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Exploring Consumer Behaviour towards Zero-sugar Beverages: A Case Study of Delhi NCR

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HIGHLIGHTS

- The value of KMO (0.940) and significant Bartlett's Test show the sample is adequate for factor analysis.
- Factor analysis revealed two distinct dimensions: consumer behaviour and consumer perception regarding zero-sugar beverages.
- Chi-squared test indicates a significant association between educational qualification and awareness of zero-sugar beverages among consumers.

ARTICLE INFO

Keywords: Consumer behaviour, Factor analysis, Chi-square test, Zero sugar beverages, Perception.

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ABSTRACT

In recent years, rising consumer health consciousness has led to a significant shift in beverage consumption patterns, especially in urban areas like Delhi National Capital Region (NCR). This research aims to understand consumer behaviour towards zero-sugar beverages in the Delhi NCR. A structured survey of 320 respondents across different age groups, income levels, and health profiles was conducted using a structured questionnaire in 2025 through multistage sampling. Factor analysis was employed as a statistical tool to analyze consumer behaviour and perception towards zero-sugar beverages. A chi-square test was used to examine the relationship between customers' awareness of zero-sugar beverages and their level of education. In the findings, two significant factors had arisen: one concerned consumers influenced by health fears and mistrust; the other was health-conscious or positive consumers, motivated by fitness, health, and informed choices. According to the study, respondents who were highly concerned about their health and concerned about labels preferred sugar-free beverages. There was considerable dissent about the deception that sugar-free beverages are solely for persons with diabetes. The study's overall conclusions indicate that the sugar-free beverage industry in Delhi NCR is still relatively nascent but has a lot of potential.

INTRODUCTION

The global beverage sector has experienced tremendous change as consumer health preferences have changed and worries about sugar-related illness risks have grown (Malik & Hu, 2022). The need for healthy beverage options has increased due to the rising incidence of non-transmissible disorders like weight gain, diabetes, and tooth disease (Du et al., 2018). Zero-sugar beverages, which provide the taste and enjoyment of conventional sugar-sweetened beverages (SSBs) despite the corresponding calorie consumption, have become one of these fast-expanding categories (Sylvetsky & Rother, 2018). In order to replicate the sweetness of sucrose despite drastically lowering energy content, non-nutritive or low-calorie sweeteners like stevia, sucralose, acesulfame-K, and aspartame are

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used in the formulation of zero-sugar beverages (Fitch & Keim, 2012; Gardner et al., 2012). This invention responds to the World Health Organization's (WHO) nutritional guidelines, which intend to minimise the hazards to metabolism and oral disease by limiting the usage of free sugar to less than 10 per cent of overall daily caloric intakes (WHO, 2015). The appeal of these products lies not only in their calorie-free composition but also in advancements in food science and sensory technology, which have enabled manufacturers to enhance flavour profiles and reduce the aftertaste traditionally associated with artificial sweeteners. In addition, businesses are also adding therapeutic substances such as vitamins, herbal extracts, and electrolytes to zero-sugar beverages to promote various healthcare and wellbeing objectives, such as hydration, immune building, and strength improvement (IFIC, 2022).

According to the study of Maiti and Saha (2022), most customers (80%) in metropolitan regions preferred unorganised companies, whereas 78 per cent of customers in rural areas relied on street vendors. Before purchasing, every respondent examined the food's quality, paying particular attention to its colour, shape, and look. Rural residents were marginally more aware of tainted food (68%) than urban residents (64%). According to a survey, Soliga tribes eat more freshly caught fish than Koragas, primarily due to convenience, affordability, and access. Choice variations draw attention to regional differences in tribal purchasing patterns. These observations can help fish vendors and health officials encourage fish eating, particularly to enhance nutrition in Dakshina Kannada and Chamarajanagar (Sajeev et al., 2023).

The study aims to analyse and explore consumer behaviour toward zero-sugar beverages in Delhi NCR, with a focus on identifying the barriers and misconceptions that prevent their adoption. In the Delhi NCR, consumer behaviour and attitudes significantly influence the marketplace trends and purchase practices, especially as zero-sugar beverages emerge as a preferred choice among health-conscious individuals. A similar study on consumer perception towards organic food discloses that market variables, such as availability and belief in genuineness, convenience, and socioeconomic position, influence customer buying decisions. It has been underlined that agricultural extension agencies and other stakeholders must work together to raise awareness and educate the public in order to close the disparity amongst farm-level activities and consumer views and encourage more sustainable consumption patterns (Yadav et al., 2024).

