DOI: https://doi.org/10.54393/pbmj.v9i6.1396

PAKISTAN BIOMEDICAL JOURNAL
https://www.pakistanbmj.com/journal/index.php/pbmj/index
ISSN (E): 2709-2798, (P): 2709-278X
Volume 9, Issue 06 (June 2026)

Original Article

Perception Versus Reality: Consumer Beliefs About the Caloric Content of Honey, Jaggery, and Sugar

Alzumar Gul Khan[1*] and Joat Khalid[1]

[1]Department of Public Health, University of the Punjab, Lahore, Pakistan

ARTICLE INFO

Keywords:
Nutrition Literacy, Consumer Behavior, Food Choice, Sweetener Consumption, Health Halo, Dietary Beliefs

How to Cite:
Khan, A. G., & Khalid, J. (2026). Perception Versus Reality: Consumer Beliefs About the Caloric Content of Honey, Jaggery, and Sugar: Perception Versus Reality: Caloric Content of Honey, Jaggery, and Sugar. Pakistan BioMedical Journal, 9(6), 29-34. https://doi.org/10.54393/pbmj.v9i6.1396

***Corresponding Author:**
Alzumar Gul Khan
Department of Public Health, The University of Punjab, Lahore, Pakistan
khanalzumar@gmail.com

Received Date: 12th April, 2026
1st Revision Date: 3rd June, 2026
Acceptance Date: 17th June, 2026
Published Date: 30th June, 2026

ABSTRACT

Pakistan has one of the highest prevalence rates of diabetes in the world. Even so, while calorie and glycemic impacts of both may be similar, honey and jaggery are still seen as healthier than white sugar. **Objectives:** To find out the pattern of use of sweeteners, perception of consumers, knowledge about honey, jaggery, white sugar, and factors associated with the perception about their use among adults in Pakistan. **Methods:** A cross-sectional online survey was conducted using the convenience sampling method, including 170 Pakistani people aged 18 years or older. A semi-structured questionnaire was used to determine the intake, perception, knowledge, and sources of information about the sweeteners. Descriptive statistics, Friedman tests, post-hoc comparisons, and chi-square tests were used. **Results:** 74.7% of the participants used white sugar as a sweetener, and 85.3% of them used it daily. White sugar was given a lower perceived healthfulness score than honey and jaggery. The nutritional-knowledge questions were answered correctly by only 12.9% of the participants. Family was positively linked to the perception of healthier honey through an unadjusted analysis, while this link was strong. This link was strong and positively associated with the perception of honey being healthier by family as an information source. **Conclusions:** There was a clear difference between what was perceived as healthy and the actual consumption of sweeteners. While the acceptance of honey and jaggery was better, white sugar was still the major sweetener. The results can be used for the development and assessment of nutrition-education interventions on misconceptions about natural sweeteners.

INTRODUCTION

Non-communicable diseases (NCDs) are increasing very rapidly, especially type 2 diabetes and obesity, due to which people are now focusing on their diet and sugar consumption [1, 2]. At the same time, natural sweeteners like honey and jaggery are being considered healthier and better alternatives compared to refined white sugar [3]. In Pakistan, this thought is more relevant as sweeteners are an integral part of our daily culinary life; from chai to traditional desserts, these are used in almost every household daily [4, 5]. This has brought about a significant paradox for consumers. Though the use of natural sugars has grown, the use of white sugar is still higher, and some consumers may believe that these alternatives – honey and jaggery – have fewer calories or won't impact their blood sugar, even though they provide a similar caloric benefit. Although they have a similar number of calories as refined sugar [6, 7]. White sugar is being increasingly replaced with jaggery and honey, as people believe that these are healthier. This phenomenon is referred to as the "health halo" effect. It's when someone thinks that nature/organic is equal to good, in all aspects. So, people believe that any food that is naturally sourced is healthy, and don't mind the nutritional content. Very common in the culture of South Asia [8, 9]. The eating of sugary foods is deeply ingrained in Pakistani culture. It has also been confirmed by recent data from the TAP (Tobacco and Adolescent Health in Pakistan) survey (2023-2024). The results of this survey indicate that approximately 70.5% of adolescents drink sugary

Copyright© 2026 The Authors. Published by CrossLinks International Publishers LLC, USA
This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0)

DOI: https://doi.org/10.54393/pbmj.v9i6.1396

beverages at least more than 7 times weekly and 38.2% drink sweetened homemade beverages [10]. Pakistan is facing a growing problem of overweight and obese teenagers and early onset of diabetes. In 2024, diabetes among adults has reached 31.4%, which is one of the highest in the world. So, it is very important to know the cause of this high sugar consumption [10, 11]. The World Health Organization says that people should eat less than 10% of their daily calories from added sugars, and ideally below 5%, to reduce the risk of tooth decay and unhealthy weight gain [12].

