performance among adolescents (Arnob et al., 2025).

Overall, the current findings contribute additional evidence from Iraq supporting the association between unhealthy dietary behaviors and academic performance among adolescents. Although the cross-sectional design prevents determination of causal relationships, the consistent pattern observed across multiple academic subjects suggests that dietary behaviors may represent an important modifiable factor related to educational outcomes. Future longitudinal studies are needed to clarify the temporal relationship between dietary habits and academic performance and to explore the underlying biological, social, and environmental mechanisms involved. Interventions promoting healthier food choices, improved nutritional awareness, and supportive school food environments may represent valuable strategies for improving adolescent health and academic achievement. These findings highlight the potential value of school-based nutrition interventions in Iraq, including nutrition education programs and healthier school food environments, to promote improved dietary behaviors among adolescents.

Several limitations should be considered when interpreting these findings. The higher proportion of female students (82.2%) may limit the generalizability of the results, although this was related to the inclusion of three girls’ schools and one boys’ school. Gender-stratified analysis was not performed because of the unequal distribution of

participants between male and female students, and future studies with balanced gender representation are recommended. In addition, dietary intake was self-reported, which may introduce recall and social desirability bias and potentially affect the accuracy of fast-food and sugar-sweetened beverage consumption estimates. Future studies should consider using validated dietary assessment tools, objective nutritional measures, and longitudinal designs to improve dietary exposure assessment and strengthen evidence regarding these associations.

5. Conclusion

This study suggests that higher consumption of fast food and sugar-sweetened beverages is inversely associated with academic performance among junior school students. Students with more frequent consumption tended to achieve lower academic scores, whereas those with lower intake demonstrated better academic outcomes. Given the established relationship between academic achievement and long-term educational and professional outcomes, these findings highlight the importance of promoting dietary health education and healthy lifestyle practices among school-aged children.

Schools, families, and communities should consider strategies that encourage healthier dietary choices and reduce excessive consumption of fast food and sugar-sweetened beverages. Further longitudinal studies and intervention-based research are required to clarify the temporal relationship between dietary behaviors and academic performance and to better understand the potential mechanisms underlying these associations.

The findings provide baseline evidence from Iraq that may support future research and inform educational and public health strategies aimed at improving adolescent health and academic outcomes. However, the results should be interpreted with caution, as the cross-sectional design prevents causal inference, and residual confounding factors may have influenced the observed associations. Additionally, dietary information was self-reported, which may introduce recall or reporting bias. Future studies should investigate the biological and behavioral mechanisms linking dietary patterns with cognitive function, including the potential roles of nutrient composition and brain regions involved in learning and memory, such as the hippocampus and prefrontal cortex.

Declaration

All authors have read and approved the final manuscript and agree to its submission. The work is original, has not been published previously, and is not under consideration elsewhere.

Abbreviations

ANOVA: Analysis of Variance

CI: Confidence Interval

SSBs: Sugar-Sweetened Beverages

WHO: World Health Organization

StDev: Standard Deviation

OR: Odds Ratio

Ethics approval and consent to participate

The study was approved by the Ethics Committee of the Faculty of Science and Health, Koya University (reference: 11-2025). The requirement for informed consent to participate was waived by the Ethics Committee, as the study involved anonymized, questionnaire-based data collection and did not include clinical intervention or identifiable human subjects. All procedures involving human participants were conducted in accordance with the ethical standards of the institutional Ethics Committee and with the principles of the Declaration of Helsinki.

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Author contributions

Z.T.K, N.H.H, R.A.O, and S.K.M contributed equally to the conception and design of the study, data collection, data analysis and interpretation, manuscript drafting, and critical revision of the manuscript. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

Informed consent

Obtained.

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The Publication Ethics Committee of the Macrothink Institute.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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