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Consumer Awareness and Behavioural Trends in the Adoption of Millets and Millet-based Products

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

The study aims to investigate the consumer awareness and buying behavior towards millets and millets-based products in Ludhiana city. A descriptive research design was used to guide data collection and analysis. The primary data was collected through a structured and non-disguised questionnaire. A total sample of 200 respondents was selected for the study based on convenience sampling. The findings indicated that in terms of awareness, 78% of respondents were familiar with pearl millet (Bajra), followed by 72% with sorghum (Jowar), and 54.5% with finger millet (Ragi). Awareness was significantly lower for other millets, including Foxtail (Kangni), Kodo, and Little Millet. The study found that 80% of respondents purchase millet flour, followed by millet cookies (56%) and breakfast cereals (35%). A majority (66%) spend less than Rs. 700 monthly on millet products, with only 8% spending over Rs. 1000. Social media (57%) and word of mouth (48%) were the primary sources of information. Most respondents (30%) buy millet products once a

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month, while 21% buy occasionally. Grocery/kirana stores (53%) were the most common purchase location, followed by supermarkets (39%). The findings suggest a need for more affordable and accessible millet-based products and increased consumer awareness.

Keywords: Buying behavior; millets; millets-based products; balanced diet; celiac disease.

1. INTRODUCTION

In 2020, Pearl Millet (Bajra) and Sorghum (Jowar) together contributed approximately 19 percent to the world's production. India's Pearl Millet production accounts for 40.51 percent followed by Sorghum 8.09 percent in the global production of millets in the year 2020. Some of the commonly grown millets in India are sorghum (Jowar), pearl millet (Bajra), finger millet (ragi), barnyard millet (Jhangora), Proso millet (Barri), foxtail millet (Kangni), Kodo millet (Kodra), Little Millet and Pseudo Millets (Buckwheat and Amaranths etc). The three millets that make up the majority of India's overall millet production are Pearl millet (Bajra), Sorghum (Jowar), and Finger Millet (Ragi) (APEDA, 2022). The versatility of millets extends beyond their cultivation to a wide array of millet-based products that cater to various dietary preferences and culinary traditions. Millet flour serves as a gluten-free alternative for baking bread, cakes, and cookies, appealing to individuals with gluten sensitivities or celiac disease. Breakfast cereals and muesli made from millets offer a nutritious start to the day, rich in fiber, vitamins, and minerals. Millet-based snacks such as puffed millet bars, crackers, and chips provide convenient and healthy options for on-the-go consumption. Beverages like millet milk and millet-based beverages offer dairy-free alternatives rich in nutrients. Millet-based pasta, noodles, and ready-to-eat meals further diversify the range of millet products available, catering to diverse culinary preferences and lifestyles. (Santra et al., 2020). Millet consumption in India has seen a resurgence in recent years, driven by a growing awareness of its nutritional benefits and sustainable farming practices. Millets, such as pearl millet (bajra), sorghum (jowar), finger millet (ragi), foxtail millet (kangni), and others, have been traditional staples in many parts of India for centuries. They are rich in nutrients like iron, calcium, fiber, and antioxidants, making them valuable additions to a balanced diet, especially for vegetarians and those with gluten sensitivity. (Bhaskarachary et al., 2019).

In India, millet consumption has experienced a resurgence, especially in states like Karnataka, Maharashtra, Telangana, and Tamil Nadu. Known as the "Millet Bowl of India," Karnataka has a strong tradition of consuming millets such as Ragi and Jowar, with popular dishes like Ragi Mudde and Jowar Roti (Patel et al., 2020). Maharashtra and Telangana also have deep-rooted millet consumption patterns, with Jowar and Jonna Rotte being staples in their diets, respectively. In Tamil Nadu, Ragi is a staple grain used in dishes like Ragi Koozh and Ragi Sangati. These states have implemented various government initiatives to promote millet cultivation among farmers and increase awareness among consumers about the nutritional benefits of millets, contributing to improved public health and sustainable agricultural practices (Subramanian et al., 2021).

2. REVIEW OF LITERATURE

Kalidas & Mahendran, (2017) evaluated that consumers have historically spent a lot of money on food. Consumers globally spend one-third of their income on food, compared to Indian consumers who spend more than half of their income on food. Processed food items, particularly instant meal items, have taken up a significant amount of space on supermarket shelves and store shelves in the Indian market.

