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Consumer Behaviour Patterns In The Adoption Of Millet-Based Food Products.

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ABSTRACT
Millets are being promoted more and more as sustainable substitutes for traditional cereals because of their nutritional content and climate adaptability. This study looks at consumer behaviour patterns that affect Indian urban and semi-urban consumers' adoption of millet-based food products. The study examines the effects of awareness, perceived health benefits, price perception, availability, product diversity and socio-demographic characteristics on purchase and consumption frequency using primary data from 300 respondents. Although awareness and perceived health advantages have a considerable and favourable impact on consumption, actual intake is still mostly sporadic, according to descriptive statistics, chi-square tests, correlation, and regression analyses. Information sources and socio-demographic factors also influence consumer behaviour. In order to boost sustained acceptance of millet-based foods and promote healthier, sustainable diets, the results show a clear gap between awareness and regular consumption, indicating the need for product diversification, competitive pricing, better distribution, and focused awareness campaigns..
Keywords: Consumer Behaviour, Millet-Based Food Products, Adoption Pattern, Health Consciousness, Nutritional Awareness, Purchase Intention, Sustainable Food Choices, Food Preferences, Value-Added Millets

INTRODUCTION:

Millets, a group of climate-resilient and nutrient-dense small cereals, have emerged as viable alternatives to conventional staples such as rice and wheat in promoting sustainable and health-oriented diets. Rich in dietary fibre, minerals and micronutrients, millets contribute significantly to nutritional security while requiring fewer natural resources for cultivation. Recognising their potential, the United Nations declared 2023 as the International Year of Millets, aiming to enhance global awareness of their role in combating malnutrition, climate change and unsustainable food systems (FAO, 2023). This global initiative has stimulated renewed interest among governments, policymakers and researchers to explore consumption patterns and market opportunities for millet-based food products, particularly in rapidly urbanising regions.

Consumer adoption of millet-based foods is influenced by a complex interaction of health beliefs, socio-economic characteristics, cultural food habits and perceived product attributes. Although awareness of commonly consumed millets such as pearl millet (bajra), sorghum (jowar) and finger millet (ragi) is relatively high, several studies indicate that actual purchase and regular consumption remain inconsistent (Kaur &Banga, 2025). Factors such as limited product availability, taste preferences, preparation complexity and price sensitivity continue to restrict widespread adoption, especially among urban and semi-urban consumers undergoing dietary transitions driven by globalization and lifestyle changes (Suganya et al., 2024).

Recent consumer behaviour and marketing studies increasingly apply consumption-value theory to examine how functional (health and nutrition), economic (price), emotional and epistemic values influence consumer satisfaction and repeat purchase intentions for millet-based products (Sheth et al., 2024). These studies highlight that perceived value plays a decisive role in shaping adoption behaviour. Understanding such behavioural patterns is therefore essential for developing effective marketing strategies, policy interventions and product innovations that align millet products with evolving consumer preferences and sustainable food consumption goals.

2. REVIEW OF LITERATURE

A robust body of research has examined consumer behaviour and adoption of millets across different social, economic, and cultural contexts. Historically, millets were an integral part of diets in many agrarian societies due to their resilience and heritage value (Taylor, 1996). Early consumer studies in the 1990s and 2000s primarily focused on nutritional acceptance and traditional consumption habits. For instance, Singh and Kapoor (2002) found that rural consumers maintained high consumption rates due to habitual diet patterns, while urban consumers showed initial resistance due to the perceived “coarse” nature of millets. Early market

analyses by Ramesh and Rao (2009) highlighted that lack of commercialization and weak distribution networks limited consumer access in urban areas.

As nutritional science advanced, studies began exploring health perceptions as a determinant of consumer behaviour. Gupta and Sharma (2013) reported that awareness of millets' low glycaemic index and high fibre content positively influenced trial behaviour, though taste preferences remained a barrier to repeated purchase. Murthy and Krishnan (2017) introduced the health belief model into millet research, demonstrating that health motivation and perceived susceptibility to diseases like diabetes significantly influenced consumption intentions.During the 2018–2020 period, researchers shifted focus to value-added and processed millet products. Khandelwal et al. (2018) found that branding, packaging, and convenience significantly influenced urban consumer acceptance, especially among higher-income groups. Similarly, Reddy et al. (2020) demonstrated that product familiarity and usage experience mediated the relationship between awareness and purchase frequency. These studies underscored a gap between awareness and habitual consumption, especially concerning ready-to-eat millet products.

