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UNDERSTANDING WOMEN'S PREFERENCE IN MILLETS, CONSTRAINTS AND SUGGESTIONS FOR DIETARY INCLUSION

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ABSTRACT

The present study was conducted in all talukas of the Anand district, middle Gujarat among 150 women respondents. The paper described consumer preferences for millets using conjoint analysis, identified constraints faced by women in including millets in their diets through Kendall's coefficient of concordance and presented suggestions to increase millet consumption based on percentage and frequency analyses. The findings revealed that consumers prioritized price and taste over aroma, grain size, and colour. Major constraints included low palatability, limited access to millet grains and processed products, and higher prices than other cereals. The women respondents suggested that developing and promoting diverse millet-based recipes through training and demonstrations, government initiatives aimed at improving affordability and accessibility, and increased inclusion of millets in the Public Distribution System (PDS) would help enhance millet uptake in their diets.

***Keywords**: millets, women, preference, anand, suggestions, consumer preferences, conjoint analysis, dietary constraints, kendall's coefficient of concordance, nutritional awareness, gujarat, millet promotion strategies*

INTRODUCTION

India is an agrarian society, with its deep-rooted agriculture, continues to shape the country's socio-economic landscape. Historically the Indian diet was diverse, comprising grains like wheat, barley, lentils, and millet, along with vegetables and dairy products which are nutritional. However, the Green Revolution, focusing on rice and wheat, altered these dietary patterns significantly leading to decline in dietary diversity even though millets are healthy and good for the body, causing widespread of nutritional deficiencies, undernutrition and malnutrition.

With numerous awareness programs and initiatives from the government, people are starting to include millets in their diet. This is a transition phase during which perceptions of millets are changing, and there is greater health consciousness among people, which will lay the foundation for a plan to promote millets as a staple effectively.

This study is needed to identify why women adopt or avoid millets despite their high nutritional value. It specifically examines how factors like affordability, taste preferences, awareness, and regional availability influence their choices. Insights will support targeted strategies to reintroduce millets into women's daily diets for improved family nutrition. This study includes Anganwadi women as respondents because, as mothers and caregivers, they play a pivotal role in shaping household nutrition. According to Pinal and Preeti (2022), Anganwadi women already enjoy a degree of nutritional security, reflecting a foundational awareness of balanced diets. This creates a valuable opportunity to position millets not only as a nutritional necessity but also as a dietary enhancement. Given their attentiveness to family health, these women are well-placed to recognize and advocate the specific health benefits of millets. Their existing mindset around nutrition can act as a catalyst for integrating millets into regular diets and encouraging their wider community adoption. As primary caregivers, their dietary choices and awareness significantly influence household nutrition, positioning them as key agents in promoting millet consumption at the grassroots level.

The present study explores the motivations and barriers that influence Anganwadi women's decisions to include or avoid millets in their daily meals. It aims to identify the key factors shaping their preferences, the challenges they face in incorporating millets into their diets, and how their choices can contribute to mainstreaming millets as a staple, nutritious food.

By examining these questions, the study seeks to generate actionable insights that can inform demand-driven interventions and policy frameworks to promote millet

consumption. In doing so, it aims to support nutritional security, enhance public health outcomes, and contribute to building a more sustainable and resilient food system.

OBJECTIVES

(1) To study the preference of women for millets and their products

(2) To find out the constraints as perceived and suggestions given by women for getting nutritional benefits from millets

METHODOLOGY

The study was conducted on registered women of anganwadis in Anand district of middle Gujarat. An ex-post-facto research design was adopted. A proportionate random sampling method was employed at the taluka level to select anganwadis in proportion to their distribution across the selected region, ensuring that the sample accurately represented the relative number of Anganwadis in each taluka. Out of a total of 1,993 anganwadis spread across 8 talukas, 15 anganwadis were selected proportionally. From each selected Anganwadi, 10 women respondents were chosen, resulting in a total sample size of 150 women for the study. Data collection was through personal interviews using a specially designed and pre-tested interview schedule regarding the questions what they preferences, major constraints they face. Initially prepared in English and then translated into Gujarati. The schedule was refined based on pre-testing with 20 non-sampled respondents. This study measured consumer preference of women in five attributes (taste, color, aroma, size of grain and price) by conjoint analysis. A combination of attributes was given to women and asked them to select which they preferred among and between the attributes. It was used because it allows for the simultaneous evaluation of multiple products attributes and helps identify the relative importance of each attribute in shaping consumer preferences. Constraints perceived by the women were noted during the pretest interview. Few important and repeating constraints were enlisted in the schedule and their opinion was collected in the form of ranking and assessed using Kendall's coefficient of concordance. Respondents rated a set of statements regarding potential barriers, allowing the identification of the most significant constraints. Suggestions to increase the intake of millets were found through frequency and percentages.

