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Consumer awareness and attitude toward millet-based processed foods in urban India

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Abstract

This study examines urban consumers' awareness, attitudes, and purchase behaviour toward millet-based value-added products (MBVAPs) in India. Based on responses from 104 participants across Tier-1 and Tier-2 cities, data were analysed using descriptive statistics and the Theory of Consumption Values (TCV) framework. Results indicate a high level of awareness and positive perception, with consumers associating millets with health, sustainability, and tradition. Functional, emotional, and social values strongly influence acceptance, while epistemic and conditional values—linked to curiosity, convenience, and affordability—remain moderate. Despite favourable attitudes and willingness to pay a 10-20% premium, purchasing is largely occasional, reflecting an intention-behaviour gap. Consumers prefer modern, convenient formats like cookies and breakfast flakes, primarily purchased through supermarkets and online platforms. Price sensitivity, limited availability, and taste satisfaction remain key constraints. Strategic interventions in product innovation, pricing, and retail access are vital to mainstream millets in urban diets.

Keywords: Millets, consumer perception, value-added products, theory of consumption values, urban consumers, purchase behaviour.

1. Introduction

Millets, often termed “nutri-cereals,” are a group of small-seeded grains belonging to the Poaceae family. Historically cultivated across Asia and Africa, they include sorghum (jowar), pearl millet (bajra), finger millet (ragi), and minor millets such as foxtail, kodo, barnyard, and little millet. These grains are known for their resilience to drought, short growing cycles, and low input requirements, making them ideal for rainfed and resource-poor regions (Rasika *et al.*, 2024; FAO, 2021)^[8, 3].

India is the world's leading millet producer, contributing nearly 20% of global output and 80% of Asia's production (APEDA, 2023)^[1]. Despite their traditional prominence in Indian diets, millet cultivation and consumption declined post-Green Revolution due to policy preferences for rice and wheat (Swaminathan, 2016)^[10]. However, growing awareness of millets' nutritional benefits—such as high fiber, essential amino acids, calcium, iron, and a low glycemic index—has sparked renewed interest, particularly among health-conscious consumers (ICAR-IIMR, 2022; Chandrasekara & Shahidi, 2012)^[4, 2].

In response, the Government of India declared 2018 as the National Year of Millets and championed the United Nations' declaration of 2023 as the International Year of

Millets (UNGA, 2021)^[11]. These initiatives have catalyzed policy support, research, and private sector engagement in millet value chains.

Parallel to this resurgence is the rise of millet-based processed products—ranging from traditional staples to modern innovations like noodles, cookies, energy bars, and breakfast cereals. These products align with global trends favoring functional, gluten-free, and sustainable foods (Rasika *et al.*, 2024)^[8]. In international markets, millets are increasingly positioned as “superfoods,” a term used to describe nutrient-dense foods with potential health and wellness benefits (Lucas *et al.*, 2022)^[6].

Understanding how urban consumers perceive these products is essential for scaling millet adoption. Urban markets are shaped by evolving dietary preferences, convenience-driven lifestyles, and increasing health awareness. Insights into consumer attitudes, awareness, and behavioral drivers can inform targeted strategies for product development, marketing, and policy interventions.

This article explores urban consumers' awareness and perception of millet-based processed products, drawing on empirical data and global literature to identify key trends, challenges, and opportunities for mainstreaming millets in modern diets.

2. Objectives of Study

The increasing recognition of millets as climate-resilient, nutrient-dense grains has led to a surge in the development and promotion of millet-based processed products. However, the success of these products in urban markets depends significantly on consumer awareness, perception, and behavioral intent. In this context, the present study was undertaken with the following specific objectives:

1. To evaluate the level of awareness and knowledge among urban consumers regarding millets and millet-based value-added products.
2. To examine consumer attitudes and perceptions toward millet-based processed products in terms of trust, healthfulness, sustainability, taste, and pricing.
3. To analyze urban consumers' usage intentions, preferences, and behavioral patterns related to millet-based products, guided by the Theory of Consumption Values (TCV).

