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Original Research Article

Sugar vs artificial sweetener: Perceptions from Patients with Type 2 Diabetes– A Cross-Sectional Study

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Abstract: The burden of type 2 diabetes is increasing rapidly in low- and middle-income countries, with diet modification being central to management. Artificial sweeteners (AS) are widely promoted as sugar substitutes, yet misconceptions about their consumption persist among patients. ***Objectives:*** This study aimed to assess the perception and consumption of AS in patients with Type 2 diabetes mellitus. ***Methods:*** A cross-sectional study was conducted over three months among 170 patients with Type 2 diabetes mellitus attending a tertiary hospital clinic. Participants aged ≥18 years, with at least middle school education and ≥5 years of diabetes, were included. Data on demographics, perception, and consumption related to AS were collected using a pretested, structured questionnaires. Chi-square and multinomial logistic regression were used for analysis ***Results:*** Of the 170 participants, 92.9% had heard of AS and 87.6% reported current consumption, though only 14.1% were aware of side effects. Preference for AS over sugar was reported by 84.7%, while label-checking was limited (25.9%). AS consumption showed significant associations with residence ($p<0.001$), socioeconomic status ($p=0.004$), and physical activity ($p<0.001$). Perception of AS was associated with residence, education, occupation, and socioeconomic status (all $p<0.001$). No significant association was found with comorbidities ($p=0.341$). ***Conclusion:*** AS consumption is prevalent but poorly informed. Targeted educational programs are needed to address perception gaps and encourage safe dietary consumption.

Keywords: Artificial sweetener ; Diabetes mellitus; Sugar substitutes ; Comorbidities, Artificial sweetener.

INTRODUCTION

Diabetes is a chronic metabolic disease marked by elevated blood glucose levels that, over time, cause damage to the heart, blood vessels, eyes, kidneys, and nerves. Type 2 diabetes is the most prevalent form, primarily affecting adults. A global target has been set to halt the rise of obesity and diabetes by 2025. The majority of people with diabetes live in low- and middle-income countries, and the disease directly causes about 1.5 million deaths annually. Over the past few decades, both the prevalence and incidence of diabetes have steadily increased.(1)

The rising burden of overweight and obesity has drawn strong attention to unhealthy dietary patterns and energy imbalance. Reducing sugar intake and increasing energy are considered crucial strategies for weight control and diabetes management. Artificial sweeteners (AS), which provide sweetness without any calories, are promoted as an alternative to sugar to help cut down caloric intake.(2)

Sugar is mainly from sugarcane and is the most commonly used sweetener in foods and beverages. Although it supplies energy in the form of carbohydrates, it contains only empty calories without any essential nutrients. During 2023–2024, India consumed an estimated 31 million metric tonnes of sugar.(3)Given the parallel rise in lifestyle disorders such as diabetes, the demand for sugar substitutes has also grown.(4)

Artificial sweeteners, also called non-nutritive sweeteners (NNS), are food additives that mimic the taste of sugar with little or no calories. Each sweetener differs in aftertaste, sweetness intensity, and persistence. They are wildly used in processed foods such as beverages. Many people prefer them to enjoythe sweet taste without any added calories. They are recommended only in limited amounts since they are considered safe generally.(5)

Artificial sweeteners may serve as a temporary strategy to reduce sugar intake or a long-term aid in weight and glucose management. When consumed cautiously, they can be part of a healthy diet and can help individuals with diabetes by lowering calorie and sugar intake. However, concerns remain regarding their long-term side effects. Continuous use has been linked to health risks such as obesity, metabolic disorders, cardiovascular disease, stroke, and even cancer. Therefore, diabetic patients should be made aware of both the benefits and possible risks of artificial sweetener before consumption.

For this study, diabetes was defined as a chronic metabolic disease characterized by persistent hyperglycaemia causing progressive organ damage.(6)Artificial sweeteners was defined as food additives that mimic the taste of sugar while providing little or no calories.(7)

Objectives :
This study aimed to evaluate the perception and consumption of patients with diabetes mellitus in relation to the consumption of artificial sweeteners.