METHODOLOGY

A systematic questionnaire provided through an online survey utilising Google Forms was used to collect and analyse primary data from Delhi NCR. A wide range of people live in Delhi NCR, including health-conscious individuals and students from different economic backgrounds and geographical areas. This variability ensures that the results represent a larger population, making it a perfect place to investigate attitudes and intention to sample non-zero-sugar beverages. Delhi NCR is also known for its extensive food and beverage marketing, metropolitan eating patterns, high consumption of sugar-sweetened drinks by college students, and ignorance of health issues. A sample of 320 respondents was selected, and data were collected using multistage sampling in 2025. Primary sampling units, defined as (wards/sectors), were selected from Delhi, Gurugram, Noida, Ghaziabad, and Faridabad using probability proportional to size. Within each unit, households or intercept points were systematically chosen, and respondents were stratified by education, age, and gender to ensure accurate population representation. A structured questionnaire was designed to gather information, which contained closed-ended questions to assess awareness, perception, and willingness to consume zero-sugar beverages. A 5-point Likert scale was used which was already test and found reliable in the study of Yadav et al., (2024) to design the questions and gather information about consumer behaviour regarding zero-sugar beverages and the barriers and misconceptions that prevent consumers from adopting zero-sugar beverages.

Factor analysis was employed to analyse and interpret the data by using IBM SPSS 22 software. The data met the requirements for factor analysis. The KMO value was above 0.6. Bartlett's test of sphericity was significant ($p < 0.05$). These results show there were enough correlations among variables. Therefore, the dataset was suitable for reliable factor extraction. Factor analysis was used to identify the factors responsible for identifying the concerned consumers, influenced by health fears and mistrust, and health-conscious or positive consumers, motivated by fitness, health, and informed choices.

The chi-square test was used to check the relationship between the educational qualification of respondents and their awareness towards zero-sugar beverages. A similar test was performed to check the relationship between farmers' demographic profile and their awareness of climate change (Kumar & Saxena, 2024). The hypothesis formulated for checking the association between the educational qualification of respondents and their awareness of zero-sugar beverages:

H_0: There is no significant association between the educational qualification of respondents and their awareness of zero-sugar beverages.

The Pearson Chi-Square value was 20. 371 with three degrees of freedom and the value of p (level of significance) 0.000, which was significantly below the threshold of 0.05 which demonstrate the statistically significant relationship between the variables examined. With three degrees of freedom and a significance level of 0.003, the Likelihood Ratio value 14.195 provides additional evidence for a meaningful relationship.

RESULTS

Factor analysis was conducted to analyse the consumer behaviour and perception towards zero-sugar beverages. The results were drawn after analysing the data were presented in the following tables.

Table 1. KMO and Bartlett's test Table

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.940
Bartlett's Test of Sphericity	Approx. Chi-Square	3153.121
	df	105
	Sig.	.000

Table 1 reflected the outstanding Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy score of 0.940, indicating that the dataset was appropriate for factor analysis. The parameters were suitable for structure discovery because of their high KMO value, which means an elevated degree of shared variance. Furthermore, the correlation matrix did not constitute an identity matrix, as confirmed by the significant results of Bartlett's Test of Sphericity (Chi-square = 3153.121, df = 105, $p < 0.001$). It indicated that the variables have important links with one another, which supports proceeding with factor analysis.

Table 2 identified two components based on their eigenvalues being greater than 1. An additional 19.69 per cent of the total variance was explained by the second component, which has an eigenvalue of 2.954, while the first component's initial eigenvalue of 7.020 accounts for 46.80 per cent. These two elements work together to explain 66.49 per cent of the cumulative variance, indicating a significant representation of the original dataset (Table 2). Following rotation, which redistributes the explained variance for improved interpretability, the first and second components account for 30–12 per cent and 36–38 per cent, respectively. This rotated solution offers a more balanced and transparent structure of the underlying factors, indicating that these elements successfully capture most of the dataset's information.

The first component can practically be a group of closely associated variables that capture one aspect of the studied construct. In contrast, the second aspect might capture a separate but complementary value. By decreasing multicollinearity and enhancing model stability, such a distinct separation promotes conceptual comprehension and makes it easier to perform follow-up analysis.

The rotated component matrix showed two clear factors shaping consumer views on zero-sugar beverages. Component 1 revealed perception of concerns included harmful preservatives, bad taste, artificial sweeteners, long-term health risks, and higher prices of zero-sugar beverages for consumers. This suggests a group of consumers affected by fear, distrust, and scepticism about zero-sugar drinks. On the other hand, Component 2 reflected positive views and motivations. It was strongly connected to the belief that zero-sugar beverages are healthier, help with weight management,

Table 2. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.020	46.800	46.800	7.020	46.800	46.800	5.456	36.375	36.375
2	2.954	19.692	66.492	2.954	19.692	66.492	4.517	30.117	66.492
3	.661	4.409	70.901						
4	.590	3.933	74.834						
5	.573	3.822	78.657						
6	.421	2.810	81.467						
7	.407	2.711	84.177						
8	.376	2.508	86.685						
9	.352	2.346	89.032						
10	.331	2.204	91.236						
11	.295	1.964	93.200						
12	.286	1.905	95.105						
13	.267	1.781	96.886						
14	.253	1.689	98.575						
15	.214	1.425	100.000						

Extraction Method: Principal Component Analysis.

