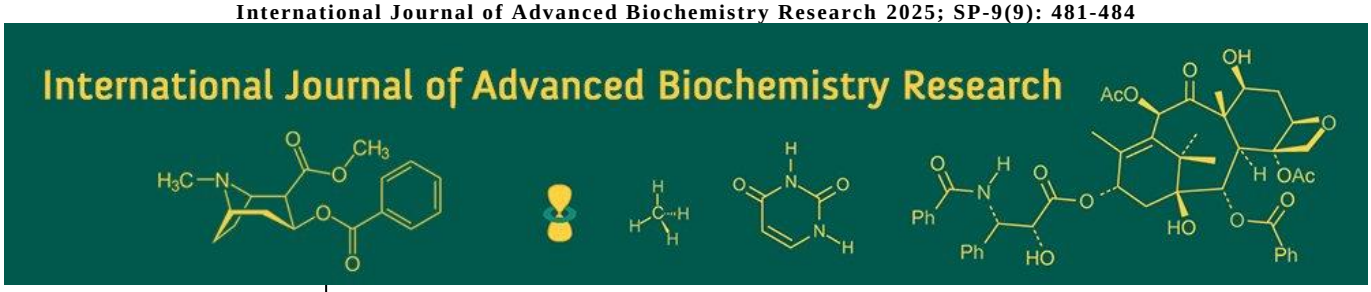

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Assessing millet consumption frequency and its role in everyday nutrition

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Abstract
Millets are increasingly recognized as climate-resilient and nutrient-rich grains with the potential to improve dietary diversity. The present study was undertaken to assess the frequency of millet consumption and its role in routine diets among 200 urban respondents. Results revealed that 72% of participants consumed millet-based foods, with weekly intake (35%) being the most common pattern, followed by monthly (20%) and daily (18%). Bajra and jowar emerged as the most preferred millets, largely consumed in traditional dishes and snacks. Health benefits were identified as the primary motivator for consumption, while barriers included taste preference, lack of awareness, and limited availability. A majority (75%) perceived millets as affordable, and nearly three-fourths agreed that they are healthier than rice and wheat, although only 10% fully substituted cereals with millets. The findings highlight a growing health-driven interest in millets among urban populations, yet consistent availability, improved taste acceptability, and innovative product development are needed to enhance regular consumption.

Keywords: Millets, dietary habits, urban consumers, frequency of consumption, health benefits, barriers, affordability

Introduction
The global food system is currently facing the dual challenge of ensuring nutritional security while adapting to climate change. In this context, millets often referred to as "nutri-cereals" have re-emerged as important crops due to their rich nutrient profile, resilience to harsh agro-climatic conditions, and relatively low resource requirements compared to rice and wheat (Devi *et al*., 2014) [3]. Once considered "coarse grains," millets are now being repositioned as superfoods capable of addressing both malnutrition and lifestyle-related diseases such as diabetes, obesity, and cardiovascular disorders (Anitha *et al*., 2021) [1].

India has historically been one of the largest producers and consumers of millets. Bajra (pearl millet), jowar (sorghum), and ragi (finger millet) form the major share of millet cultivation, with smaller millets such as foxtail, little, and kodo millet contributing regionally (Rao *et al*., 2017) [6]. Despite their significance in traditional diets, millet consumption has steadily declined over the last few decades due to changing food preferences, aggressive promotion of rice and wheat under the Public Distribution System, and urbanization-driven lifestyle shifts (Muthamilarasan & Prasad, 2021) [5]. This decline has resulted in a narrowing of dietary diversity, with potential negative consequences for both human health and sustainable agriculture.

In recent years, however, millets have gained renewed attention at both policy and consumer levels. The Government of India declared 2018 as the "National Year of Millets," and the United Nations recognized 2023 as the "International Year of Millets," highlighting their potential role in achieving Sustainable Development Goals, particularly those related to health, food security, and climate resilience (FAO, 2023) [4]. Urban populations, in particular, are becoming more health-conscious and open to dietary diversification, which presents an opportunity for millets to re-enter routine diets in innovative forms ranging from traditional recipes to ready-to-eat products.