Most of the people in Pakistan believe that both honey and jaggery are healthy options, but on the other hand, diabetes is also very common here. Although international studies have examined perceptions of natural and refined sweeteners, limited evidence is available on how Pakistani consumers simultaneously perceive, use, and understand honey, jaggery, and white sugar. In particular, the relationship between nutritional knowledge, socio-demographic characteristics, information sources, and sweetener beliefs remains insufficiently studied. Thus, this study aimed to examine the perceptions and use of caloric sweeteners, which are frequently used in Pakistan.

METHODS

The study was a cross-sectional online survey organized by the Department of Public Health, University of the Punjab, Lahore. The participants were selected from various parts of Pakistan using social media. It was conducted among Pakistani adults aged 18 years and above. The data were gathered for two months from January 2026 to March 2026. The study recruited respondents from Pakistan who gave informed consent and were able to understand the questionnaire both in Urdu and English, and who were nutritionists or healthcare professionals, or were pregnant or lactating women. Convenience sampling technique was used. This method is appropriate for this exploratory study, although it could have resulted in a sampling bias as they were recruited via social media networks, which may not have reached older adults, individuals who do not have access to the internet, and those who are not of high socioeconomic status. Thus, the results of this study are only reasonably applicable to the general Pakistani population. The sample size was calculated using the standard cross-sectional formula: $n = Z^2 \times p(1-p)/d^2$, with Z = 1.96 for a 95% confidence level, p = 0.50 as the conservative estimate for unknown prevalence of sweetener perceptions among Pakistani adults, and d = 0.075 (7.5% margin of error). This calculation yielded a minimum requirement of 171 participants. This study aimed for 180 participants to account for incomplete responses; 170 completed the survey, representing a 94.4% completion rate and achieving 99.4% of the target sample, which was deemed sufficient for exploratory analysis. The primary reasons for non-completion were partial responses (n=8) and failure to meet inclusion criteria (n=2). The final sample of 170 participants (99.4% of target) was considered adequate for this exploratory analysis. The questionnaire was developed through a systematic four-step process. First, items were derived from a literature review of previous validated instruments on sweetener perceptions and nutritional knowledge, adapted to the Pakistani context. Second, three public health specialists reviewed the questionnaire for content validity, yielding a Content Validity Index of 0.85, indicating good content validity. Third, pilot testing was conducted with 30 participants (not included in the final analysis) to assess face validity, clarity, and comprehension, with minor revisions made based on participant feedback. Fourth, the internal consistency reliability of the 8-item perception scale was assessed (Cronbach's α = 0.78, 95% CI: 0.70-0.85), indicating acceptable reliability. No separate construct validity testing was performed, which is acknowledged as a limitation. The questionnaire was formed on Google Forms, and we circulated it through social media platforms like WhatsApp, Facebook, Instagram, etc. The odds ratio (OR = 18.5, 95% CI: 8.9-38.5) was obtained from a simple 2×2 cross-tabulation comparing participants who reported family as an information source for honey's health benefits versus those who did not. This is an unadjusted bivariate analysis and does not account for potential confounding variables. Digital informed consent was given by all participants.

The data were processed by SPSS software version 26.0, after checking for missing data. The internal consistency of the 8-item perception scale was acceptable (Cronbach's α = 0.78). Data were summarized using descriptive statistics: frequencies, percentages, means, standard deviations, and 95% confidence intervals (Wilson score intervals for proportions and standard error intervals for means). The test of goodness of fit (Chi-square) and test of independence were conducted, and under the null hypothesis it was assumed that the sweetener categories are distributed equally. Small cell sizes were grouped together to meet the expected frequency assumptions (>= 5) whilst maintaining independence of participants. There were few missing data (<5%), and complete case analysis was used. Because of the ordinal nature of the data, the Friedman test was used to compare Likert scales with each other, and values of mean ± SD were reported descriptively because of acceptable reliability and near-normal distribution. For the Chi-square test, the effect size was calculated using Cramér's V, with the value of 0.10 considered as small, 0.30 as medium, and 0.50 as large, and for the Friedman test, the effect size was calculated using Kendall's W, with the value of 0.10 considered as small, 0.30 as medium, and 0.50 as large. The level of statistical significance was $p<0.050$.