Table 3. Rotated component matrix

Statements	Component 1	Component 2
I regularly read labels to check for sugar content in beverages.	-.231	.653
I believe zero-sugar beverages are healthier.	-.024	.822
I feel that zero-sugar beverages help in maintaining weight.	-.197	.825
Advertisements influence my decision to try zero-sugar beverages.	-.158	.772
Price is a deciding factor when choosing between zero-sugar and regular beverages.	-.181	.805
I am willing to pay more for zero-sugar beverages	-.148	.773
I prefer zero-sugar beverages over regular sugary drinks.	-.207	.789
I believe that zero beverages smell artificial or have an off-putting aroma.	.634	-.257
I think zero-calorie beverages contain harmful preservatives.	.838	-.220
I avoid zero beverages because they have an unpleasant taste.	.888	-.206
I think zero-sugar beverages are only for people with diabetes or health issues.	.888	-.206
I believe zero-sugar beverages cause long-term health problems.	.798	-.189
I believe that the artificial sweeteners used in zero beverages are unsafe.	.825	-.097
Zero-sugar beverages are too expensive compared to regular soft drinks.	.824	-.169
I believe that zero beverages smell artificial or have an off-putting aroma.	.832	-.050

and are worth a higher price. It also considered the impact of ads and pricing.

Table 4 indicates that the rotated component matrix contained two identified factors: one reflects the consumer behaviour towards zero-sugar beverages, and the other demonstrates the consumer perception towards zero-sugar beverages. The first factor of consumer behaviour towards zero-sugar beverages includes statements that demonstrate positive attitudes and active engagement, such as reading labels on a regular basis (loading = 0.825), thinking about the health benefits (0.822), and being influenced by advertisements (0.789). These products show consumers embracing healthier options despite cost concerns and making well-informed decisions. The factors, with a high Cronbach Alpha of 0.901 and a strong eigenvalue, demonstrate the behaviour-related items' exceptional internal consistency and dependability.

The second factor, consumer perception, reflects doubts and negative views about zero-sugar beverages. It covers health concerns such as beliefs that artificial sweeteners are harmful (0.798) or may cause long-term health problems (0.824) and sensory aversions, including aversion to artificial taste or smell (0.888). A common misunderstanding that zero-sugar beverages are exclusively for people with diabetes or health-conscious people is also brought to light by the perception factor. This factor exhibits extremely high reliability, indicating a strong coherence in the negative attitudes held by specific consumer segments, with a Cronbach's Alpha of 0.932. Together, these two elements provide a fair assessment of the psychological and motivational obstacles to the uptake of sugar-free beverages.

The findings of Table 5 indicated a strong relationship between consumers' awareness of sugar-free beverages and their level of education. The Pearson Chi-Square value of 20.371 depicted a statistically significant link between the variables under investigation, as demonstrated by a p-value of 0.000, far lower than the 0.05 criterion. According to the high numbers in the YES category relative to their expected values, respondents with higher educational backgrounds (graduate, postgraduate, and above) overwhelmingly reported knowing about zero-sugar beverages. On the other hand, those with only a 12th pass had a higher unawareness count (5) than anticipated (10), suggesting that their awareness was comparatively lower. In general, awareness rises with educational attainment, indicating that consumers' understanding of sugar-free beverages was significantly influenced by education. The results were significant at a 5% significance level, and insufficient evidence supports the null hypothesis. So, the null hypothesis was

Table 4. Factors Identified from rotated component matrix

Factors Name	Statements	Eigen Value	Cronbach Alpha
Consumers' behaviour towards zero-sugar beverages	I regularly read labels to check for sugar content in beverages.	0.825	0.901
	I believe zero-sugar beverages are healthier.	0.822	
	I feel that zero-sugar beverages help in maintaining weight.	0.805	
	Advertisements influence my decision to try zero-sugar beverages.	0.789	
	Price is a deciding factor when choosing between zero-sugar and regular beverages.	0.773	
	I am willing to pay more for zero-sugar beverages	0.772	
	I prefer zero-sugar beverages over regular sugary drinks.	0.653	
Consumer perception towards zero sugar beverages	I believe that zero beverages smell artificial or have an off-putting aroma.	0.888	0.932
	I think zero-calorie beverages contain harmful preservatives.	0.888	
	I avoid zero beverages because they have an unpleasant taste.	0.838	
	I think zero-sugar beverages are only for people with diabetes or health issues.	0.825	
	I believe zero-sugar beverages cause long-term health problems.	0.824	
	I believe that the artificial sweeteners used in zero-calorie beverages are unsafe.	0.798	
	Zero-sugar beverages are too expensive compared to regular soft drinks.	0.634	
	I believe that zero beverages smell artificial or have an off-putting aroma.	0.888	