Yet, despite this growing awareness, questions remain regarding how frequently urban consumers integrate millets into their diets, which varieties are most preferred, and what factors influence or hinder their regular consumption.

Barriers such as limited availability, higher costs of processed products, and taste preferences continue to affect adoption rates (Choudhury *et al*., 2020) [2]. Understanding consumer behavior in urban settings is therefore essential to promote millet consumption effectively and design targeted interventions that address both supply-side and demand-side challenges.

Against this background, the present study seeks to assess the frequency of millet consumption and its role in routine diets among urban respondents. By examining consumption patterns, preferred varieties, perceived benefits, and barriers, this research aims to contribute to the growing discourse on millet revival and its implications for nutrition security and sustainable food systems.

Materials and Methods

Study Area and Participants

The study was conducted in an urban setting of Ahmedabad city, Gujarat (India), where changing dietary habits and increased health awareness have influenced food choices. A total of 200 respondents were selected to represent diverse age groups, genders, and socio-economic backgrounds. The inclusion criteria consisted of adults (≥18 years) residing in the city for at least one year, while individuals with medical restrictions that strictly prohibited cereal consumption were excluded.

Research Design

A **cross-sectional survey design** was employed to capture current millet consumption patterns and perceptions. The approach was chosen for its ability to provide a snapshot of consumer behavior within a specific population at a given time.

Data Collection Tool

Data were collected using a structured questionnaire consisting of 15 close-ended questions. The tool covered four domains:

1. Consumption patterns (frequency, preferred meals, and food forms)
2. Types of millets consumed
3. Perceptions and motivators (health benefits, affordability, availability)
4. Barriers and recommendations

The questionnaire was pre-tested with 20 individuals for clarity and reliability, and minor modifications were made accordingly.

Table 1: Domains and Example Questions in the Questionnaire

Domain	Focus Area	Example Question	Response Options
Consumption patterns	Frequency of intake	How often do you consume millets?	Daily/Weekly/Monthly/Rarely-Never
Preferred use	Meal choice and form	At which meal do you prefer millet the most?	Breakfast/Lunch/Dinner/Snacks
Types consumed	Variety of millet	Which type of millet do you consume most frequently?	Bajra/Jowar/Ragi/Others
Perceptions & motivators	Health and affordability perception	Do you think millets are healthier than rice/wheat?	Strongly agree/Agree/Neutral/Disagree
Barriers and recommendations	Factors limiting adoption & suggestions	What is the main barrier to including millet in your daily diet?	Taste/Awareness/Cost/Availability/None

Data Collection Procedure

Respondents were approached in public places such as educational institutes, workplaces, and residential societies. Participation was voluntary, and informed consent was obtained before administering the questionnaire. Data were collected in person to ensure clarity and completeness of responses.

Data Analysis

Descriptive statistics such as frequency and percentage distribution were used to summarize the data. Tables and graphs were prepared to present results clearly. Special care was taken to align analysis with the objectives of the study, focusing on the frequency of millet consumption, perceived benefits, and barriers in routine diets.

Results and Discussion

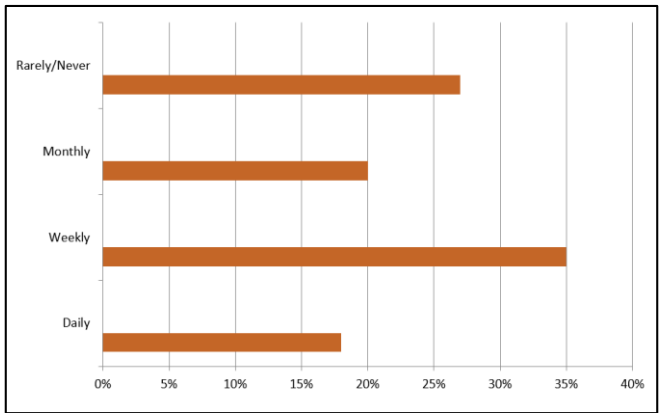
Consumption Status and Frequency

Among the 200 respondents, 72% reported consuming millet-based foods, while 28% did not include them in their diets. This indicates a growing awareness and acceptance of millets among urban populations, although a significant minority still avoids them. Similar findings were reported by Anitha *et al*. (2021) [1], who observed that urban consumers increasingly recognize millets as health-promoting but have not yet made them a staple.

