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A Study on Awareness and Consumption of Millets among Female Teachers

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Abstract

Background: Millets are recognized as "smart foods" due to their high nutritional value and benefits for human health, environmental sustainability, and farmer livelihoods. Despite their role in preventing lifestyle-related diseases, millet consumption has declined due to changing dietary habits.

Objectives: To assess awareness levels, consumption patterns, and factors influencing millet intake among female teachers in selected colleges of Lucknow.

Methods: A cross-sectional study was conducted among 116 female teachers from Isabella Thoburn College and Navyug Kanya Mahavidyalaya. Data were collected using a structured questionnaire on awareness, consumption practices, sources of information, perceived health benefits, and barriers. Data were analyzed using SPSS version 26. Descriptive statistics summarized the data, and the Chi-square test assessed the association between awareness and consumption.

Results: Most participants were aged 36–45 years (22.28%). Awareness of millets was high (98%), but regular consumption was reported by only 38.8%, while 51.7% consumed millets occasionally. Preference for other foods (47.6%) was the primary barrier, followed by long cooking time (19%) and limited availability (10.5%). Friends and family were the main sources of information (39.7%). Health benefits motivated consumption in 65.5% of participants, though knowledge of specific benefits was limited. Indian breads (50%) and breakfast items (46.6%) were the most preferred millet-based foods. A significant association was observed between awareness and consumption ($\chi^2 = 96.174$, $P < 0.001$).

Conclusion: Despite high awareness, regular millet consumption remained limited. Strengthening nutrition education and government initiatives promoting millet farming, processing, and availability can enhance consumption and support healthier, sustainable diets.

Keywords: Awareness; Consumption; Health benefits; Nutritional value; Sustainable food

Introduction

Millets, frequently called "smart food," offer benefits on three major fronts: they are considered "good for the individual," "good for the planet," and "good for the farmer." [1,2]

Millets are counted among the world's most important cereal grains, with consumption spanning over one-third of the global population. They hold the sixth position among cereal crops in terms of worldwide agricultural output. Common varieties include Jowar (Sorghum), Sama (Little Millet),

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Misra R, et al., J Food Sci Nutr Res 2026
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Ragi (Finger Millet), Korra (Foxtail Millet), and Variga (Proso Millet). Among these, Bajra (Pearl Millet) and Sama contain higher levels of fat, whereas Ragi possesses the lowest fat content, making it an ideal choice for low-fat dietary requirements [3].

Millets are historical crops, believed to be among the first cereal grains ever domesticated by humans. In India, a major factor contributing to malnutrition and the rise of non-communicable diseases like diabetes is insufficient dietary variety. Promoting the cultivation of small millets alongside traditional staple crops offers a sustainable remedy. These grains are exceptionally nutritious, non-glutinous, and non-acidic, ensuring they are gentle on the digestive system. Furthermore, their high lecithin content promotes nervous system health, thus elevating their functional food status. Although they have recently been marginalized in daily diets, small millets maintain significant nutritional value. While major cereals primarily provide calories, small millets are abundant in essential micronutrients such as B vitamins, calcium, iron, folic acid, and sulfur, along with being a significant source of dietary fiber. These characteristics make them a powerful tool for overcoming nutritional deficiencies [4].

Millets demonstrate a marked nutritional superiority over wheat and rice, particularly concerning their mineral and fiber content. Every type of millet contains more fiber than both rice and wheat; some even possess over 50 times the fiber of rice. Finger millet is exceptionally rich in calcium, providing approximately 30 times the amount found in rice, with all other millets containing at least twice that amount. Additionally, Foxtail millet and Little millet offer significantly higher levels of iron than rice, establishing millets as a generally healthier dietary choice [5].

Millets are not only naturally gluten-free and characterized by a low glycemic index, but they also supply abundant dietary fiber, vital vitamins, proteins, and minerals. [1,2,6,7] Regular consumption significantly supports overall health by enhancing cardiovascular function and digestion, helping to alleviate migraines, aiding the body's detoxification processes, reducing the risk of certain cancers, and improving muscular and nervous system functions. They are also known to strengthen the respiratory system, assist in managing high blood pressure, and effectively regulate blood sugar levels [6,8,9]. Because of their gluten-free nature, millets are particularly well-suited for individuals dealing with celiac disease or gluten intolerance [6].