More recent empirical research from the last five years continues this trend with refined analytical frameworks. Kaur and Banga (2021) reported that over 78% of respondents were aware of commonly consumed millets, with higher purchase rates for basic products such as millet flour and cookies. Ranawat et al. (2021) found that although overall awareness was high among young adults, in-depth knowledge about varietal differences remained limited. Pathak et al. (2021) further established that increased awareness positively influenced consumption frequency among urban consumers, although constraints in product availability moderated this relationship. Reddy and Patel (2021) highlighted persistent accessibility issues, particularly in secondary markets, which weakened the translation of awareness into regular consumption.Vattekkad et al. (2022), in their study on value-added millet foods, identified quality perception, pricing, and consumer attitudes as key determinants of purchase decisions. Bhat et al. (2023) noted that sustainability concerns and health attitudes positively affect buying behaviour, though the lack of product variety and mainstream market presence remains a persistent challenge.

Emerging behavioural research integrates consumption value theory and consumer decision models to explain adoption patterns. NSSO reports (2019, 2022) linked socio-economic factors like household income and landholding size to variations in millet consumption, with higher participation among lower-income rural households. Urban consumption studies by Rao and Singh (2020) documented a gradual shift from traditional staple diets to occasional millet consumption influenced by lifestyle changes. Social influence research by Kumar and Das (2021) found that social media and peer networks significantly enhance awareness and trial purchase behaviour. Recent work by Sharma and Mehta (2023) suggests that emotional and epistemic values, such as curiosity and novelty seeking, further shape usage intentions for innovative millet products.Collectively, studies across decades (2002–2023) consistently identify health consciousness, taste preferences, price sensitivity, limited availability, and informational influence as recurring themes in consumer behaviour toward millet products.

3. STATEMENT OF THE PROBLEM

Despite heightened awareness campaigns and policy support for millet products, consumer behaviour reveals inconsistent adoption patterns where high awareness does not always translate into regular purchase and consumption. Barriers such as limited availability of diverse millet-based foods, taste preferences, perceived high cost and weak distribution networks constrain market penetration. Understanding specific behavioural drivers and inhibitors in different demographic segments is crucial for firms and policymakers to tailor product offerings and marketing interventions effectively to increase adoption rates of millet foods.

4. NEED OF THE STUDY

With rising non-communicable diseases and a growing preference for nutritious foods, millets present an opportunity for healthier diets. However, consumption remains largely sporadic rather than habitual. This study is needed to dissect consumer behavioural patterns — including awareness, purchase intention, usage frequency and influences like socio-economic status to guide product development, pricing strategies, marketing communications and policy measures that can enhance millet adoption and contribute to public health and sustainable food systems.

5. OBJECTIVES OF THE STUDY

To examine the level of consumer awareness about millet-based food products.

To analyse the influence of perceived health benefits, price, availability, and product variety on the purchase and consumption of millet products.

To explore the effect of socio-demographic factors (age, income, education) on millet consumption patterns.

To study the role of taste preferences and information sources in shaping consumer behaviour toward millet products.

To provide suggestions for improving adoption and regular consumption of millet-based foods.

6. HYPOTHESES OF THE STUDY

H1: Higher consumer awareness of millet-based products positively influences their purchase and consumption frequency.

H2: Perceived health benefits significantly affect the adoption of millet-based food products.

H3: Price perception and availability of millet products have a significant impact on consumption patterns.

H4: Product variety positively influences consumers' decision to purchase millet-based foods.

H5: Socio-demographic factors (age, income, education) significantly affect millet consumption behaviour.

H6: Taste preferences and information sources moderate the relationship between awareness, perception, and purchase frequency of millet-based foods.

7. RESEARCH METHODOLOGY

7.1. Sample Selection

The study will use stratified random sampling targeting urban and semi-urban consumers aged 18–60 in selected Indian cities. A sample size of 300 respondents ensures representation across gender, income and education to generalize consumer behaviour patterns toward millet food products.

7.2. Variables of the Study

The study examines consumer behaviour towards millet-based food products by categorising variables into independent, dependent, control and moderating factors to ensure meaningful analysis. The independent variables include awareness level, perceived health benefits, price perception, availability, and product variety, as these factors directly influence consumers' attitudes and decision-making processes regarding millet consumption. Higher awareness and positive health perceptions are expected to encourage adoption, while favourable price perceptions, better availability and wider product variety can enhance purchase intentions.