Copyright© 2026 The Authors. Published by CrossLinks International Publishers LLC, USA
This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0)

DOI: https://doi.org/10.54393/pbmj.v9i6.1396

RESULTS

In this study, 170 participants were enrolled. The demographic characteristics showed that the majority of these participants were aged between 36 and 45 years. The sample comprised more males than females. In terms of education, the largest proportion of participants had a Bachelor's degree, followed by Intermediate, Master's or higher, and Matriculation or below (Table 1).

Table 1: Demographic Characteristics with Descriptive Statistics

Characteristics	Category	n (%)	95% CI
Age	18-25	34 (20.0%)	14.3-26.7
	26-35	51 (30.0%)	23.4-37.3
	36-45	68 (40.0%)	32.8-47.6
	46-55	17 (10.0%)	6.2-15.5
	56+	0 (0.0%)	–
Gender	Male	102 (60.0%)	52.4-67.2
	Female	65 (38.2%)	31.1-45.8
	Prefer Not to Say	3 (1.8%)	0.5-5.2
Education	Matric/below	25 (14.7%)	10.0-20.8
	Intermediate	51 (30.0%)	23.4-37.3
	Bachelor's	60 (35.3%)	28.3-42.9
	Master's+	34 (20.0%)	14.5-26.7

Daily consumption of white sugar was reported by a large number of participants as compared to honey and jaggery. White sugar was used weekly by only a small number of people, while more people used honey and jaggery on a weekly basis (Table 2).

Table 2: Sweetener Usage Patterns with Chi-Square Test

Sweeteners	Most Used, n (%)	95% CI	Daily, n (%)	Weekly, n (%)	Rarely/Never, n (%)
White Sugar	127 (74.7%)	[67.7, 80.8]	145 (85.3%)	15 (8.8%)	10 (5.9%)
Honey	20 (11.8%)	[7.6, 17.3]	10 (5.9%)	25 (14.7%)	135 (79.4%)
Jaggery	17 (10.0%)	[6.2, 15.5]	15 (8.8%)	30 (17.6%)	125 (73.5%)
Stevia/Artificial	6 (3.5%)	[1.5, 7.3]	–	–	–
Test	**χ^2**	**df**	**p-value**	**Effect Size (Cramér's V)**	**95% CI for V**
Chi-Square Goodness of Fit	226.57	3	<0.001*	0.67	[0.60, 0.73]

Almost everyone used white sugar at least sometimes, but most people rarely or never used honey and jaggery. These findings indicate that white sugar remains a very dominant sweetener in these participants, both in terms of their choice and frequency of usage (Table 3).

Table 3: Pairwise Post-Hoc Comparisons of Consumer Perception

Sweetener	Mean rank	Mean Score ± SD	95% CI	Comparison	Z	Adjusted p-value	Effect size r
Honey	2.85	4.60 ± 0.64	4.50-4.70	Honey vs jaggery	-2.05	0.120	0.16
Jaggery	2.10	4.50 ± 0.70	4.40-4.60	Honey vs sugar	-11.82	<0.001	0.91
Sugar (Reference)	1.05	3.00 (fixed reference)	Not estimable	Jaggery vs sugar	-11.20	<0.001	0.86
Overall Test	–	–	–	Friedman $\chi^2(2) = 82.36$; $p < 0.001$; Kendall's W = 0.24	–	–	–

The Friedman test was selected as a non-parametric alternative to repeated-measures ANOVA for comparing ordinal Likert-scale perception scores across the three sweeteners, as the data were not normally distributed. Chi-square assumptions (expected cell counts ≥5 and independence) were verified before analysis. The odds ratio (OR = 18.5, 95% CI: 8.9-38.5) was derived from an unadjusted 2×2 cross-tabulation comparing family information source with honey health beliefs. Bonferroni correction ($\alpha = 0.017$) was applied to Friedman post-hoc pairwise comparisons, while no correction was applied to exploratory Chi-square tests, necessitating cautious interpretation of marginally significant findings (Table 4).

Table 4: Consumer Knowledge Assessment

Knowledge Question	Correct, n (%)	95% CI	Incorrect, n (%)	Don't Know, n (%)	χ^2 (vs. Chance) *	p-value
Calories in 1 Tsp White Sugar	42 (24.7%)	[18.6, 31.7]	57 (33.5%)	71 (41.8%)	4.71	0.030*
Lowest Glycemic Index	50 (29.4%)	[22.9, 36.8]	62 (36.5%)	58 (34.1%)	15.06	<0.001*
Both Correct (Combined)	22 (12.9%)	[8.5, 18.7]	–	–	–	–

Only 24.7% of the respondents knew the correct calorie count of sugar. And only 29.4% knew which sweetener has the lowest glycemic index. Both knowledge scores are significantly above chance level (p=0.030 and p<0.001, respectively), yet the majority of consumers lack accurate nutritional knowledge (Table 5).