Millets are a valuable source of essential fatty acids, specifically linoleic, oleic, and palmitic acids, which are available in their free form. They also contain complex lipid compounds in bound forms, such as mono-galactosyl diacylglycerols, di-galactosyl diacylglycerols, phosphatidylethanolamine, phosphatidylserine, and phosphatidylcholine. Minor amounts of fatty acids like arachidic acid, behenic acid, and erucic acid are also present. Millet oil is notably rich in linoleic acid and tocopherols, which enhances its nutritional value. As an alkaline-forming, gluten-free grain, millet is easily digestible and suitable for those with gluten intolerance. Furthermore, it supplies key B-complex vitamins (niacin, folic acid, riboflavin, and thiamine) alongside phosphorus, all crucial for metabolic functions and energy production in the human body [10].

Health Benefits and Nutritional Value of Millets

Millets provide a wide array of health benefits, including supporting cardiovascular health, mitigating migraines, stabilizing blood sugar, and promoting digestive function. They also help minimize the risk of specific cancers, support bodily detoxification, enhance respiratory function, strengthen immunity, boost energy levels, and improve both muscular and nervous system health. Nutritionally, millets surpass common staples like rice and wheat across several indicators. They are particularly rich in dietary fiber, with every type containing much more than rice or wheat. For instance, finger millet delivers nearly thirty times the calcium of rice, making it an excellent source of this vital mineral. Similarly, both foxtail millet and little millet contain iron levels substantially higher than those found in rice. This superior mineral profile establishes millets as a critical element in achieving nutritional adequacy and addressing micronutrient deficiencies [11].

Despite their significant health benefits, millet consumption has fallen, largely due to insufficient public awareness of their uses [6,7]. The increasing consumption of refined flour products drives lifestyle changes that subsequently heighten the risk of diseases such as diabetes, hypertension, and obesity [2,3,5].

In response to these identified problems, the Indian government has initiated efforts to promote the cultivation, awareness, and consumption of millets [6]. This aligns with larger international efforts, including the declaration of 2023 as the 'Year of Millets' and the United Nations' strategic inclusion of increased millet consumption in SDG 2, with the goal of eliminating all forms of malnutrition by 2030 [2].

Despite their superior nutritional quality and resilience to climate variations, the cultivation area for small millets in India saw a substantial drop from 7.22 million hectares in 1961 to 2.29 million hectares by 2009. This trend reflects a broader decline in millet production and consumption, driven by multiple factors.

Millet cultivation and consumption patterns in India have been inconsistent. Following a decline between 2005 and 2008, a modest increase occurred from 2009 onward. However, this recovery was short-lived, with a downward trend resuming in 2012. Several major issues underpin

Misra R, et al., J Food Sci Nutr Res 2026
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this overall decline: millets typically yield less than other crops, require significant manual labor, and involve arduous farming techniques. Farmers also receive inadequate market prices for their harvest. Furthermore, small millets are often scarce in local markets, and when available, their price can be excessive for consumers. The easy accessibility of staples like rice and wheat through public distribution systems strongly suppresses the demand for millets. Additionally, millets receive less government policy support compared to these major crops. Finally, insufficient investment in the development and effective marketing of new millet-based products has also impeded their wider acceptance [12].

Aim

To assess the awareness and consumption of millets among female teachers in Isabella Thoburn College and Navyug kanya Mahavidyalaya College, Lucknow.

Objectives

- To assess the awareness about millets among female teachers.
- To assess the consumption pattern of millets among female teachers.

Methodology

Study design

Cross-sectional study

Study area

The study was carried out in two institutions located in Lucknow: Isabella Thoburn (I.T.) College and Navyug Kanya Mahavidyalaya.

Study population

The target population included female teachers employed at Isabella Thoburn College and Navyug Kanya Mahavidyalaya.

Sample size and sampling technique

The study's sample consisted of 116 female teachers from Isabella Thoburn (I.T.) College and Navyug Kanya Mahavidyalaya in Lucknow. This sample size was determined based on the number of eligible and willing participants available during the data collection. A purposive convenience sampling technique was employed to select the participants, as it ensured inclusion of individuals most relevant to the study objectives.