Table 2: Frequency of Millet Consumption

Frequency	Respondents (n=200)	Percentage (%)
Daily	36	18
Weekly	70	35
Monthly	40	20
Rarely/Never	54	27

With respect to frequency, the majority consumed millets weekly (35%), followed by monthly (20%), daily (18%), and rarely/never (27%). These results suggest that while awareness exists, regular integration remains limited. Earlier studies noted a similar pattern, emphasizing that urban consumers tend to treat millets as supplementary foods rather than as core staples (Muthamilarasan & Prasad, 2021) [5].



Graph 1: Frequency of Millet Consumption

Preferred Meals and Forms of Consumption

Table 3: Preferred Meals for Millet Consumption

Meal	Respondents (n=200)	Percentage (%)
Breakfast	60	30
Lunch	50	25
Dinner	40	20
Snacks	50	25

Millets were most commonly consumed during breakfast (30%), followed by lunch (25%), snacks (25%), and dinner (20%). Breakfast and snack-time preference reflects the convenience of ready-to-cook and light millet-based dishes such as porridge, upma, and khichdi. Regarding the form of consumption, traditional preparations (35%) dominated, but a notable share used snack-based items (30%) and ready-to-eat products (20%). This highlights the growing role of processed millet foods in urban areas, aligning with consumer convenience trends reported by Choudhury *et al.* (2020) [2].

Varieties Consumed

Table 4: Varieties of Millets Consumed

Millet Variety	Respondents (n=200)	Percentage (%)
Bajra (Pearl millet)	70	35
Jowar (Sorghum)	50	25
Ragi (Finger millet)	40	20
Small millets*	40	20

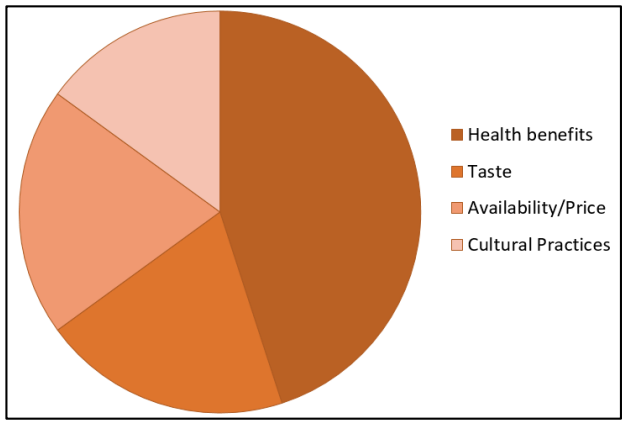
Among types of millets, bajra (35%) was most preferred, followed by jowar (25%), ragi (20%), and small millets (20%). The dominance of bajra and jowar can be attributed to their cultural familiarity and wider availability in local markets. Rao *et al.* (2017) [6] similarly reported that these millets account for the majority of urban consumption, while smaller millets remain niche products.

Motivators for Consumption

Table 5: Motivators for Millet Consumption

Motivator	Respondents (n=200)	Percentage (%)
Health benefits	90	45
Taste	40	20
Availability/Price	40	20
Cultural practices	30	15

The strongest driver for millet consumption was health benefits (45%), followed by taste preference (20%), availability/price (20%), and cultural practices (15%). This finding echoes the conclusion of Devi *et al.* (2014) [3], who highlighted millets' polyphenols, dietary Fiber, and glycemic benefits as major reasons for their revival. The strong health-driven motivation suggests that public health campaigns have successfully created awareness, though taste and convenience still influence adoption.