RESULTS AND DISCUSSION

Preference of women for millet and their product

The preference of women for millet and their products refers to the specific attribute level they consider when selecting these products for consumption. Studying these preferences in detail involves understanding the different levels of attributes that influence their choices, which is presented in Table 1

Table 1 : Preference of women for millet and their products (n=150)

Sr. No.	Attributes	Attributes levels	Utility	Standard error	Relative importance	Rank
1	**Taste**	Pungency	-16.000	1.005	57.694	1st
		Sweet	16.000			
2	**Colour**	White	-0.689	1.005	2.475	5th
		Yellow	0.689			
3	**Aroma**	Natural	1.912	1.005	6.896	4th
		Scented	-1.912			
4	**Size of grain**	Small	-2.116	1.005	7.623	3rd
		Bold	2.116			
5	**Price**	Low	7.021	1.005	25.312	2nd
		High	-7.021			
Total			11.564	1.230	100.00	
Correlation		Value		Sig		
Pearson's R		0.961		<0.01		
Kendall's rank correlation		0.855		<0.01		

The main attributes that influenced women's preferences for millets were taste, colour, aroma, grain size, and price. For each respondent, part-worth values were calculated using Ordinary Least Squares (OLS) regression. Part-worth values are numerical scores that represent how much each attribute level contributes to a respondent's overall preference for a product or choice. These part-worth values show how much each attribute level affects the overall preference or liking of the millet, *i.e.,* utility or satisfaction that consumers associate with specific features. They were

estimated based on how respondents rated or ranked different combinations of these attributes during the conjoint analysis survey.

Table 1 shows the average part-worth values and the relative importance of each attribute. The relative importance was found by comparing the differences in part-worth values for each attribute, which helped to understand which attributes mattered most to the consumers.

Among all the attributes of millet studied, the taste was found to be the most important and first consideration for consumers, accounting for 57.694 per cent of relative importance with sweet taste having the utility of 16.000, price had a strong influence on consumer's preference after taste in women accounting for 25.312 per cent with low price having the utility 7.021. The individual utilities for small and bold size grain (7.623% preference) were (-2.116) and 2.116 utility, respectively. Aroma formed the fourth most important factor having a relative importance of 6.896 per cent, with natural one having the utility of 1.912. Colour was the least important attribute accounting for 2.475 per cent of relative importance with 0.689 utility for yellow, which is preferred the least.

The Pearson's R and Kendall's rank correlation coefficients are reported in conjoint analysis to assess the goodness-of-fit between the observed preferences (actual respondent ratings or rankings) and the estimated preferences predicted by the conjoint model. High values of these correlations (close to 1) indicate that the conjoint model accurately represents the respondents' preferences. Correlations among all attributes were very high and significant. Correlations Pearson's rank (0.961*) and Kendall's rank (0.855*) were observed at 1 .00 per cent level of significance for the consumers (Table 1).

This gives strong confidence in the suitability of the additive model. The consumers would prefer a reduction in the taste of millet rather than price and aroma because the tastelessness of millet causes children and old people to not prefer eating millet. People in the Anand district were culturally habituated to eating sweet millet from ages, hence they prefer sweet over pungency. Colour was one of the least preferred attributes, with yellow being preferred for natural seeds for consumption because polishing of millet would lead to loss of some nutrition. The results are aligned with the results reported by Banu *et al*. (2023).

Constraints as perceived by women in millet consumption

As mentioned in the methodology, repeated questions during pretest interview were tested. Various interpretations can be drawn throughout the study, but the feedback received regarding constraints highlights the specific problem areas for the women.

Kendall's coefficient of concordance

Kendall's Coefficient of Concordance (W) is a statistical measure used to assess the degree of agreement among multiple respondents when they rank a set of items. It quantifies how consistently respondents assign ranks, indicating whether there is a pattern of consensus or whether the rankings are random or inconsistent. On the other hand, mean ranks provide a simple method for summarizing the average position of each item across all respondents. In this study, each of the 150 respondents ranked 8 constraints related to millet consumption. The ranks given to each constraint were averaged to obtain the mean rank, helping to identify which constraints were considered more or less important overall.

While mean ranks give an overview of collective opinion, Kendall's W offers a more robust statistical assessment by evaluating the level of agreement across all rankings. It considers not only the order but also the consistency of responses. Therefore, Kendall's W complements mean ranks by confirming whether the observed rankings reflect a statistically significant consensus rather than random variation.

- Mean ranks show the average perception across the group and help you identify which constraints are considered most or least important overall.
- Kendall's W tells you whether there is a statistically significant agreement among the respondents in their rankings. Without W, you wouldn't know if the mean ranks are reliable or just due to random variation in opinion.