Alekhya & Shravanthi, (2019) studied the factors and measures of consumer acceptance of millet-based products. They found that Income has a minimal impact on choices. Social media is the best way to share information about millet benefits. People consume millets because of their nutritious nature and maintain good health. Price and supply influence purchase decisions, especially for brown top millet. Improving taste is crucial for gaining customer acceptance.

Bharathy & Rajapushpam, (2020) explored in their research that consumers' purchase decisions when it comes to millet products are impacted by a variety of psychological elements, such as motivation, perception, attitude, decision-making processes, interactions with social groups, and the choice of brands and outlets based on characteristics and emotional appeal. These elements are crucial for identifying marketing possibilities.

Rambabu & Porika, (2020) evaluated that packaging strategies have a significant impact on consumer buying behaviour. Innovative packaging designs, attractive colours, and high-quality packaging materials and wrappers can attract and retain customers. Businesses should consider the perception and preferences of customers while developing packaging strategies to meet their expectations.

Meng et al., (2021) identified that several factors like awareness of nutritional and health benefits, texture, appearance quality, promotion, price, knowledge, gender, age, and residence significantly influence millet product consumption behavior. To promote the high-quality development of the millet industry in Hebei Province, he suggested some measures like increasing research and development of high-yield and high-quality millet varieties, supporting millet processing enterprises, and diversifying functional millet products.

Shirahatti et al., (2022) found a connection between consumers' intention, buying behavior, and satisfaction towards millet grains, known for their immunity-boosting properties. The results indicate that consumer intention and buying behaviour significantly impact satisfaction with millet products. The study highlights the benefits of consuming millets for agriculture and the environment.

Singh & Vemireddy, (2023) identified in response to growing health concerns in urban India, there is a notable shift in dietary preferences, with consumers moving away from staple cereals towards healthier options, including Nutri-cereals such as millets and diverse food groups and they collected primary data involved interviews, focused group discussions, and online questionnaires in major metropolitan and tier 2 cities across India. The study revealed that key drivers for the transition to millets are health considerations and social networks. Recommendations include government policies to boost millet production, awareness campaigns through mass media, and private sector initiatives offering value-added millet products to encourage consumption.

Kumo, (2023) studied and explored how consumer behaviour research can be utilized to develop different and effective marketing strategies and how consumer behaviour insight can be helpful for marketers in designing target market strategies. Findings revealed that consumer behaviour is influenced by many factors such as demographic, psychographic, situational, cultural, and technological factors. He suggested that adopting a multi-perspective approach and integrating technological advancements can help marketers create personalized and impactful marketing campaigns.

Amrutha et al., (2024) explored the dietary patterns and nutritional status of households focusing on the consumption of small millets in both urban and rural areas. The research highlighted that rural households had higher per capita consumption of small millets compared to urban households. Small millets constituted a higher percentage of total energy intake in rural households compared to urban areas. It was found that a significant proportion of both urban and rural households reported experiencing the health benefits of consuming small millets.

In this context the study on consumer awareness and buying behaviour towards millets and millets-based products in Ludhiana city of Punjab was under taken with following objectives :

1. To study consumer awareness towards millets and millet-based products
2. To analyse the buying behaviour of consumer towards millets and millet-based products.

3. RESEARCH METHODOLOGY

A descriptive research design was formulated which guided the collection and analysis of data and the survey was done with the help of a structured and non-disguised questionnaire. The present study was restricted to Ludhiana city. The population of the study consisted of all the consumers of millets and millet-based products in Ludhiana city. Those respondents were considered for the study who have consumed millets and millet -based products in past 6 months at the time of study. Ludhiana City is divided into 4 Zones- Zone A, Zone B, Zone C, and Zone D as per the Municipal Corporation, Ludhiana. A list of localities under each zone was procured from the Municipal Corporation, Ludhiana, and one locality was selected from each zone on a random basis and 50 respondents were selected from each locality based on convenience sampling. Thus, a total of 200 respondents were selected for the study. To meet the objectives of the study primary data was collected with the help of a structured and

non-disguised questionnaire. Data was collected related to various parameters like awareness and buying behavior of consumers towards millets and millet-based products.

4. RESULTS AND DISCUSSION

4.1 Demographic Profile of the Respondents

The demographic profile of the respondents includes the basic information regarding the respondents. It consists of information on gender, age, educational qualification, family type, family size, annual family income, occupation, etc.