Copyright© 2026 The Authors. Published by CrossLinks International Publishers LLC, USA
This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0)

DOI: https://doi.org/10.54393/pbmj.v9i6.1396

Table 5: Associations between Key Socio-Demographic Variables

Association Tested	χ^2	Df	p-value	Cramér's V	95% CI for V
Family Source × Honey Health Belief	33.34	1	<0.001*	0.44	[0.31, 0.55]
Education × Label Reading	12.84	6	0.045*	0.19	[0.05, 0.32]
Gender × Most Used Sweetener	8.26	3	0.220	0.16	[0.00, 0.28]
Age × Daily Sugar Use	3.33	3	0.343	0.14	[0.00, 0.26]
Education × Willingness to Switch	9.87	6	0.130	0.17	[0.00, 0.29]
Calorie Knowledge × Honey Calorie Belief	4.21	4	0.378	0.11	[0.00, 0.23]
Income × Most Used Sweetener	12.64	12	0.395	0.14	[0.00, 0.26]

Multiple Chi-square tests were performed to examine associations between socio-demographic variables and sweetener-related beliefs. As these analyses were exploratory and no correction for multiple comparisons (e.g., Bonferroni) was applied, significant findings (particularly those with p-values close to 0.050) should be interpreted cautiously as potential false positives. Only the family × honey belief association ($p<0.001$) and education × label reading association ($p=0.045$) showed statistically significant results, with the latter being marginally significant and requiring confirmation in future studies

DISCUSSION

The three main findings of this study were: a strong perception among Pakistani adults that honey and jaggery are healthier than white sugar thus indicating a health halo effect, poor nutritional knowledge about the caloric and glycemic properties of both sweeteners with only 12.9% of participants correctly answering both knowledge questions, and a significant gap between the attitude and actual consumption of natural sweeteners with white sugar being the most commonly used sweetener (74.7% most used; 85.3% consumed daily). These results are summarized in the discussion below, which will be compared to the literature. A robust health halo effect was discovered, in which participants considered honey and jaggery healthier than white sugar. This perception is a product of cultural practices and beliefs reinforced by media and social norms. This positive image did not, however lead to replacement behaviors; as the preferred sweetener in terms of being most used (74.7%) and consumed daily (85.3%), sugar is still the major sweetener. This gap between perceptions and consumption is significant. In the Pakistani context, according to our findings, although positive attitudes toward honey and jaggery have been seen, the actual behavior of the consumers is yet to change, as white sugar is very much entrenched in the people's daily food habits. Newer studies also support this. Hewa Pathirana et al. conducted a study to examine the effect of coconut jaggery on blood sugar in healthy individuals and found no significant differences in blood glucose response between coconut jaggery and cane sugar [13]. Similarly, a large umbrella review by Norouzzadeh *et al.* analyzed 69 clinical trials involving 3,544 participants. They found that although the daily consumption of 10g of honey may lower HbA1c (average blood sugar), it can also increase blood pressure, triglycerides, and fasting blood sugar in people who already have health issues. This shows that the health effects of honey are complex and sometimes they are inconsistent [14]. Studies suggest that the metabolic effects of honey and jaggery are very similar to white sugar. This challenges the common belief among people which is that natural means healthy or low-calorie. Clinical trials show that low- and no-calorie sweeteners help in weight loss. But observational studies have shown opposite results [15-17]. The current study, however, revealed that although these are alarming numbers, most of the consumers did not know the true nutritional facts of sweeteners. Ayoub-Charette et al. reported in their study that while clinical trials show low- and no-calorie sweeteners help in weight loss, observational studies have shown contrary results [17]. This means the evidence isn't always clear-cut or simple. Additionally, the WHO (2024) recommends using scientific evidence, rather than taking it on faith that natural is better than processed, for the selection of food [18]. The current findings align with international research demonstrating that nutrition claims can mislead consumers into overestimating product healthfulness. Prada et al. reported that sugar-related claims on food products lead consumers to perceive them as healthier options, though the effect varied by claim type [19]. The current study found family to be a very important influence on beliefs about these sweeteners. The participants who learned about the healthiness of honey from their family were 18.5 times more likely to believe that honey is healthy (OR = 18.5, $p<0.001$). This finding relates to the fact that people in Pakistan already consume a lot of sugar. The TAP survey (2023-2024) revealed that 70.5% of the adolescents consume sugary beverages at least 7 times a week and 38.2% of the adolescents consume traditional sweetened homemade drinks. It is difficult to effect change in beliefs regarding scientific facts when these beliefs are so ingrained in the culture and heritage of the people. A study on food ads in Pakistan revealed that Pakistanis marketers highlight the natural side and health benefits of sugar to make it look good. They employ emotional appeals and attractive graphics to make sugar look healthy. This advertising, along with their family's education, forms a powerful system, which keeps people thinking that honey and jaggery are healthier than they really are [20].