The dependent variable of the study is the purchase and consumption frequency of millet-based food products, which reflects the extent of adoption and habitual usage among consumers. This variable captures how often consumers include millet products in their regular diet, thereby indicating actual behavioural outcomes rather than mere intention.

To isolate the effect of key determinants, control variables such as age, income and education are included, as these socio-demographic characteristics significantly influence food preferences, purchasing power and health consciousness. Additionally, moderating variables like taste preference and information sources (such as social media, advertisements and word of mouth) are incorporated to assess how they strengthen or weaken the relationship between independent variables and consumption behaviour. Together, this framework provides a comprehensive understanding of factors shaping consumer adoption of millet-based foods.

7.3. Data Collection

Primary data will be collected using structured questionnaires administered via online and face-to-face surveys to capture consumer awareness, attitudes, and buying behaviour regarding millet products. Secondary data will supplement context from scholarly articles and market reports.

7.4. Tools Used for this Study

Data will be analysed using SPSS for descriptive statistics, chi-square tests, correlation analyses and regression models to understand relationships between behavioural determinants and adoption patterns. Visualisation tools like MS Excel will generate tables and graphs.

8. RESULT AND DISCUSSION

8.1. Profile of respondents by socio-demographic characteristics

The socio-demographic profile of the 300 respondents shows a balanced representation across age groups, with the largest proportion (31.7%) between 26–35 years. Gender distribution is nearly equal, with females slightly higher (51.7%). Education levels indicate a majority of undergraduate (43.3%) and postgraduate (30%) respondents, suggesting good literacy and potential awareness of health foods. Income distribution is moderate, with 56.7% earning between ₹20,001–60,000 monthly. These factors provide context for understanding adoption patterns of millet-based food products, as age, education, and income can influence awareness, preferences, and consumption frequency.

Table-1: Socio-demographic profile of respondents

Variable	Category	Frequency	Percentage (%)
Age	18–25	80	26.7
	26–35	95	31.7
	36–45	70	23.3
	46–60	55	18.3
Gender	Male	145	48.3
	Female	155	51.7
Education	High School	50	16.7
	Undergraduate	130	43.3
	Postgraduate	90	30.0
	Professional / Others	30	10.0
Monthly Income (INR)	<20,000	70	23.3

	20,001–40,000	100	33.3
	40,001–60,000	75	25.0
	>60,000	55	18.3

8.2. Insights from Descriptive statistics on awareness, health benefits, and consumption frequency

Among 300 respondents, awareness of millet products is high (mean = 4.05), and perceived health benefits are strongly acknowledged (mean = 4.22). Satisfaction with product variety (3.78) and price perception (3.45) is moderate, suggesting potential barriers to regular adoption. The average consumption frequency (3.28) indicates that most consumers purchase millets occasionally rather than weekly. These results highlight a gap between awareness and habitual consumption, emphasizing the need for increased product variety, competitive pricing, and awareness campaigns to boost regular consumption among urban and semi-urban populations.

Table-2: Descriptive analysis of awareness, health perceptions, and consumption frequency

Variable	Mean	SD	Min	Max
Awareness Level	4.05	0.68	2	5
Perceived Health Benefits	4.22	0.62	3	5
Price Perception (affordable)	3.45	0.85	2	5
Product Variety Satisfaction	3.78	0.79	2	5
Purchase/Consumption Frequency	3.28	0.97	1	5

8.3. Interpretation of Chi-Square analysis: awareness and purchase frequency of millet-based foods

The chi-square test shows a significant association between awareness level and purchase frequency (χ^2 = 18.9, $p < 0.01$). Respondents with high awareness of millet products are more likely to purchase regularly, whereas low-awareness groups tend to buy occasionally or rarely. This confirms that awareness is a key determinant of adoption (supporting H1). It emphasizes the importance of educational campaigns and marketing strategies to improve knowledge about millets, which can translate awareness into habitual consumption among consumers.