From table 2, based on the mean rank it is found that low palatability, lack of access to grains and their processed products and high prices compared to other cereals are the major constraints faced by the women followed by difficulty in the availability of millets in public distribution system, lack of knowledge about the cooking procedure and variability in the dishes, non-availability of ready-to-eat and ready-to-cook foods of millet, considered as medicinal food only and not suitable for all ages.

Insights into the constraints reveal that women tend to limit their consumption of millet to only one or two varieties, primarily bajra and ragi, due to their deep-rooted cultural significance and longstanding dietary practices. Whereas other kinds of millets are not consumed/ consumed less. Factors such as geographical constraints and animal attacks hinder the production of these millets, making their availability a significant challenge, particularly in semi-rural and rural areas of Anand district.

Table 2 Constraints faced by the women in consuming millet (n=150)

Sr. No.	Constraints	Mean Rank	Rank
1	**Low palatable**	1.99	1
2	**Lack of access to grains and their processed products**	3.41	2
3	**Difficulty in availability of millets in public distribution system**	4.97	4
4	**High price compared to other cereals**	3.44	3
5	**Lack of knowledge about the cooking procedure and variability in the dishes**	4.42	5
6	**Non-availability of ready to eat and ready to cook foods of millet**	5.13	6
7	**Don't have the knowledge of different millet.**	5.68	7
8	**Belief that not suitable for all age categories**	6.97	8

The low palatability of millet causes children and elderly people to dislike millets, which is also a significant reason for not including millet in their diets. Additionally, some women (employees) have difficulty in eating them in the afternoon, as they become sticky when cooked in the morning. Some of the women also mentioned that they do not prefer millet because the PDS provides them with more cereals than millets. However, they revealed that the PDS only provides only 2 kg of bajra per household and doesn't supply any other millets. Some women mistakenly believe that millets generate heat in the body and therefore prefer not to consume them.

Table 3 : Results of Kendall's coefficient of concordance

Parameters	Values
Sample	150
Kendall's coefficient of concordance (W) value	0.398
Chi-Square	417.935
Degrees of freedom	7
Asymp. Sig.	0.000

In Table 3, it is evident that the agreement among raters is moderate as Kendall's W ranges from 0 to 1, where W = 1 indicates perfect agreement among all raters. All rankings are identical across all raters. W = 0 indicates no agreement among raters. The statistical significance of Kendall's W value and the associated Chi-Square test indicates that the findings are reliable. These results can be used to inform the development of methodologies and policies aimed at addressing the issues identified by the women. Future research could explore the factors contributing to the moderate level of agreement and investigate ways to enhance consensus among raters. These findings are in align with Kumar *et al.* (2020), Amrutha *et al.* (2024) and Gita *et. al* (2020)

Suggestions offered by women to increase the intake of millets in their diet

Additionally, an attempt was made to overcome the constraints faced by the women and increase their inclination to consume millet. Suggestions offered by the women during personal interview were taken into account and ranked based on the frequency and percentages.

Table 4 : Suggestions offered by women to increase the intake of millets in their diet (n=150)

Sr. No.	Suggestions	Frequency	Per cent	Rank
1	**Developing and promoting diverse recipes through trainings and demonstrations**	86	57.33	1
2	**Government initiatives should enhance affordability and accessibility**	80	53.33	2
3	**Including more millet in PDS**	76	50.66	3
4	**Increasing awareness of millet' health benefits**	72	48.00	4
5	**Better branding and introducing more variety of millet and their processed products**	66	44.00	5
6.	**Introduce millet meals twice a week in the ICDS, school mid-day meals, welfare hostels and such other schemes of the government**	65	43.33	6
7	**Provide market channels through e-NAM**	42	28.00	7
8	**Price incentives for the farmers through Government procurement of millet**	40	26.66	8

Table 4, clearly indicated that 57.33 per cent of women suggested that developing and promoting diverse recipes through trainings and demonstrations (ranked 1st), followed by 53.33 per cent that government initiatives should enhance affordability and accessibility of millets (ranked 2nd), 50.66 per cent of them suggested to include more millet in

PDS (ranked 3rd) to increase the uptake of the millets in their diet were the top three suggestions made by the women.

Training and Demonstrations to the public on how to cook with millet can make these grains more appealing and versatile in everyday meals, creating a good opinion about millets among people, making millet affordable and accessible, ensuring that people from all economic backgrounds can benefit from their nutritional value. Introducing millet meals in government schemes like ICDS and school midday meals can improve nutritional outcomes for children and vulnerable groups. Including millet in the Public Distribution System helps ensure a wider reach, particularly among low-income populations who rely on subsidized food grains.