Inclusion criteria

- Female teachers
- Employed atIsabella Thoburn College and Navyug Kanya Mahavidyalaya at the time of data collection
- Willing to participate and provide informed consent

Exclusion criteria

- Female teachers on long-term leave or unavailable during the data collection period

Data collection procedure

Data were collected using a structured questionnaire, which was developed as Google Form, with the complete information. The form link was shared with the participants via WhatsApp, and submitted forms were included in the data analysis

Data analysis

All collected data were initially entered into Microsoft Excel for organization and preliminary review. Subsequently, the data were transferred and analyzed using SPSS Statistics, Version 26. To characterize the study variables, descriptive statistics were employed. Specifically, frequencies and percentages were used to present categorical data, providing clear insights into the distribution of participants' awareness levels and their consumption patterns. The analysis focused on comprehensively describing these key aspects of the study. The association of age with awareness and consumption of millets was examined using the *t*-test. Chi-square test was used to identify association between awareness and consumption of millets.

Result

The age-wise distribution of participants is shown in figure 1 The highest proportion of respondents were in the 36–45 years age group (22.28%), followed by the 25–35 years age group (19.87%). Participants in the 46–55 and 56–65 age groups accounted for 15.06% and 12.65%, respectively.

The majority of participants, (98%), responded “Yes”, while only (2%) responded “No”. (figure 2) This indicates a level of awareness regarding millets among the study participants.

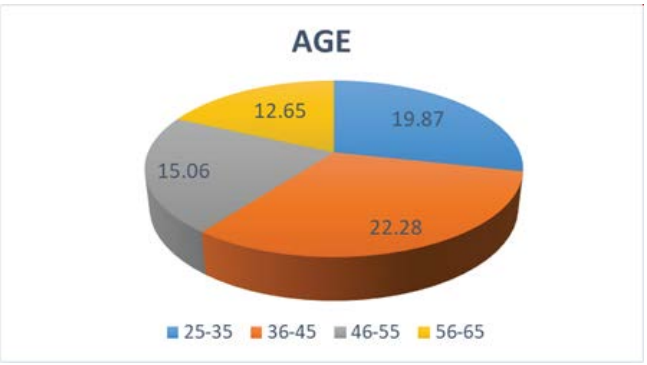

Figure 1: Age-wise distribution.

Misra R, et al., J Food Sci Nutr Res 2026
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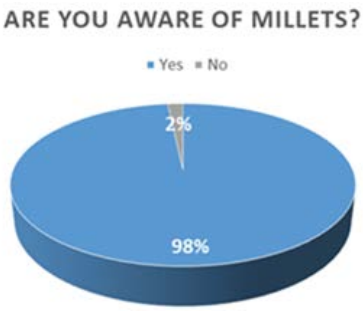

Figure 2: Awareness regarding millets.

Participants were asked whether they include millets in their diet. As shown in figure 3, 51.7% of respondents reported consuming millets "sometimes," indicating occasional intake. A total of 38.8% responded "yes," suggesting regular consumption, while 9.5% reported "no," indicating that they do not consume millets at all.

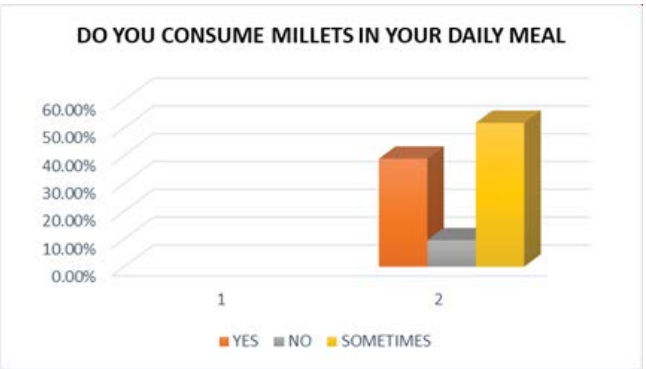

Figure 3: Millet consumption.

Participants who reported not consuming millets were asked the primary reason for their non-consumption. As shown in figure 4 the most frequently reported reason was a preference for other types of food, accounting for (47.6%) of responses. The long time of cooking was the second most reported reason, noted by (19%) of participants.