3. Research Methodology

3.1. Research Design

This study adopted a descriptive and quantitative research design to investigate urban consumers' awareness, perceptions, and behavioral patterns toward millet-based processed products. The research was conducted during the year 2025 and a structured questionnaire, developed to capture data across five thematic domains: awareness and knowledge, aptitude and perception, usage intentions and preferences, consumption values (based on the Theory of Consumption Values), and behavioral patterns.

3.2. Questionnaire Development

The questionnaire was comprised of both categorical and Likert-type scale items to facilitate quantitative analysis. The items were informed by existing literature on consumer behavior toward functional foods and superfoods (Lucas *et al.*, 2022; Meyerding *et al.*, 2018)^[6, 7], and were designed to assess both cognitive and affective dimensions of consumer decision-making. The Likert-scale items ranged from agreement levels (e.g., strongly agree to strongly disagree) and frequency-based responses (e.g., never to very regularly).

3.3. Sampling and Data Collection

A convenience sampling method was employed to collect primary data. The questionnaire was disseminated via email to a randomly selected group of urban consumers residing in Tier-1 and Tier-2 cities across India. A total of 104 ($n=104$) valid responses were received. The use of digital distribution enabled broader geographic reach and ensured participation from diverse demographic segments within the urban population. Participation was voluntary and anonymous, ensuring ethical compliance and data confidentiality.

3.4. Data Analysis

The collected data were compiled, processed, and analyzed using descriptive statistical tools. Cumulative frequencies, percentages, arithmetic mean, and other descriptive measures were employed to interpret consumer responses. The analysis focused on identifying awareness levels, knowledge gaps, attitudinal trends, and behavioral drivers

influencing the consumption of millet-based processed products in urban markets.

4. Results and Discussion

The collected data was categorized into various broad areas like demographic characteristics of consumers, awareness level towards millets products, factors influencing the consumer preference towards millets and millet products, and constraints faced by consumer in consuming the millet value added products

4.1 Socio economic characteristics of Consumers

Understanding the socio-economic characteristics of consumers is essential for analyzing their food choices and health-related behaviors. The present study surveyed 104 urban consumers from Tier-1 and Tier-2 cities across India. The demographic analysis is represented in Table 1.

The sample was predominantly male (75%), with females comprising 25%. A majority of respondents (56.2%) were aged between 26-35 years, followed by 39.6% in the 18-25 years group, indicating a youthful and economically active demographic.

In terms of education, 76.9% of respondents were postgraduates or above, 11.5% were graduates, and 3.8% held professional or technical diplomas. Occupationally, 50% were employed, 47.9% were students, and a small proportion (2.1%) were homemakers or self-employed.

Monthly household income varied, with 33.3% earning ₹50,000-1,00,000, 25% earning ₹25,000-50,000, 20.8% below ₹25,000, and 20.8% above ₹1,00,000. Most respondents (87.5%) were single, and 64.6% lived in households with 4-5 members.

This demographic composition reflects a well-educated, young, and urban consumer base—an ideal segment for assessing perceptions of health-oriented, value-added food products like millets.

Table 1: Socio economic characteristics of consumers.

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	72	75
	Female	24	25
Age Group	18-25 years	38	39.6
	26-35 years	54	56.2
	36-45 years	2	2.1
	46-55 years	2	2.1
	Above 55 years	0	0
Education	Graduate	12	11.5
	Post-Graduate & Above	80	76.9
	Professional/ Technical Diploma	4	3.8
Occupation	Service/Private Employee	48	50
	Student	46	47.9
	Business/Self-employed	2	2.1
Monthly Income	Below ₹25,000	20	20.8
	₹25,000-50,000	24	25
	₹50,000-1,00,000	32	33.3
	Above ₹1,00,000	20	20.8
Marital Status	Single	84	87.5
	Married	12	12.5
Household Size	Up to 3 members	22	22.9
	4-5 members	62	64.6

	Above 5 members	12	12.5
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4.2 Awareness level & Knowledge

As shown in Table 2, The findings indicate a strong level of awareness among urban consumers regarding millets. A large majority (82%) reported being aware of different types of millets, with a high mean score of 4.3 on a 5-point scale. Similarly, 78% of respondents were familiar with millet-based value-added products, such as snacks and ready-to-eat

items, reflecting good familiarity (mean score: 4.1). Awareness of millets’ health benefits was even higher, with 85% acknowledging their nutritional value, supported by a mean score of 4.4. These results suggest that urban consumers are well-informed and receptive to millets, both in traditional and processed forms.