Table 1 presents a detailed demographic profile of 200 respondents across various parameters. In terms of gender distribution, the survey achieved a balanced representation with 50% male and 50% female respondents. It was found that 50.5% percent of respondents fall in the age group of 21-30 years and 15% percent in the category of 41-50 years. 12 percent of respondents were in the category of >50 years and 11.5 percent were in the age group of 31-40 years. Only 11 percent of the respondents were in the age group of <20 years. The majority of respondents were in age group of 21-30 years. On categorizing the respondents based on their educational qualifications it was found that 50 percent were graduates, 32.5 percent were post-graduates and above, 13.5 percent were intermediate, 3.5 percent attained matriculation and only 0.5 percent were illiterate. Based on occupation, 51.5 percent were students, 13.5 percent were private employees, 13.5 percent were homemakers, 11 percent were self-employed, 7.5 percent were government employees, and 0.5 percent were retired people. Only 2.5 percent of respondents had a different occupation than the above-mentioned categories.

Table 1. Demographic profile of the respondents

Particulars	Frequency	Percentage (%)
Gender		
Male	100	50%
Female	100	50%
Total	200	100%
Age (in years)		
<20	22	11%
21-30	101	50.5%
31-40	23	11.5%
41-50	30	15%
>50	24	12%
Total	200	100%
Educational Qualification		
Illiterate	1	0.5%
Matric (8^{th})	7	3.5%
Intermediate (12^{th})	27	13.5%
Graduation	100	50%
Postgraduation and above	65	32.5%
Total	200	100%
Occupation		
Student	103	51.5%
Government employee	15	7.5%
Private employee	27	13.5%
Homemaker	27	13.5%
Self-employed	22	11%
Retired	1	0.5%
Any other	5	2.5%
Total	200	100%
Marital status		
Married	84	42%
Unmarried	116	58%
Total	200	100%

Particulars	Frequency	Percentage (%)
Family structure		
Nuclear	120	60%
Joint	73	36.5%
Extended	7	3.5%
Total	200	100%
Family size		
Small (Upto 4)	92	46%
Medium (5-7)	76	38%
Large (8 and above)	32	16%
Total	200	100%
Annual Income: (Rs in Lacs/annum)		
<1	47	23.5%
1-3	28	14%
3-6	50	25%
6-9	39	19.5%
>9	36	18%
Total	200	100%

(Source primary data)

The survey respondents were almost evenly split between married (42%) and unmarried (58%) individuals. Family structures varied, with nuclear families being the most prevalent at 60 percent, followed by joint families at 36.5 percent, and a smaller percentage in extended family setups that is 3.5 percent. 46 percent of respondents belonged to small families (up to 4 members) and 38 percent to medium-sized families (5-7 members), and 16 percent had more than 6 people in their family.

The income distribution shows a diverse range of respondents across income brackets. 25 percent of respondents were having annual income between 3-6 lakhs. 23.5 percent of respondents had an annual income of less than 1 lakhs, 19.5 percent had an annual income between 6-9 lakhs, and 18 percent had an annual income of more than 9 lakhs. Only 14 percent of the respondents had annual incomes between 1-3 lakhs.

From the Table 2, it can be seen that most of the respondents i.e. 156(78%) were aware of pearl millet (Bajra), followed by 144(72%) were aware of sorghum(jowar), followed by 109 (54.5%) respondents are aware of Finger Millet (Ragi). A lower awareness level is observed for Foxtail Millet (Kangni), with 52 respondents (26%) and 35 respondents (17.5%) are aware of Kodo Millet, and only 25 respondents (12.5%) are aware of Little Millet (Kutki/Shavan).