Graph 2: Motivators for Millet Consumption

Affordability and Availability

Perceptions of affordability were generally positive: 45% rated millets as affordable and 20% as very affordable, whereas 25% considered them expensive and 10% very expensive. Regarding availability, 40% reported consistent access, while 45% observed occasional availability. A smaller share (15%) indicated limited or no availability. These findings are consistent with FAO (2023) [4], which noted that urban food chains are increasingly integrating millets, though supply chain irregularities remain a concern.

Affordability Level	Respondents (n=200)	Percentage (%)
Very Affordable	40	20
Affordable	90	45
Expensive	50	25
Very Expensive	20	10

Health Perceptions and Substitution

A large majority of respondents considered millets healthier than rice and wheat, with 35% strongly agreeing and 40% agreeing to this statement. Only 5% disagreed. However, when asked about substitution, only 10% had fully replaced rice/wheat, while 50% partially replaced them, and 40% did

not substitute at all. This finding illustrates a gap between awareness and practice. Muthamilarasan & Prasad (2021) [5] argue that culinary habits, cultural attachment to rice and wheat, and taste acceptance limit full substitution despite health awareness.

Experimentation and Recommendation

Respondents showed moderate experimentation with millet-based recipes: 40% sometimes tried new dishes, while 20% experimented frequently. Importantly, 55% stated they would definitely recommend millets to others, demonstrating the role of peer influence in expanding millet adoption. Such willingness for recommendation has been documented in behaviour change studies, where social networks reinforce dietary transitions (Anitha *et al*., 2021) [1].

Barriers to Consumption

The main barriers identified were taste preference (25%), lack of awareness (25%), high cost (20%), and limited availability (20%). Interestingly, 10% reported no barrier, reflecting a growing acceptance of millets. Similar consumer-level barriers were identified by Choudhury *et al*. (2020) [2], who emphasized that improving taste acceptability and offering diverse, affordable millet-based products are crucial for mainstreaming these grains in urban diets.

Discussion in Context

Overall, the study reveals that while urban consumers recognize the health benefits of millets and show willingness to include them, actual frequency of consumption remains low. Bajra and jowar dominate, while ragi and small millets are still less popular. Positive affordability perceptions indicate potential for scaling millet markets, but barriers such as taste and availability require targeted strategies.

These results highlight that urban India is in a transitional phase of millet revival from awareness toward adoption. For millets to move from the periphery to the centre of diets, policy measures such as stronger supply chains, recipe promotion campaigns, and affordable product innovations are necessary. The findings resonate with global initiatives like the International Year of Millets 2023 (FAO, 2023) [4], which emphasized millets as a sustainable solution for health and climate challenges.

Conclusion

The present study highlights the evolving but uneven integration of millets into the diets of urban consumers. While awareness of the nutritional benefits of millets is high, actual consumption remains limited to weekly or occasional inclusion rather than daily practice. Bajra and jowar were the most commonly consumed varieties, with breakfast and snack items emerging as preferred meal choices. Health consciousness was the primary motivator, suggesting that consumer education campaigns have been effective. However, barriers such as taste preferences, irregular availability, and perceived cost continue to restrict widespread adoption.

The findings underscore that urban India is at a transitional stage shifting from recognition to gradual acceptance of millets. For millets to truly reclaim their role as staple foods, targeted strategies are essential. These include diversifying ready-to-cook and ready-to-eat millet products, strengthening local supply chains, and promoting recipes that enhance taste and convenience. Policy support, combined with community-level initiatives, can further bridge the gap between awareness and practice.

Ultimately, promoting millets not only addresses nutrition and lifestyle diseases but also supports sustainable agriculture and food security. By embracing these climate-resilient grains, urban populations can contribute to a healthier diet and a more sustainable food system.

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