Table 2: Awareness Level of Respondents on Millets and MBVAP.

Sl. No.	Awareness Statement	Response Trend (Majority)	Mean Score (1-5)*	Interpretation
1	Awareness of different types of millets	82% Yes	4.3	High awareness
2	Familiarity with millet-based value-added products	78% Yes	4.1	Good familiarity
3	Knowledge regarding the health benefits of millets	85% Yes	4.4	Very good awareness

Analysis of product identification revealed that consumers possess a moderate ability to recognize millet-based processed items compared to regular staple cereals, with a mean score of 3.8 and a coefficient of variation of 24.2%. This suggests familiarity but also indicates that millet products often lack distinct visual or branding cues in the marketplace.

The market visibility assessment, analyzed using a weighted mean of 3.1, showed that most consumers encounter millet-based products only occasionally. Limited shelf presence and inconsistent availability remain key barriers to wider adoption. Similar findings were reported by Singh *et al.* (2023) and TRIF (2024), who noted that urban consumers’ millet purchase frequency depends largely on retail exposure and product placement.

In contrast, the trust dimension, demonstrated a high mean score of 4.0 with negative skewness (-0.54), indicating strong agreement with the statement that millets are trustworthy because of their traditional and natural origin. This reflects the enduring cultural association of millets with authenticity and healthfulness, a factor that continues to positively influence consumer sentiment (Lähteenmäki, 2013; Meyerding *et al.*, 2018)^[5, 7].

4.3 Attitude and Perception of Consumers

Understanding consumer attitudes and perceptions is crucial

to evaluate the long-term potential of millet-based value-added products (MBVAPs) in urban markets. Respondents’ attitudes were measured using multiple Likert-scale statements focusing on product appeal, health perception, willingness to adopt, and brand trust.

As presented in Table 3, the results show a highly favourable attitude among urban consumers toward millet-based products. Respondents strongly associated these products with health benefits (mean = 4.3) and lifestyle-related disease prevention (mean = 4.2), indicating awareness of their nutritional and functional advantages. Similarly, trust and authenticity scored highly (mean = 4.1), reflecting consumers’ confidence in millets as traditional and natural foods.

Environmental consciousness was particularly strong, with the statement “Consuming millet-based products supports sustainable agriculture and the environment” receiving the highest mean score (4.4), suggesting that sustainability messaging could further strengthen consumer appeal.

Conversely, aspects related to taste (mean = 3.6) and price fairness (mean = 3.4) recorded moderate scores, indicating areas where consumer expectations remain partially unmet. These findings imply that while consumers perceive millets as nutritious and ethical, taste experience and pricing strategies are crucial for improving repeat purchase behavior.

Table 3: Attitude and Perception of Respondents toward Millet-Based Products (N = 104).

Sl. No.	Statement	Mean Score	Std. Dev.	Interpretation
1	Millet-based products are trustworthy because they are traditional and natural.	4.1	0.83	High trust and authenticity perception
2	Millet-based products are healthier than regular processed products.	4.3	0.76	Strong belief in health benefits
3	Millet-based products can help prevent lifestyle-related diseases (e.g., diabetes, obesity).	4.2	0.79	Positive perception of preventive health role
4	Consuming millet-based products supports sustainable agriculture and the environment.	4.4	0.72	Strong environmental and ethical perception
5	Millet-based products have a promising future in urban food markets.	4.1	0.85	Optimistic outlook on market growth
6	The taste of millet-based products meets my expectations.	3.6	0.92	Moderate taste satisfaction
7	The price of millet-based products is reasonable for their health benefits.	3.4	0.95	Moderate price-value perception

4.4 Consumption Values (TCV Analysis)

The Theory of Consumption Values (TCV) proposed by Sheth *et al.* (1991)^[9] provides a framework to understand why consumers choose one product over another. It identifies five core consumption values—functional, social, emotional, epistemic, and conditional—that collectively

explain consumer behaviour. In this study, respondents’ attitudes and perceptions of millet-based value-added products (MBVAPs) were examined within this framework. To understand the motivational factors influencing consumer perception, 15 statements were included in the questionnaire and analysed using the Theory of

Consumption Values (TCV) framework. These were categorized into six dimensions—Functional, Social, Emotional, Epistemic, Conditional, and Behavioural Intention. Responses were rated on a five-point Likert scale

(1 = Strongly Disagree to 5 = Strongly Agree), and composite mean scores were computed to determine the dominant values shaping consumer preferences.