The absence of participants aged 56 years and above represents a significant limitation, as this age group may have different sweetener consumption patterns and health beliefs compared to younger adults. This absence likely reflects the recruitment method via social media platforms (WhatsApp, Facebook, Instagram), which may have limited reach to older adults who have lower social media engagement. This may have introduced age-related

Copyright© 2026 The Authors. Published by CrossLinks International Publishers LLC, USA
This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0)

DOI: https://doi.org/10.54393/pbmj.v9i6.1396

selection bias and limits the generalizability of findings to older Pakistani adults. The results help in the development and assessment of nutrition-education interventions to address misconceptions about natural and refined sweeteners in the future. The present study offers preliminary evidence of the perception, knowledge, and consumption gap of sweeteners in the Pakistani context.

CONCLUSIONS

In this study, Pakistani adults believed that honey and jaggery were better for health than white sugar, although their nutritional knowledge was low about the calories and glycemic index of these sweeteners. However, these good impressions did not match the prevailing usage, and white sugar continued to be the most widely and often used sweetener. Unadjusted cross-sectional analysis found that family as an information source had a strong association with favourable beliefs about honey, but cannot rule out the possibility of the effect being caused by other factors or of it being related to the same causal factor.

Authors' Contribution

Conceptualization: JK
Methodology: JK
Formal analysis: JK
Writing and Drafting: AGK, JK
Review and Editing: AGK, JK

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

Source of Funding

The authors received no financial support for the research, authorship and/or publication of this article.

REFERENCES

[1] Mozaffarian D. Dietary and Policy Priorities to Reduce the Global Crises of Obesity and Diabetes. Nature Food. 2020 Jan; 1(1): 38-50. doi: 10.1038/s43016-019-0013-1

[2] Jahn S, Elshiewy O, Döring T, Boztug Y. Truthful Yet Misleading: Consumer Response to 'Low Fat' Food with High Sugar Content. Food Quality and Preference. 2023 Jul; 109: 104900. doi: 10.1016/j.foodqual.2023.104900.

[3] Arshad S, Rehman T, Saif S, Rajoka MS, Ranjha MM, Hassoun A *et al.* Replacement of Refined Sugar by Natural Sweeteners: Focus on Potential Health Benefits. Heliyon. 2022 Sep; 8(9). doi: 10.1016/j.heliyon.2022.e10711.

[4] Hayat N, Mustafa G, Alotaibi BA, Nayak RK, Naeem M. Households' Food Consumption Pattern in Pakistan: Evidence from Recent Household Integrated Economic Survey. Heliyon. 2023 Sep; 9(9). doi: 10.1016/j.heliyon.2023.e19518.

[5] Singh P, Ban YG, Kashyap L, Siraree A, Singh J. Sugar and Sugar Substitutes: Recent Developments and Future Prospects. Sugar and Sugar Derivatives: Changing Consumer Preferences. 2020 Dec: 39-75. doi: 10.1007/978-981-15-6663-9_4.

[6] Kumar[1] A and Singh S. jaggery Over Sugar On. Dietary Sugar, Salt and Fat in Human Health. 2020 Mar: 347. doi: 10.1016/B978-0-12-816918-6.00016-0.

[7] Gulati S and Misra A. Sugar Intake, Obesity, and Diabetes in India. Nutrients. 2014 Dec; 6(12): 5955-74. doi: 10.3390/nu6125955.

[8] Veerbhan K and Malik A. The Health Halo of Jaggery: Benefits Beyond Sugar, But A High Glycemic Index Risk. Magna Scientia Advanced Research and Reviews. 2025, 14(02): 085-095. doi: 10.30574/msarr.2025.14.2.0093.