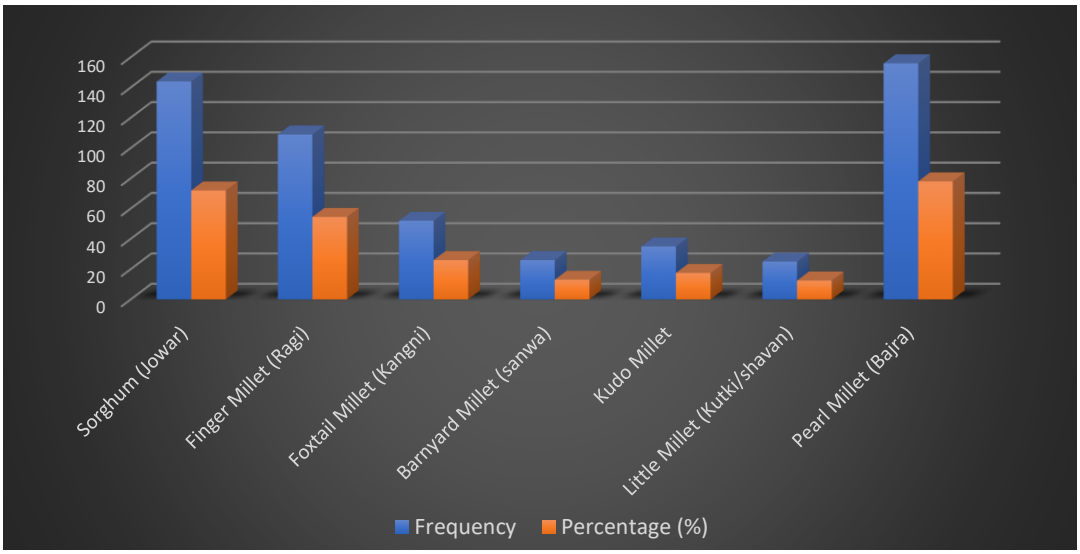

Fig. 1. Distribution of respondents according to their awareness about the types of millets

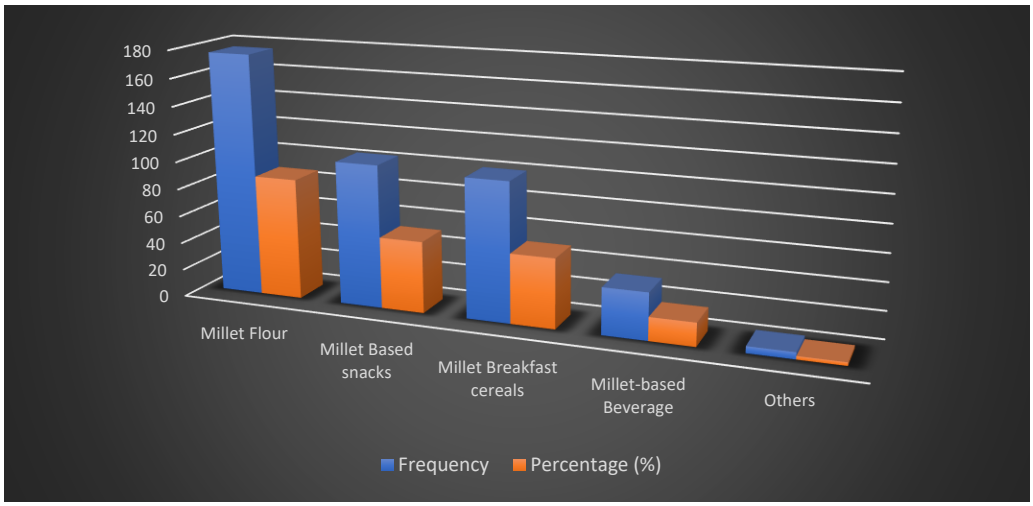

Fig. 2. Distribution of respondents according to their awareness

Table 2. Distribution of respondents according to their awareness about the types of millets

(n=200)

Type of millets	Frequency	Percentage (%)
Sorghum (Jowar)	144	72
Finger Millet (Ragi)	109	54.5
Foxtail Millet (Kangni)	52	26
Barnyard Millet (sanwa)	26	13
Kudo Millet	35	17.5
Little Millet (Kutki/shavan)	25	12.5
Pearl Millet (Bajra)	156	78

**Multiple choice*

Table 3. Distribution of respondents according to their awareness about the types of millet-based products

(n=200)

Type of Millet products	Frequency	Percentage (%)
Millet Flour	176	88
Millet Based snacks	104	52
Millet Breakfast cereals	101	50.5
Millet-based Beverage	34	17
Others	5	2.5

**Multiple choice*

Table 4. Distribution of respondents according to knowledge about health benefits of millets

(n=200)

Knowledge about health benefits	Frequency	Percentage (%)
Very Low	20	10
Low	19	9.5
Moderate	109	54.5
High	38	19
Very High	14	7

Table 3 depicts the type of millet-based product respondents are aware. 176 (88%) respondents are aware of millet flour, 104 (52%) respondents are aware of millet-based snacks, followed by 101 (50.5%) are aware of millet breakfast cereals and 34 (17%) are aware of millet-based beverages. Only 5 (2.5%) are aware of any other millet-based product.