MATERIALS AND METHODS

This cross-sectional study was carried out in a tertiary care hospital in Tamil Nadu's Chengalpattu district over the course of three months, from September to November 2024. The study population comprised individuals aged 18 years and above with a confirmed diagnosis of Type 2 Diabetes Mellitus of at least five years' duration, who were attending the diabetic clinic during the study period. Inclusion criteria required participants to be educated to at least the middle school level. Patients unable to comprehend or respond to the study interviews were excluded.

The required sample size was determined using the formula for cross-sectional studies with a single proportion:
$n = [(Z\alpha)^2 \times p \times q] / d^2$
$Z\alpha = 1.96$ (for 95% confidence interval)
p = Expected proportion of artificial sweetener consumption = 86% (0.86), based on previous Indian study by Sobhana et al(8)
d = Absolute precision = 6% (0.06)
Calculation: $n = [(1.96)^2 \times 0.86 \times 0.14] / (0.06)^2$ $n = [3.84 \times 0.1204] / 0.0036$ $n = 128$

An additional 33% was added to account for potential incomplete responses or non-compliance, yielding a final sample size of 170 participants.
Study participants were selected by simple random sampling from the list of eligible patients attending the diabetic clinic.A pretested, pre validated structured questionnaire was used for data collection. The questionnaire was assessed for validity through review by specialists in endocrinology, community medicine, and clinical nutrition. Pilot study was done and the methodology was found to be effective, minor corrections were made in the questionnaire sentencing.Information was obtained on sociodemographic variables, as well as participant's perception and consumptionregarding artificial sweetener.

The study protocol was reviewed and approved by the Institutional Human EthicsCommittee. The ethics approval number is IHEC-I/3109/24. Informed consent was obtained from all participants prior to enrolment.Following informed consent, data were collected using the structured questionnaire.

Statistics:
Data was entered into Microsoft excel and statistical analysis were carried out using IBM SPSS software version 27.0. Categorical variables were expressed as proportions, and quantitative variables were summarized as mean (standard deviation) or median (interquartile range), as appropriate. Associations between qualitative variables were examined using the multiple logistic regression analysis. Potential confounders (age, gender, education, socioeconomic status, residence, duration of diabetes, comorbidities, physical activity, and drug compliance) were considered in logistic regression models.

RESULTS

Table I presents the demographic details of the 170 study participants with type 2 diabetes mellitus. The mean age was distributed across three categories: 40–59 years (40%), 60–69 years (26.5%), and ≥70 years (33.5%). There was a nearly equal gender distribution, with 55.9% males and 44.1% females. The vast majority resided in urban areas (92.9%), and educational attainment was high: 66.5% had a graduate or postgraduate degree. Most subjects were from lower-middle (57.1%) or upper-class (31.8%) socioeconomic backgrounds. Hypertension (33.5%) and obesity (27.6%) were the most common comorbidities reported.

Table I. Demographic details of study participants (n=170)

Socio demographic	N(%)
Age (in years)	
40-59	68(40)
60-69	45(26.5)
≥ 70	57(33.5)
Gender	
Male	95(55.9)
Female	75(44.1)
Residence	
Urban	158(92.9)
Rural	12(7.1)
Educational qualification	
Primary school	43(25.3)
High school	4(2.4)
Intermediate/diploma	10(5.9)
Graduate	69(40.6)
Postgraduate	44(25.9)
Occupation	
Unemployed	80(47.1)
Unskilled worker	1(0.6)
Clerical/shop/. Business	7(4.1)
Semi professional	38(22.4)
Professional	10(5.9)
Homemaker	34(20.0)
Socioeconomic status	
Upper class	54(31.8)
Upper middle	19(11.2)
Lower middle	97(57.1)
Co-morbidities	
Hypertension	57(33.5)
Foot/leg problems	5(2.9)
Coronary artery disease	19(11.2)
Dyslipidaemia	8(4.7)
Gastrointestinal disease	25(14.7)
Kidney disease	1(0.6)
Obesity	47(27.6)
Eye disease	3(1.8)
None of these	5(2.9)