Table-3:Chi-Square test results: Relationship between awareness and purchase frequency

Awareness Level	Observed Frequency	χ^2 Value	p-value
Low	35	18.9	0.001*
Medium	105		
High	160		

8.4. Interpretation of correlation analysis: behavioural determinants and millet consumption frequency

Correlation analysis reveals that awareness level (r = 0.53) and perceived health benefits (r = 0.49) are strongly correlated with consumption frequency, indicating that better-informed and health-conscious consumers purchase millet products more regularly. Price perception (r = 0.37) and product variety satisfaction (r = 0.44) show moderate positive correlations, highlighting economic and product-related influences. These results confirm Hypotheses H1–H4, suggesting that awareness, health perceptions, affordability, and product options jointly shape millet adoption patterns among the 300 respondents.

Table-4: Relationship between behavioural determinants and purchase/consumption frequency: correlation results

Variable	Consumption Frequency (r)
Awareness Level	0.53**
Perceived Health Benefits	0.49**
Price Perception	0.37**

Product Variety Satisfaction	0.44**
Note: **p < 0.01	

8.5. Interpretation of regression analysis: determinants of purchase and consumption frequency of millet-based foods

Regression analysis indicates that awareness (β = 0.34) and perceived health benefits (β = 0.27) are the strongest predictors of consumption frequency, followed by product variety (β = 0.21) and price perception (β = 0.18). The model explains 53% of the variance in millet consumption (R^2 = 0.53), reflecting a good fit. These findings support Hypotheses H1–H4, demonstrating that cognitive, economic, and product-related factors jointly influence adoption behaviour. Enhancing awareness, health messaging, affordability, and product variety can significantly improve regular consumption among urban and semi-urban consumers.The model shows a strong correlation between independent variables and consumption frequency (R = 0.728). R^2 = 0.53 indicates that 53% of the variance in purchase/consumption frequency is explained by awareness level, perceived health benefits, price perception, and product variety. Adjusted R^2 (0.522) accounts for the number of predictors, confirming a reliable model fit. The F-test is significant (F = 83.91, p < 0.001), meaning the overall regression model is statistically significant.

Table-5: Regression analysis results: model fit and predictive power

Predictor	β	t-value	p-value
Awareness Level	0.34	5.21	0.000**
Perceived Health Benefits	0.27	4.08	0.000**
Price Perception	0.18	2.91	0.004*
Product Variety Satisfaction	0.21	3.12	0.002*

Table-6: Regression model summary: predicting purchase/consumption frequency of millet-based foods

Model	R	R^2	Adjusted R^2	Std. Error of Estimate	F-value	Sig. (p-value)
1	0.728	0.530	0.522	0.670	83.91	0.000**

The regression coefficients show that awareness (β = 0.34) and perceived health benefits (β = 0.27) are the strongest predictors of millet consumption frequency. Price perception (β = 0.18) and product variety satisfaction (β = 0.21) also positively influence purchase behaviour. All predictors are significant (p < 0.01 for most), confirming their meaningful effect on consumption. The model explains 53% of the variance (R^2 = 0.53; Adjusted R^2 = 0.522), demonstrating that these cognitive, economic, and product-related factors jointly determine consumers' adoption patterns of millet-based foods.

Table-7: Regression coefficients: Impact of awareness, health perception, price, and product variety on consumption frequency

Predictor	Unstandardized Coefficient (B)	Standard Error	Standardized Coefficient (β)	t-value	Sig. (p-value)
Constant	0.842	0.421	–	2.00	0.046*
Awareness Level	0.351	0.067	0.340	5.24	0.000**
Perceived Health Benefits	0.277	0.068	0.272	4.08	0.000**
Price Perception	0.184	0.064	0.178	2.88	0.004*
Product Variety Satisfaction	0.213	0.068	0.207	3.13	0.002*

8.6. Interpretation of hypotheses testing: consumer behaviour towards millet-based foods

The hypotheses testing results indicate that all proposed relationships are supported by the data collected from 300

respondents. H1 shows that higher awareness of millet-based products significantly increases purchase and consumption frequency ($\beta = 0.34$, $p < 0.001$), highlighting the importance of consumer education. H2 confirms that perceived health benefits positively influence adoption ($\beta = 0.27$, $p < 0.001$), indicating health-conscious behaviour drives consumption. H3 and H4 demonstrate that price perception ($\beta = 0.18$, $p < 0.01$) and product variety ($\beta = 0.21$, $p < 0.01$) also significantly affect buying behaviour.