Additional factors included not easily available of millets (10.5%), high pricing of millets (7.6%), and do not like (6.7%). A smaller portion of respondents indicated they were not aware about healthy of millets (6.7%) or that they not familiar with anyone (1.9%)

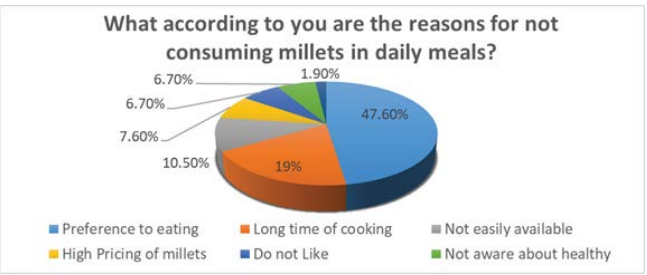

Figure 4: Reason for non-consumption of millets.

Participants were asked to identify their primary source of information about millets. As shown in figure 5, the majority of respondents (39.7%) reported receiving information from friends or family. This was followed by doctors or nutritionists, cited by (20.7%) of participants.

Other sources of information about millets & its benefits included periodicals, magazines, or books (12.1%), health or nutrition-related courses (11.2%), and newspapers (5.2%). A smaller proportion of respondents marked TV shows (2.6%) and other sources (8.6%) as their main source of information, contributing to the remaining percentage.

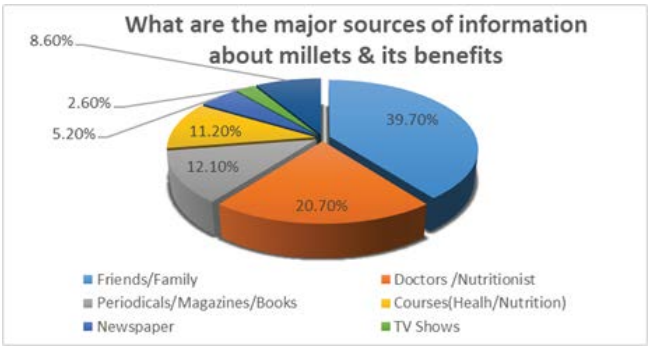

Figure 5: Major sources of information about millets & it's benefits.

Participants who reported consuming millets were asked about the primary reason for their consumption. As shown in Figure 6 the most frequently reported was for health benefits, reported by 65.5% of respondents. This was followed by daily food habit/tradition in the family (12.1%) and for a change in daily routine (6.9%).

Other reasons included being advised by a doctor or nutritionist (5.2%), consuming millets for a weight loss (5.2%), or for their taste, flavor, and texture (2.6%). A small percentage of respondents (2.6%) mentioned health problems such as gluten intolerance. Interestingly, none of the participants selected cost effectiveness as a reason for millet consumption.

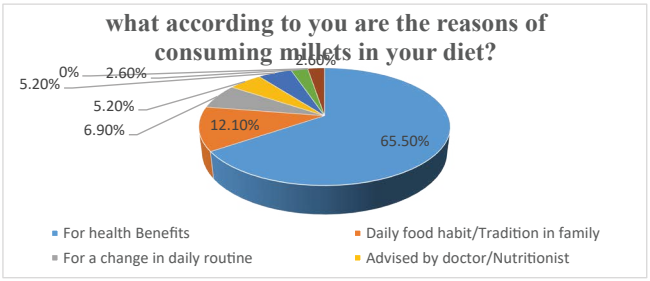

Figure 6: Reason for consumption of millets in the diet.

The results reveal that participants were comparatively less aware of certain health benefits of millets. As shown in Table-1, (38.8%) of respondents reported that millets enhance skin and bone health. This was followed by improves brain

development (28.4%) and helping to fight type 2 diabetes by balancing blood sugar (21.6%).

Other frequently cited benefits included increased immunity and removes toxin (20.7%), weight loss (15.5%), and aid in digestion (13.8%). Additionally, 12.9% of participants recognized millets as a gluten-free food, while 12.1% believed it helps to reduce cholesterol.

Table 1: Awareness of Health Benefits of Millets.

Benefit	Count	Percentage
Reduce Cholesterol	14	12.10%
Aids in digestion	16	13.80%
Helps in fighting type 2 Diabetes	25	21.60%
Improves brain development	33	28.40%
Weight loss	18	15.50%
Gluten free food	15	12.90%
Increase immunity & removes toxins	24	20.70%
Enhance skin & bone health	45	38.80%

As shown in table 2, Differences in mean age by awareness were not statistically significant (p = 0.268). Participants who reported being aware had a mean age of 42.39 ± 9.96 years, whereas those who were not aware had a mean age of 34.50 ± 4.95 years.