Perceptionand consumption of participants regarding artificial sweeteners are shown in Table II.Almost all participants (95.3%) had heard of artificial sweeteners, and 80% were aware of the different types. However, knowledge about the health risks was very low (8.2%). In consumption, 22.4% reported craving sugar rarely, while 69.4% experienced cravings often. The most commonly used sweeteners were Stevia (43.5%) and saccharin (30.6%).Respondents were asked about the use of commonly available forms of artificial sweeteners: Stevia in powder sachets, Saccharin in tablets, Sucralose in granules or sachets, and Aspartame in tablet form. About 46.5% of the respondents spent less than ₹1000 per month on sweeteners.

Table II: Perception&Consumption of study participants (n=170)

Perception	N(%)
Heard of artificial sweeteners	
Yes	162(95.3)
No	8(4.7)
Aware about types of artificial sweeteners	
Yes	136(80.0)
No	34(20.0)
Had food/snack with artificial sweetener	
Yes	115(67.6)
No	55(32.4)
Aware of health issues due to artificial sweetener	
Yes	14(8.2)

No	156(91.8)
Consumption	**N(%)**
Sugar craving	
Sometimes	14(8.2)
Often	118(69.4)
Rarely	38(22.4)
Replacing sugar (white)	
Never	30(17.6)
Sometimes	38(22.4)
Often	38(22.4)
Daily	25(14.7)
Rarely	39(22.9)
Sweetener used	
Stevia	74(43.5)
Aspartame sweetener	9(5.3)
Sucralose	29(17.1)
Saccharin	52(30.6)
Don't know	1(0.6)
Don't use	5(2.9)
Artificial sweetener usage	
Tea/ coffee	34(20.0)
For other food items	62(36.5)
Not using	74(43.5)
Expenditure (per month)	
0-1000rs	79(46.5)
1001-2000rs	70(41.2)
2001-3000rs	21(12.4)

Table III: Analysis of Factors Associated With Sugar Craving and Artificial Sweetener Consumption Among Patients With Diabetes Mellitus

Table III details the associations between sociodemographic variables and perception of artificial sweeteners. High levels of awareness was seen in urban residents (83.5% of those with perception were urban) and in people with higher education. Statistically significant associations were observed for residence (urban vs. rural, $p < 0.001$), education ($p < 0.001$), occupation ($p < 0.001$), and socioeconomic status ($p < 0.001$).

In case of socioeconomic status, significant associations were found ($p<0.001$), with upper class (85.2%) and lower-middle class (87.6%) participants showing better perception compared to upper-middle class (26.3%). This pattern suggests that both ends of the socioeconomic spectrum had greater awareness, possibly due todifferent pathways of health information access.

No significant relation was found for age ($p = 0.213$), gender ($p = 0.440$), or most comorbidities (e.g., hypertension, coronary artery disease), indicating that higher educational attainment and urban residence were linked with better perception of artificial sweeteners.

P value < 0.05 – Statistically significant at 95% confidence interval

TableIV demonstrates that among diabetic patients, the prevalence of sugar craving and artificial sweetener consumption is influenced by several key sociodemographic and behavioural factors.For analysis, patients reporting sugar cravings 'sometimes' or 'often' were grouped as 'Yes,' while those reporting cravings 'rarely' were classified as 'No'. While age and gender did not show significant associations with either sugar craving or sweetener consumption, residence, higher socioeconomic class, and regular physical activity were all significantly associated with greater consumption of artificial sweeteners ($p < 0.001$ for residence and physical activity, $p = 0.004$ for socioeconomic class). Additionally, good drug compliance was significantly linked to decreased sugar craving ($p = 0.027$). On the other hand, duration of diabetes was not significantly related to sugar craving or sweetener use. These findings suggest that environmental and lifestyle factors are more influential in determining artificial sweetener consumption and sugar craving in diabetic population.