Table 4: TCV Composite Scores (N = 104)

TCV Dimension	Number of Items	Mean score (1-5)	Std. Deviation	Interpretation
Functional	3	4.23	0.41	Very strong perceived health & quality value
Social	3	4.08	0.47	Strong social signaling / peer acceptance
Emotional	3	4.06	0.54	Positive affect and identity attachment
Epistemic	3	3.88	0.62	Moderate curiosity/novelty interest
Conditional	4	3.52	0.69	Moderate; dependent on availability, price, promotions

The composite scores of TCV framework are shown in Table 4. The TCV analysis shows that functional value scores highest (mean = 4.23), indicating that urban consumers primarily evaluate millet-based value-added products on health and utility attributes — they view these products as nutritious, of good quality, and useful for maintaining a healthy diet. Social value (mean = 4.08) and emotional value (mean = 4.06) are also strong, suggesting that millets carry social approval (healthy-lifestyle signalling) and an emotional resonance (comfort/trust/tradition) among respondents.

Epistemic value scored moderately (mean = 3.88), meaning consumers are curious and open to novelty but may not consistently pursue experimentation. The conditional value recorded the lowest mean (3.52), highlighting that purchase decisions remain sensitive to situational factors — in particular, product availability, convenience, promotions, and perceived price-benefit balance. Overall, the TCV mapping suggests that while intrinsic product attributes (health, trust, identity) create a favourable disposition, market and situational constraints (distribution, pricing, convenience) are the main bottlenecks to converting positive perceptions into routine purchases.

4.5 Consumer Purchase Behaviour Patterns

The study explored four key dimensions of consumer purchase behaviour related to millet-based processed products: frequency of purchase, product preferences, purchase locations, and willingness to pay a premium.

4.5.1 Purchase Frequency of Millet-Based Products

The pie chart (fig.1) clearly shows that the majority of respondents (62 out of 104; ~60%) purchase millet-based products occasionally, indicating that these items are still part of irregular or trial-based consumption patterns. Around 20 respondents (19%) reported monthly purchases, suggesting a smaller but growing segment of regular users. Only 14 respondents (13%) buy millet-based products weekly, while 8 respondents (8%) stated that they never purchase such products.

4.5.2 Preferred Product Types

The bar graph Preferred Millet-Based Products (fig.2) indicates that Breakfast flakes (61.5%) and Cookies/Biscuits (57.7%) emerged as the most preferred millet-based products, followed by Instant Mixes (44.2%). Noodles (21.2%) and Beverages (17.3%) had moderate preference, while items like flour, raw millets, and powder forms were selected by only 1.9% of respondents each, suggesting

limited appeal for traditional formats.

4.5.3 Purchase Locations

Supermarkets were the dominant purchase channel (71.2%), followed by online shops (40.4%) and local shops (30.8%). Organic and health stores accounted for 28.8%, while millet-specific stores were rarely used (1.9%). This indicates a strong reliance on mainstream retail and digital platforms for millet product access.

4.5.4 Willingness to Pay Premium

Price sensitivity was evident, with 38.5% (28 out of 104) of respondents unwilling to pay any premium. However, 25% were willing to pay up to 20% more, and smaller segments were open to paying 30% (3.8%) or more than 30% (5.8%) over regular product prices. This suggests that while health benefits are valued, pricing remains a critical factor in consumer decision-making.