Similarly, age differences across consumption categories were not statistically significant (p = 0.055). Participants who reported consuming the product had the mean age (45.06 ± 10.34 years), followed by those who consumed it sometimes (42.31 ± 10.37 years) and those who did not consume it (38.18 ± 9.31 years).

Table 2: Association of Age with Awareness and Consumption Patterns of Millets.

Variables	Age (Years) (Mean ± SD)	P- Value
Awareness		
Yes	42.39 ± 9.96	0.268
No	34.50 ± 4.95	
Consumption		
Yes	45.06 ± 10.34	0.055
No	38.18 ± 9.31	
Sometimes	42.31 ± 10.37	

As shown in table 3, a significant association was found between awareness and consumption ($\chi^2 = 96.174$, $P < 0.01$)

Table 3: Association Between Awareness and Consumption of Millets.

	Awareness	Consumption	Chi Square	P value
Yes	114	45	96.174	P<0.001
No	2	11		
Sometimes	0	60		

Preferred Forms of Millet Consumption in the Diet

Participants were asked in which form they prefer to consume millets. The majority of respondents (50%) preferred millets as an Indian bread item (e.g., bhakari, Ragi, Roti. This was closely followed by consumption as a breakfast item (e.g., porridge/Kheer/Ghavan, etc.), selected by (46.6%) of participants.

Other notable preferences included consuming millets as a substitute for rice (e.g., khichdi) at (26.7%), and in ready-to-cook forms (e.g., Dosa batters/Khichadi mix, etc.), reported by (24.1%). Millets were also chosen as a mid-time snack (e.g., puffs/Pops/Popcorns) by (16.4%), and in ready-to-eat forms (e.g., drinks/snacks) by (12.9%). The least preferred form was as an appetizer (e.g., nachani ambil), reported by only (3.4%) of respondents.

Discussion

The present study shows a very high level of awareness regarding millets, with 98% of participants reporting knowledge and only 2% indicating no awareness. Age-wise distribution revealed that the majority of respondents were in the 36–45 years group (22.28%), followed by the 25–35 years group (19.87%), while 15.06% and 12.65% belonged to the 46–55 years and 56–65 years groups respectively. This suggests that millet awareness and interest are more prominent among middle-aged adults. A similar pattern was reported by Kalaiselvi and Fathima and Fathima (2016) [13], who reported that 92% % of women in Coimbatore city were aware of millets, with awareness being highest among the 30–45 age group.

Despite this high awareness, several barriers to millet consumption were observed. In the present study, 47.6% of non-consumers preferred other foods, 19% reported long cooking time as a barrier, while 10.5% mentioned non-availability, 7.6% high pricing, and 6.7% dislike of taste. Similarly, Bhatt and Singh (2015) [14] found that 54% of their respondents avoided millets due to preference for polished rice and wheat, while 26% cited long cooking time and 20% pointed to poor availability as limiting factors. Kamatar and Gaddad (2019) [15] also reported that 42% of urban respondents avoided millets because of high cost and 28% due to lengthy cooking procedures. These findings consistently show that taste preference, cooking time, and availability are major barriers across different populations.

Misra R, et al., J Food Sci Nutr Res 2026
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With respect to consumption frequency, the present study found that 50.9% consumed millets occasionally, 23.3% daily, 16.4% twice a week, and 9.5% thrice a week. This irregularity indicates that awareness has not yet translated into daily consumption habits. Kalaiselvi and Fathima (2016) [13] similarly observed that although 92% were aware of millets, only 36% consumed them daily, while the majority (48%) consumed them irregularly. Bhatt and Singh (2015) [14] also reported that only 22% of participants consumed millets at least once a week, highlighting the persistence of a gap between awareness and actual dietary practice.

Sources of information about millets in this study were predominantly friends and family (39.7%), followed by doctors and nutritionists (20.7%). Other sources included periodicals/books (12.1%), health-related courses (11.2%), newspapers (5.2%), and television (2.6%). In comparison, Kalaiselvi and Fathima (2016) [13] reported that 48% of their respondents learned about millets through healthcare professionals, while only 10% relied on television and print media, showing that interpersonal and professional sources remain more influential than mass media.