Table 4 shows the frequency with which respondents rated their knowledge about the health benefits of consuming millets on a scale of very low to very high. 54.5 percent of respondents rated moderate knowledge about the health benefits of consuming millets, followed by 19 percent who rated high, 10 percent rated very low and 9.5 percent rated their knowledge of

the health benefits of consuming millets as low. Only 7 percent of respondents had rated very high knowledge about the health benefits of consuming millets.

4.2 Buying Behavior towards Millets and Millet-based Products

The Table 5 shows that the majority of the respondents 160 (80%) purchase millet flour, 112 (56%) purchase millet cookies, 70 (35%) purchase millet breakfast cereals, 58 (29%), millet bread, 53 (27%) millet snack bar, 27 (14%) millet puffs, only 1 percent respondents purchase any other type of millet-based products then the above mentioned.

The Table 6 show the monthly expenditure of the respondents on the millet-based products. Majority of respondents i.e. 66 (33%) spent Rs. 500-700, 66 (33%) spent less Rs.500, followed by 52 (26%) respondents who spent Rs. 800-1000 monthly and only 16 (8%) respondents spent more than Rs. 1000 on millet-based products.

The Table 7 show that the majority of respondents i.e. 114 (57%) got information about millet from social media, 96 (48%) got it from word of mouth, 84 (42%) from television advertisements, 72 (36%) got information health expert's recommendation, 43 (22%) got it from printed materials (books, pamphlets, etc.) and only 7 (4%) got information form any other source then the above-mentioned sources.

Table 8 shows the frequency with which respondents purchase millet-based products. Maximum respondents i.e. 59 (30%) purchased millet-based products once a month, 41 (21%) purchase sometimes, 35 (18%) purchased millet-based products once a week, 27 (14%) purchase millets-based products rarely, 19 (10%) purchased once a fortnight and 19 (10%) respondents purchased once a week.

Table 5. distribution of respondents on the basis of type of millet-based products they purchase

(n=200)

Millet-based products	Frequency	Percentage
Millet Flour	160	80%
Millet cookies	112	56%
Millet Snack bar	53	27%
Millet breakfast cereals	70	35%
Millet bread	58	29%
millet puffs	27	14%
others	2	1%

**Multiple choice*

Table 6. Distribution of respondents according to monthly expenditure on millet-based products

(n=200)

Monthly expenditure	Frequency	Percentage
Less than Rs. 500	66	33%
Rs. 500 to Rs. 700	66	33%
Rs 800 to Rs. 1000	52	26%
More than Rs. 1000	16	8%
Total	**200**	**100%**

Table 7. Source of information about millets

(n=200)

Primarily rely on for information about millets	Frequency	Percentage
Television advertisements	84	42%
Social media	114	57%
Word of mouth	96	48%
Health experts' recommendations	72	36%
Printed materials (books, pamphlets, etc.)	43	22%
Others (any other)	7	4%

***Multiple Choice*

Table 8. Distribution of respondents based on frequency of purchasing millet-based products (n=200)

Frequency of purchase	Frequency	Percentage
> Once in a week	19	10%
Once a fortnight	19	10%
Once a month	59	30%
Once a week	35	18%
Rarely	27	14%
Sometimes	41	21%
Total	**200**	**100%**

Table 9. Distribution of respondents according to place of purchase of millets and millet-based products

(n=200)

Place	Frequency	Percentage
Company outlet	7	3.5%
Grocery/ kirana stores	105	52.5%
Online	11	5.5%
Supermarket/ retail stores	77	38.5%
Total	**200**	**100%**