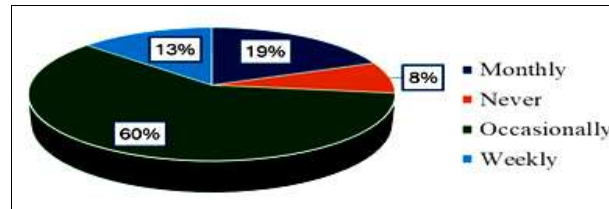


Fig 1: Frequency of Purchase of Millet-Based Products

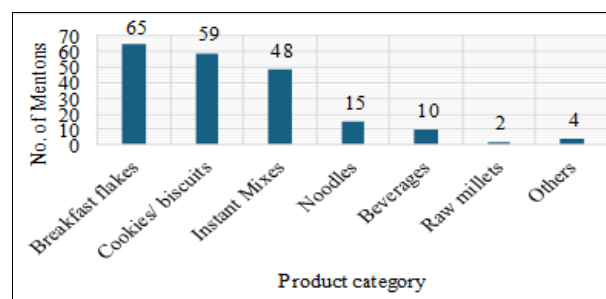


Fig 2: Preferred Millet-Based Product

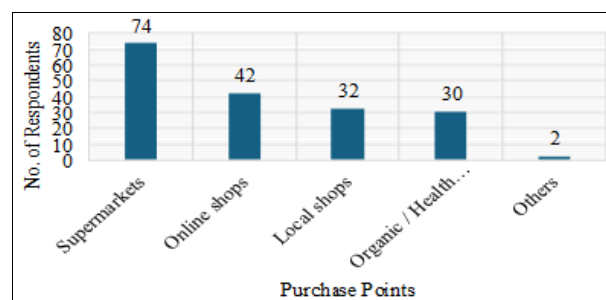
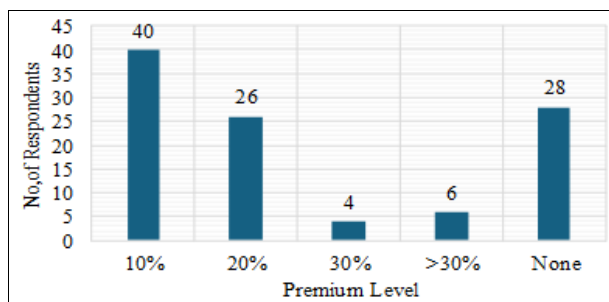


Fig 3: Purchase Point preference for Millet-Based Products**Fig 4: Willingness to Pay Premium for Millet Products**

5. Conclusion

This study provides a comprehensive understanding of the awareness, perception, and behavioural patterns of urban consumers toward millet-based value-added products (MBVAPs) in India. The findings reveal high levels of awareness regarding millets and their nutritional importance, with most respondents recognizing their health benefits and role in preventing lifestyle-related diseases. This awareness reflects the effectiveness of ongoing millet promotion initiatives and the growing positioning of millets as “nutri-cereals.” However, moderate product recognition and limited retail presence suggest that millet-based products are still gaining traction in mainstream markets and require stronger branding and distribution efforts.

Consumers exhibited a favourable attitude and perception toward MBVAPs, expressing trust in their natural, traditional, and sustainable origin and acknowledging them as healthier, eco-friendly alternatives to conventional foods. Yet, moderate satisfaction with taste and price fairness highlights the need for enhanced sensory appeal and perceived value-for-money to sustain long-term acceptance. Applying the Theory of Consumption Values (TCV) framework, the study found functional, emotional, and social values as the most influential drivers of consumer acceptance. Health benefits, quality, sustainability, and ethical responsibility were key motivators, while epistemic and conditional values—linked to curiosity, innovation, convenience, and affordability—were moderate. This indicates consumer interest is present, but purchase behaviour remains situationally constrained by price sensitivity and limited accessibility of convenient product formats.

Analysis of purchase behaviour patterns revealed that most consumers buy millet-based products occasionally, reflecting an intention-behaviour gap. Preferences are stronger for modern, ready-to-eat forms such as cookies, biscuits, and instant mixes, typically purchased from supermarkets and online platforms. While many consumers expressed willingness to pay a 10-20% premium, regular consumption is hindered by cost and availability issues.

In summary, urban consumers show high awareness and positive attitudes toward millet-based products, but price, taste, and accessibility remain key obstacles to habitual adoption. To bridge this gap, manufacturers and policymakers must focus on affordability, sensory enhancement, and wider retail access through modern trade and e-commerce. With strategic innovations, improved pricing, and supportive policy interventions, millets can

transition from a niche health food to a mainstream dietary staple, contributing significantly to nutritional security, sustainable agriculture, and resilient urban food systems.

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