Increasing awareness of millet' health benefits can drive demand, as people become more conscious of their dietary choices and health. Better branding and more variety in millet products can attract a broader consumer base and increase market appeal. Providing market channels through platforms like e-NAM can help farmers sell their produce at fair prices, improving their income and livelihood. Offering price incentives through government procurement encourages farmers to grow millet, ensuring a stable supply and promoting agricultural diversity. These findings are in alignment with Anitha *et al.* (2019), Reddy & Patel (2023), Mehta and Taterway (2024), Kachhot and Khandelwal. Yadav and Patel (2024) and Mani (2024).

CONCLUSION

This study highlights that women prefer sweet, yellow, bold and natural-scented millets due to their cultural practices in the study area and low-priced millets due to their financial conditions, keeping this into consideration. Keeping this in mind, efforts should be made by policymakers, agricultural extension agencies, food industry stakeholders, and local self-governments to promote the availability, affordability, and cultural alignment of millets to enhance their dietary inclusion.

The major constraint in the consumption of millet is its lowly palatable nature followed by lack of access to grains and their processed products, availability in PDS, high price, low knowledge in recipe of millets, less availability of ready to eat and ready to cook, little knowledge on other millets and belief of its not suitable for all the ages.

To overcome all these constraints faced by in consuming millets, efforts should be made by different groups. Government departments like Agriculture, Food, and Women and Child Development should make millets more available and affordable by including them in the Public Distribution System (PDS), ICDS, school mid-day meals, and welfare hostels. Agricultural extension workers and Krishi Vigyan Kendras (KVKs) should give training and cooking demonstrations to teach easy and tasty millet recipes. Health departments should create awareness about the health benefits of millets, especially for women and children. The food industry and local businesses should be supported to make ready-to-cook and ready-to-eat millet products. NGOs and local organizations can help spread information and encourage people to include millets in their diets. These steps will make millets more accepted, easier to use, and more affordable, leading to better nutrition and more variety in daily meals for women.

RECOMMENDATION

(a) Enhancing millet consumption through recipe development, demonstrations, and nutritional awareness

Palatability challenges and lack of awareness of millet recipes are major constraints faced in both rural and urban areas of the study. To address this, extension agencies in collaboration with SHGs, Anganwadi women should emphasize their focus on developing locally preferable millet recipes, especially for less palatability, and conducting method demonstrations to teach effective cooking and preparation techniques of different millet dishes. Additionally, government agencies should intensify efforts to promote a diverse range of millets beyond Bajra and Sorghum through targeted advertising campaigns on local radio, television, and social media platforms. Community outreach programs, such as millet fairs, school-based awareness drives, and cooking competitions, should be implemented in collaboration with local health departments and Anganwadi centres. Educational initiatives must be integrated into existing nutritional programs like POSHAN Abhiyaan, highlighting the unique health benefits of millets, especially for women, children, and the elderly. These strategies will help increase familiarity, improve acceptability, and support the mainstreaming of millets into daily diets.

(b) Strengthening millet supply chains and market integration for wider adoption

Findings from this study indicated that women respondents faced constraints such as poor access to a variety of millets, non-availability of processed products and limited affordability. To address this, government bodies like the Department of Agriculture should improve millet supply chains by enhancing storage, transport, and distribution, supported by schemes such as MIDH and PMKSY.

Strong market linkages through e-NAM, FPOs, and APMC reforms can help smallholder farmers in Anand access broader markets and fair prices, encouraging them to

grow a wider range of millets beyond Bajra and Sorghum.

Based on women's suggestions, both government and private players should promote value-added millet products such as multigrain mixes, porridges, and millet-based snacks under Startup India and MSME food processing schemes. These should cater to children and elderly preferences for taste and convenience.

(c) Promoting millet diversification through policy support and institutional integration

Interviews in Anand revealed that over 70% of women consumed only Bajra and Sorghum, primarily due to limited access and traditional food habits. To promote diversification, the Gujarat State Millet Mission, in collaboration with local Krishi Vigyan Kendras (KVKs), should focus on introducing other nutrient-rich millets such as finger millet, foxtail millet, and little millet. These millets should be incorporated into nutrition-based welfare schemes like the Integrated Child Development Services (ICDS), Mid-Day Meal Schemes, Pradhan Mantri Matru Vandana Yojana (PMMVY), and POSHAN Abhiyaan. Special emphasis must be placed on reaching pregnant women, lactating mothers, and children aged 3–6 years through Anganwadi centres. Additionally, subsidies for seed kits, promotion of pest-resistant millet varieties, and incentives for rain-fed farmers will encourage wider cultivation of these crops, even in areas facing environmental challenges like wild animal damage.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest related to the research presented in this article.

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