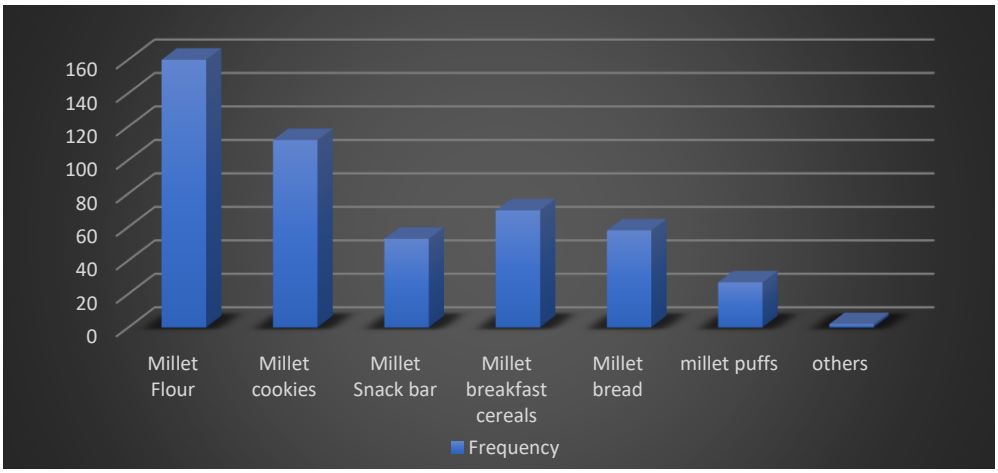

Fig. 3. Distribution of respondents on the basis of the type of millet-based products they purchase

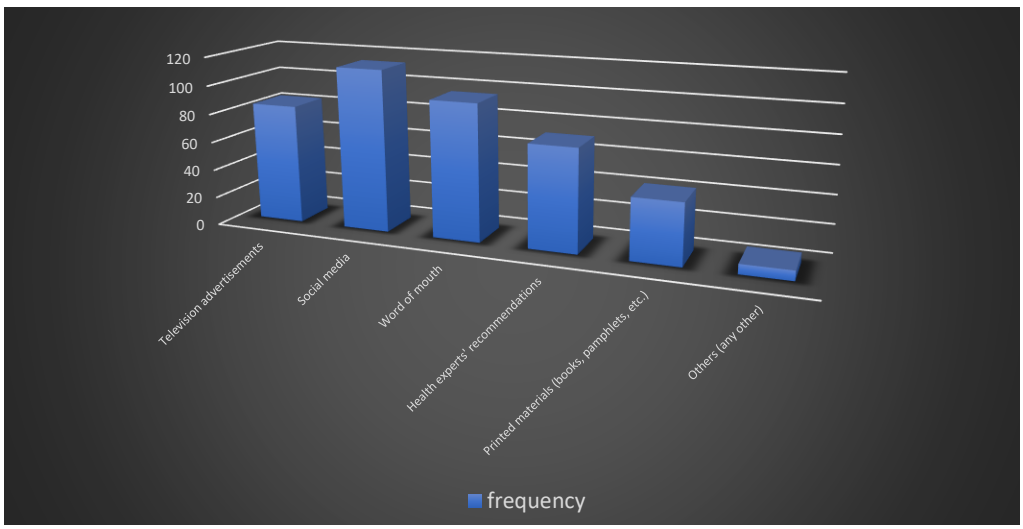

Fig. 4. Source of information

The Table 9 shows that the out of total respondents, 105(52.5%) got millet product from grocery/kirana stores, 77 (38.5%) got them from supermarket/ retail stores, 11(5.5%) bought form online platform and 7 (3.5%) bought them from company outlet.

5. CONCLUSION

The study on consumer awareness and buying behaviour towards millet and milted based products provides a comprehensive understand of consumer preferences. The majority of respondents (78%) are aware of pearl millet (bajra), followed closely by sorghum (72%) and finger millet (54.5%). However, there is significantly lower awareness of foxtail millet (26%), kodo millet (17.5%), and little millet (12.5%). This indicates a need for increased awareness campaigns for the lesser-known millets. A high percentage of respondents (88%) are aware of millet flour, with moderate awareness of millet-based snacks (52%) and breakfast cereals (50.5%). Awareness of millet-based beverages and other millet products is relatively low, suggesting potential areas for market expansion and consumer education. Most respondents spend between Rs. 500-700 (33%) or less than Rs. 500 (33%) monthly on millet-based products. Only a small fraction (8%) spends more than Rs. 1000, indicating that while there is interest, cost may be a limiting factor for higher spending. Social media (57%) and word of mouth (48%) are the primary sources of information about millets, followed by television advertisements (42%) and health experts (36%). This underlines the importance of digital and social platforms in spreading awareness and influencing consumer behaviour.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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