Table 5. Association between educational qualification and awareness of zero-sugar beverages among consumers

			Awareness of zero-sugar beverages		Total
			No	Yes	
Educational Qualification	12th Pass	Count	5	8	13
		Expected Count	1.0	12.0	13.0
	Graduate	Count	9	115	124
		Expected Count	9.3	114.7	124.0
	Postgraduate	Count	0	26	26
		Expected Count	2.0	24.1	26.0
	Higher Studies/ Above Postgraduate	Count	10	147	157
		Expected Count	11.8	145.2	157.0
Total		Count	24	296	320
		Expected Count	24.0	296.0	320.0

rejected, and the alternative hypothesis will be accepted. It depicts a significant association between educational qualification and awareness of zero-sugar beverages.

DISCUSSION

The study explored the market landscape and consumer behaviour associated with zero-sugar beverages in the Delhi NCR region, offering insights into motivations, awareness levels, purchase behaviour, and the socio-demographic influences shaping this emerging segment. The findings demonstrate a strong relation between awareness and positive behavioural intent, indicating that consumers are more likely to adopt zero-sugar beverages if they actively engage with product information, such as reading labels and considering health benefits. In contrast, unfavourable opinions stemming from health worries and sensory dissatisfaction severely impede the uptake of sugar-free beverages, underscoring the influence of false information and product experiences on consumer sentiments. A major factor in the uptake of sugar-free beverages is consumer preferences. According to research, beverage sweetness positively impacts consumer utility, making sweeter beverages less susceptible to price fluctuations and competition (Jensen et al., 2024). The implication is that health-conscious consumers might be drawn to sugar-free beverages, which are frequently considered healthier options (Gupta et al., 2021). Further consumer behaviour assessment depicts that consumers think zero-sugar beverages are a healthy option, read labels properly, and are influenced by price and advertisement. Consumers frequently read beverage labels to determine the amount of sugar and think sugar-free drinks are healthier and aid in weight maintenance. Additionally, participants report that price sensitivity and advertisement exposure significantly impact their purchase decisions, indicating the importance of external factors like these. On the other hand, some consumers perceive that zero-sugar beverages contain some harmful preservatives, bad tastes, and think these drinks are only made for diabetic persons. Some consumers believe that zero-sugar beverages have an artificial or unpleasant smell, contain harmful preservatives or unsafe artificial sweeteners, and are only meant for individuals with health conditions such as diabetes.

There is a prevailing notion that zero-sugar drinks may lead to long-term health problems and are overpriced compared to their regular counterparts. The study of Yadav et al., (2024) also portrays the attitude of consumers and perception towards organic food products. Agribusiness success is shaped by the entrepreneurial atmosphere, which also affects agripreneurs' attitudes. The experimental study of Miller et al., (2022) states that most participants (75.5%) in this experimental study read warning warnings about sugary beverages and artificial sweeteners carefully, and more than half (55.3%) said that the labels caused them to think about the health risks associated with sugary drinks. Additionally, a lot of people thought drinking sugar-free beverages would help them lose weight, but some people were worried regarding artificial sweeteners and preservatives. The findings of this study reveal a significant association between educational qualification and awareness of zero-sugar beverages among consumers. The study of Coskun & Kayisoglu (2018) finds that the percentage of people who comprehend and value the information on food labels increases dramatically with educational attainment.

CONCLUSION

This study thoroughly explains the attitudes, driving forces, and obstacles that consumers in the Delhi NCR area have regarding sugar-free beverages. The increasing need for better beverage options is undoubtedly due to rising health consciousness. However, there is still a limited shift from awareness to regular intake. These behavioural insights revealed that more label-conscious and health-conscious respondents had higher preference scores for beverages with no added sugar. In the meantime, there was general disagreement about myths like the idea that sugar-free drinks are only for people with diabetes or that they contain dangerous preservatives. The study's overall conclusions indicate that the sugar-free beverage industry in Delhi NCR is still relatively new but has a lot of potential. This study has significant implications for policy, including the need for focused publicity efforts and educational programs to dispel myths and foster consumer confidence in order to encourage the use of zero-sugar beverages.

DECLARATIONS

Ethics approval and informed consent: Informed consent was sought from the respondents of the study during the course of the research.

Conflict of interest: The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The authors declare that during the preparation of this work, thoroughly reviewed, revised, and edited the content as needed. The authors take full responsibility for the final content of this publication.

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