[9] Cao S, Tang C, Carboon I, Hayward C, Capes H, Chen YJ *et al.* The Health Halo Effect of 'Low Sugar'and Related Claims on Alcoholic Drinks: An Online Experiment with Young Women. Alcohol and Alcoholism. 2023 Jan; 58(1): 93-9. doi: 10.1093/alcalc/agac054.

[10] Afaq S, Chandrasenage D, Ashfaq U, Farzeen M, Iqbal R, Suhrcke M *et al.* Consumption of Commercial and Traditional Sugar-Sweetened Beverages Among Adolescents in Pakistan: Evidence from a National Survey. Frontiers in Nutrition. 2025 Nov; 12: 1679917. doi: 10.3389/fnut.2025.1679917.

[11] Park SE, Ko SH, Kim JY, Kim K, Moon JH, Kim NH *et al.* Diabetes Fact Sheets in Korea 2024. Diabetes and Metabolism Journal. 2025 Jan; 49(1): 24-33. doi: 10.4093/dmj.2024.0818.

[12] Worls Health Organization. Healthy Diet. 2026. https://www.who.int/news-room/fact-sheets/detail/healthy-diet.

[13] Hewa Pathirana HP, Wijesekara I, Yalegama LL, Jayasinghe MA, Waidyarathne KP, Hitigedera CN. Predictive Modeling of Glycemic Indices of Value-Added Coconut (Cocos Nucifera L) Jaggery Enriched with Specific Ingredients. Sugar Tech. 2025 Jun; 27(3): 765-70. doi: 10.1007/s12355-025-01535-z.

[14] Norouzzadeh M, Barazandeh S, Hasan Rashedi M, Jamshidi S, Hatamifar F, Maghsoomi Z *et al.* Dosage Exploration of the Effects of Honey and Its Derivatives on Cardiometabolic Outcomes: An Overview of Systematic Reviews and GRADE-Assessed Updated Meta-Analysis. Nutrition and Diabetes. 2025 Nov; 15(1): 48. doi: 10.1038/s41387-025-00403-9.

Copyright© 2026 The Authors. Published by CrossLinks International Publishers LLC, USA
This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0)

DOI: https://doi.org/10.54393/pbmj.v9i6.1396

[15] Ayoub-Charette S, Nguyen M, Chiavaroli L, Mattes RD, de Souza RJ, Khan TA *et al.* Low-and No-Calorie Sweeteners and Health: Unravelling the Evidence and Controversy. Applied Physiology, Nutrition, and Metabolism. 2026 Apr; 51: 1-1. doi: 10.1139/apnm-2025-0440.

[16] Anjum A, Qureshi HJ, Tabassum S, Anwar W, Shakil R, Anwar M *et al.* Comparative Effects of Cane Sugar, Honey and Jaggery on Plasma Glucose Level and Body Weight of Alloxan-Induced Diabetic Rats. In Proceedings. 2021 Jun; 35(3): 44-49. doi: 10.47489/PSZMC-807-35-3-44-49.

[17] Ayoub-Charette S, Kavanagh ME, Khan TA, Sievenpiper JL. Reconciling Conflicting Evidence on Low-and No-Calorie Sweeteners and Cardiometabolic Outcomes: An Umbrella Review Using Naïve and Bias-Adjusted Methods. Applied Physiology, Nutrition, and Metabolism. 2025 Dec; 50: 1-26. doi: 10.1139/apnm-2025-0068.

[18] Hossain MS, Wazed MA, Asha S, Hossen MA, Fime SN, Teeya ST *et al.* Flavor and Well - Being: A Comprehensive Review of Food Choices, Nutrition, and Health Interactions. Food Science and Nutrition. 2025 May; 13(5): e70276. doi: 10.1002/fsn3.70276.

[19] Prada M, Saraiva M, Serio A, Coelho S, Godinho CA, Garrido MV. The Impact of Sugar-Related Claims on Perceived Healthfulness, Caloric Value and Expected Taste of Food Products. Food Quality and Preference. 2021 Dec; 94: 104331. doi: 10.1016/j.foodqual.2021.104331.

[20] Shahid M, Abdulaziz M, Qayyum Z. Positive Discourse Construction Around Dietary Sugars Consumption: A Semio-Linguistic Analysis of Eco-Advertisements in Pakistan. Khaldunia-Journal of Social Sciences. 2023 Dec; 3(1): 110-27. doi: 10.36755/khaldunia.v3i1.75.

Copyright© 2026 The Authors. Published by CrossLinks International Publishers LLC, USA
This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0)