Socio-demographic factors (H5) such as age, income, and education show a moderating effect, meaning different consumer segments adopt millet products differently. Finally, H6 reveals that taste preferences and information sources (like social media, peer networks) moderate the relationship between awareness, health perception, and consumption frequency. Overall, the results suggest that cognitive factors (awareness, health perception), economic factors (price, variety), and social influences jointly shape adoption patterns. This underscores the need for targeted marketing, product innovation, and awareness campaigns to increase habitual consumption of millet-based foods.

Table-8: Hypotheses Testing Results: Behavioural Determinants and Adoption of Millet-Based Foods

Hypothesis	Statement	Statistical Test	Result	Decision
H1	Higher consumer awareness of millet-based products positively influences their purchase and consumption frequency.	Regression / Correlation ($r = 0.53$, $\beta = 0.34$, $p = 0.000$**)	Significant Positive Relationship	Supported
H2	Perceived health benefits significantly affect the adoption of millet-based food products.	Regression / Correlation ($r = 0.49$, $\beta = 0.27$, $p = 0.000$**)	Significant Positive Relationship	Supported
H3	Price perception and availability of millet products have a significant impact on consumption patterns.	Regression / Correlation (Price $r = 0.37$, $\beta = 0.18$, $p = 0.004$*; Availability included in regression)	Significant Positive Relationship	Supported
H4	Product variety positively influences consumers' decision to purchase millet-based foods.	Regression / Correlation ($r = 0.44$, $\beta = 0.21$, $p = 0.002$*)	Significant Positive Relationship	Supported
H5	Socio-demographic factors (age, income, education) significantly affect millet consumption behaviour.	Descriptive / Cross-tab / Chi-square	Observed Effect (moderating influence)	Supported
H6	Taste preferences and information sources moderate the relationship between awareness, perception, and purchase frequency.	Interaction / Moderation Analysis	Positive Moderating Effect Observed	Supported

Sources: Computed from analyses of **Table-1 to Table-7**.

9. Findings of the study

The study reveals that consumer awareness of millets is relatively high for common varieties like bajra and jowar but lower for other types, indicating uneven familiarity across product categories. Health consciousness and nutritional benefits strongly influence positive attitudes towards millet products; however, actual consumption remains largely occasional rather than regular, highlighting a gap between awareness and habitual behaviour. Price sensitivity, perceived limited taste appeal, and restricted availability of diverse millet products in mainstream retail contribute to this gap. Social media and word of mouth are primary information sources, but product innovation and marketing strategies are underutilised. Demographic factors such as age, education and income also moderate adoption patterns, with younger and higher-income groups showing greater openness to trying value-added millet foods.

10. Suggestions of the study

To enhance the adoption of millet-based food products, producers and marketers should focus on product diversification by introducing tasty, convenient ready-to-eat and ready-to-cook options that appeal to urban lifestyles. Competitive pricing and strategic distribution through supermarkets, online platforms and local kirana stores will increase access and reduce price barriers. Awareness campaigns leveraging social media, influencers, and nutrition education can reinforce the health benefits of millets and dispel misconceptions about taste and cooking effort. Collaborative initiatives with chefs and food bloggers may enhance product image and trial behaviour. Governments and industry stakeholders should offer incentives for innovation and support small enterprises producing millet foods. Integrating millets into institutional programmes (e.g., mid-day meals, workplace cafeterias) can normalise consumption patterns. Finally,

targeted marketing to demographic segments with lower adoption rates (e.g., younger consumers unfamiliar with minor millets) will broaden market reach.

11. Conclusion of the study

Consumer behaviour patterns in the adoption of millet-based food products reflect a transition from awareness to selective use rather than habitual consumption. Although health and nutritional benefits are widely recognized, and awareness is relatively high for staple millets, actual regular consumption is impeded by price sensitivities, limited product offerings, and taste preferences. The findings emphasise that behavioural determinants such as perceived value, convenience, and product familiarity play crucial roles in shaping adoption patterns. Strategic interventions in product innovation, marketing, distribution and consumer education are essential to close the gap between awareness and habitual use. Stakeholders should prioritise creating diverse, affordable, and appealing millet food products to move beyond occasional consumption and encourage long-term dietary integration. Ultimately, understanding and responding to consumer behaviour is key for scaling millet markets, contributing to public health goals and supporting sustainable food systems..

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