Table IV: Analysis of Factors Associated With Sugar Craving and Artificial Sweetener Consumption Among

Patients With Diabetes Mellitus

Sociodemographic Profile & Diabetes history	Sugar craving		P value	Using Artificial sweetener		P value
	Yesn(%) (n=132)	No n(%) (n=38)		Yes n(%) (n=136)	No n(%) (n=34)	
Age						
<60 yrs	54(40.9)	14(36.8)		56(41.2)	12(35.3)	0.531
>60 yrs	78(59.1)	24(63.2)	0.652	80(58.8)	22(64.7)	
Gender						
Male	75(56.8)	20(52.6)	0.647	78(57.4)	17(50)	0.440
Female	57(43.2)	18(47.4)		58(42.6)	17(50)	
Residence						
Urban	121(91.7)	37(97.4)	0.227	132(97.1)	26(76.5)	
Rural	11(8.3)	1(2.6)		4(2.9)	8(23.5)	**<0.001**
Socioeconomic class						
Upper class	55(41.7)	18(47.4)	0.532	51(37.5)	22(64.7)	0.004
Lower class	77(58.3)	20(52.6)		85(62.5)	12(35.3)	
Duration of diabetes						
<10 yrs	52(39.4)	14(36.8)	0.135	49(36)	17(50)	0.135
>10 yrs	80(60.6)	24(63.2)		87(64)	17(50)	
Drug compliance						
Yes	65(49.2)	11(28.9)	**0.027**	63(46.3)	13(38.2)	0.396
No	67(50.8)	27(71.1)		73(53.7)	21(61.8)	
Physical activity						
Yes	123(93.2)	36(94.7)		133(97.8)	26(76.5)	**<0.001**
No	9(6.8)	2(5.3)	0.731	3(2.2)	8(23.5)	

***P value < 0.05 – Statistically significant at 95% confidence interval**

DISCUSSION

The high awareness and use of artificial sweeteners is in line with earlier researches conducted in India and overseas. For example, Sobhana et al. found that 58.8% of Indian type II diabetics were unaware of the health risks associated with using tabletop artificial sweeteners.(8)In a similar study, Shubhashree Patil et al. discovered that only 58% of Indian diabetics were aware of AS, only 18.4% regularly used them, and only 24% were aware of long-term side effects.(9)These findings echo the knowledge gaps and behaviour patterns identified in the present study.

The association between AS usage and socioeconomic status or education is well established: graduates and those with higher qualifications demonstrated greater knowledge regarding sweeteners and their risks. This pattern is repeated in this study, where upper-class and more educated participants had higher artificial sweetener use and awareness, corroborating Jaiswal et al.'s observation that higher education is linked with greater awareness of artificial sweeteners and their uses. (10)The lack of association between comorbidities (except hypertension) and AS use is also observed in studies from both India and Bangladesh, which reported no significant links between AS use and kidney disease or obesity but did report some association with hypertension.

The current study reveals a disparity between people's high awareness of artificial sweeteners and their decreased awareness of the possible health risks associated with them. Similar gaps were found in a cross-sectional study conducted in Iran by Karajibani et al., where the majority of patients had moderate or poor awareness and only 3% showed good knowledge.(11)The majority of participants in a study conducted in Bangladesh by Shil et al. did not check labels for sweetener content, and those living in a rural area was significantly linked to decreased awareness of health risks.(12)Despite their growing availability, only 17.5% of participants in a Chinese survey by Chen et al. regularly consumed non-nutritive sweeteners, indicating a limited awareness of the use of these products into regular diets.(13) Another study by Sadiq et al. from Iraq observed that while 52% of diabetics used sweeteners, nearly 80% consumed five to ten tablets daily, indicating a lack of guidance on safe quantities .(14) Together, these findings, in line with the present study, reinforce the urgent need for structured counselling to ensure not only adoption but also informed and safe use of artificial sweeteners among diabetic patients.

Even though most participants reported using AS, the gap in awareness about possible side effects is significant. This concern resonates with findings from Nayaka et al. and Shetty et al., where a substantial proportion of diabetics were unaware of potential long-term complications of artificial sweetener consumption, and the majority did not

know the ingredients or recommended duration of use.(15)(5)

Recent literature underscores the benefits and risks of artificial sweeteners in diabetes management. Katsumi Iizuka highlighted the dual role of AS in aiding weight and glucose control yet warned of potential adverse cardiovascular and metabolic effects, necessitating cautious long-term monitoring. Large-scale cohort studies led by Debras et al. and others have linked high AS intake with all-cause mortality and increased cardiovascular risks, emphasizing the need for balanced consumption. Mayo Clinic staff also note that while AS can be useful for blood sugar management, individual responses vary and safety concerns merit attention.(16) Editorials by Depras et al. and Hong et al. provide evidence that AS consumption may impact cardiovascular health and metabolic syndrome, further stressing the critical importance of patient education.(17)(18)

Sugar craving in diabetes is influenced by activation of brain reward pathways, postprandial glucose dips, and factors such as micronutrient deficiency, stress, and poor sleep. These mechanisms reinforce preference for sweet foods and complicate dietary control.(19) Practical strategies include maintaining stable blood glucose with balanced meals rich in protein and fibre, ensuring hydration and adequate sleep, managing stress, and substituting nutrient-dense options such as fruits or nuts in place of refined sugar.(20)Integrating such approaches with counselling on safe artificial sweetener use can support better glycaemic control.

Collectively, these studies reinforce the imperative for targeted, evidence-based educational programs tailored to diabetic populations. Enhancing awareness of both the benefits and potential health risks of artificial sweeteners can empower patients to make informed dietary choices and optimize metabolic outcomes.

Strengths & Limitations :
The study used random sampling and structured interviews to provide reliable data on artificial sweetener use in diabetics. It also adds to limited Indian evidence on this topic. However, being hospital-based, the study is subject to selection and recall bias, limiting generalisability.

CONCLUSION

Artificial sweetener consumption is widespread among diabetic patients (87.6%), yet poorly informed, with only 14.1% aware of potential side effects and 25.9% checking product labels. Consumption patterns are unaffected by most demographic or clinical features but significantly influenced by socio-environmental factors including urban residence, education, and physical activity. Despite high awareness (92.9%) and acceptance, critical perception gaps persist, especially concerning potential health risks and recommended usage. These findings underscore the necessity for targeted, evidence-based diabetes education programs focused on the safe and informed consumption of artificial sweeteners, tailored to address specific knowledge deficits and promote health literacy among diverse patient populations.

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REFERENCES

1. Diabetes [Internet]. [cited 2024 June 22]. Available from: https://www.who.int/health-topics/diabetes
2. Pang MD, Goossens GH, Blaak EE. The Impact of Artificial Sweeteners on Body Weight Control and Glucose Homeostasis. Front Nutr [Internet]. 2021 Jan 7 [cited 2024 June 30];7. Available from: https://www.frontiersin.org/journals/nutrition/articles/10.3389/fnut.2020.598340/full
3. Statista [Internet]. [cited 2024 June 22]. Major sugar consumers worldwide by country 2023/2024. Available from: https://www.statista.com/statistics/496002/sugar-consumption-worldwide/
4. Food Safety Mantra Blog [Internet]. [cited 2024 June 30]. Artificial Sweeteners That Are Approved By FSSAI. Available from: https://www.foodsafetymantra.com/regulatory-insight/consumer-products/artificial-sweeteners-that-are-approved-by-fssai/
5. Nayaka R, Jain R. Knowledge, Attitude And Practice Of Diabetic Patients Regarding The Use Of Artificial Sweetners As Substitute To Sugar: KAP Of Diabetic Patients Regarding The Use Of Artificial Sweetners. Natl J Integr Res Med. 2018;9(6):28–35.
6. Diabetes [Internet]. [cited 2025 Sept 3]. Available from: https://www.who.int/health-topics/diabetes
7. Chattopadhyay S, Raychaudhuri U, Chakraborty R. Artificial sweeteners – a review. J Food Sci Technol. 2014 Apr;51(4):611–21.
8. Prabhakaran Sobhana P, Nagaraju R, Naik R, Roy V, Shakappa D. Assessment of knowledge and intake of artificial sweeteners among type II diabetic individuals and perspectives of registered dieticians in India. Int J Health Allied Sci [Internet]. 2023 Nov 14;12(4). Available from: https://rescon.jssuni.edu.in/ijhas/vol12/iss4/5
9. Shubhashree P, Priti S, Indumathi K, Seema A, Aashna P, Pranjali S, et al. Knowledge, awareness, and usage patterns of artificial

sweeteners (as) amongst people with diabetes: A cross-sectional study. IP J Nutr Metab Health Sci. 2025 May 7;8(1):24–8.
10. Pratiksha J, Sanpreet S, Dheeraj K, Tabita J. Assessment of the use of low-calorie sweeteners amongst Indian population and their awareness about their adverse effects. IP J Nutr Metab Health Sci. 2021 May 8;4(1):13–8.
11. Karajibani M, Eslahi H, Montazerifar F, Razaghee F, Dashipour A. Knowledge, Attitude, and Practices (KAPs) of Type 2 Diabetes Patients Regarding the Consumption of Artificial Sweeteners in Zahedan, Iran: A Cross-sectional Study. Hosp Pract Res. 2020 Sept 1;5(3):105–11.
12. Shil A, Zhang J, Chichger H. Investigating the use and awareness of artificial sweeteners among diabetic patients in Bangladesh. PLOS ONE. 2023 Dec 13;18(12):e0295272.
13. Chen Q, Zhang Y, Li H. Knowledge, attitude, and practice toward non-nutritive sweeteners among the population with reduced sugar intake requirement. Front Nutr [Internet]. 2024 Jan 5 [cited 2025 Apr 29];10. Available from: https://www.frontiersin.orghttps://www.frontiersin.org/journals/nutrition/articles/10.3389/fnut.2023.1268599/full
14. Sadiq MA, Salih AA. Knowledge and Attitude About Sweeteners Among Type 2 Diabetic Patients. Arch Intern Med Res. 2018 Sept 12;1(1):1–5.
15. Sharanya S Shetty D, Kumar RA, R S. Knowledge and Awareness of usage of Artificial Sweeteners among Indian type 2 diabetes individuals in a tertiary diabetes institute. Int J Med Res Rev. 2022 Oct 29;10(5):134–40.
16. Artificial sweeteners: Any effect on blood sugar? - Mayo Clinic [Internet]. [cited 2025 Aug 31]. Available from: https://www.mayoclinic.org/diseases-conditions/diabetes/expert-answers/artificial-sweeteners/faq-20058038
17. Debras C, Chazelas E, Sellem L, Porcher R, Druesne-Pecollo N, Esseddik Y, et al. Artificial sweeteners and risk of cardiovascular diseases: results from the prospective NutriNet-Santé cohort. BMJ. 2022 Sept 7;378:e071204.
18. Hong QY, Huang Y, Yang J, Su LT, Dai ZR, Zhao CF. Food sweeteners: Angels or clowns for human health? Curr Res Food Sci. 2025 Mar 12;10:101032.
19. Why Does a Diabetic Crave Sugar? Biological Reasons [Internet]. Biology Insights. 2025 [cited 2025 Sept 3]. Available from: https://biologyinsights.com/why-does-a-diabetic-crave-sugar-biological-reasons/
20. How To Stop Sugar Cravings When You Have Diabetes – Diabetic Me [Internet]. 2025 [cited 2025 Sept 3]. Available from: https://diabeticme.org/learning-center/diet-guides/how-to-stop-sugar-cravings-when-you-have-diabetes/