Health benefits were the main reason for millet consumption in this study (65.5%), followed by family traditions (12.1%), dietary variety (6.9%), medical advice (5.2%), and weight management (5.2%). In comparison, Bhatt and Singh (2015) [14] found that 72% of participants consumed millets primarily due to their perceived health benefits, with diabetes control being the most cited reason, while 15% consumed them for cultural/traditional reasons. Kamatar and Gaddad (2019) [15] also reported that 68% consumed millets for health reasons, but noted that awareness of specific properties (e.g., gluten-free nature) was very limited.

Participants in the present study showed relatively low awareness of the health benefits of millet consumption. Only 38.8% associated millets with improved skin and bone health, 28.4% with brain development, and 21.6% with diabetes management. Other reported benefits included boosting immunity (20.7%), weight loss (15.5%), digestion support (13.8%), gluten-free properties (12.9%), and cholesterol reduction (12.1%). Kamatar and Gaddad (2019) [15] observed similar findings, with 34% of respondents linking millets to diabetes management, 26% to digestive health, and only 10% recognizing their gluten-free nature. These results indicate that while some awareness exists regarding the general benefits of millets, knowledge about their functional properties remains limited across different populations.

In terms of preferred forms of consumption, the present study found that Indian bread items (50%) and breakfast preparations (46.6%) were the most favored, followed by rice substitutes (26.7%) and ready-to-cook products (24.1%). Comparatively fewer participants preferred millet-based snacks (16.4%) and ready-to-eat products (12.9%). (3.4%). Bhatt and Singh (2015) [14] reported that 62% of respondents preferred millet chapatis and porridge, with far fewer choosing snack or ready-to-eat products, again highlighting the dominance of traditional preparations.

Overall, the findings of the present study, when compared with earlier evidence (13–15), demonstrate that although awareness about millets is widespread, practical barriers such as taste preference, preparation time, and high cost continue to limit consistent dietary adoption. The persistence of these issues across multiple studies indicates the need for policy support, better processing technologies, increased product innovation, and targeted nutrition education campaigns to promote sustainable millet consumption.

The present findings show the relationship between awareness, consumption, and age. Although the mean age of participants who reported being aware was higher than that of those who were not aware, the difference was not statistically significant, suggesting that awareness was not influenced by age. Similarly, the comparison of age among the “Yes,” “No,” and “Sometimes” groups revealed no statistically significant difference in mean scores, indicating that consumption patterns were not associated with age.A statistically significant association was observed between awareness and consumption.

The study by Priya et al. among 262 married women in Tilak Nagar, Delhi, also reported a significant association between awareness and consumption of millets ($P < 0.001$). In that study, 70.9% of women who were aware consumed millets, and consumption was higher among middle-class women (78.9%) compared to lower-class women (64.9%, $\chi^2 = 4.053$, $P = 0.044$), demonstrating the influence of socioeconomic status on millet intake.

Similarly, the study by Hulas Pathak et al. in Raipur reported limited frequent consumption of millets, with only 31% of participants consuming them regularly, despite growing awareness of their health benefits. Consumption was significantly associated with awareness, and ocio-demographic factors such as age, education level, income and occupation influenced consumption patterns. Health benefits, gluten-free options, and cultural preferences were identified as key motivators among frequent consumers.

These studies indicate that while awareness is an important determinant of millet consumption, actual intake is also influenced by socioeconomic factors, accessibility, and habitual dietary practices. The findings emphasize the need for strategies that go beyond raising awareness to also improve affordability and access, including integrating millets into public programs such as the Public Distribution System (PDS) and promoting culturally acceptable ways to

incorporate millets into daily diets to enhance nutrition and support sustainable food systems.

Conclusion

The study found a high level of awareness about millets among participants, indicating that most people are familiar with their nutritional value and health benefits. However, this awareness has not fully translated into consistent consumption, as many respondents reported eating millets only occasionally. Major barriers identified include preference for other staple foods, longer cooking time, high cost, and limited availability, which limit their inclusion in regular diets.

A significant association between awareness and consumption was observed, suggesting that higher knowledge encourages greater intake. To enhance regular millet consumption, strategies should focus on improving accessibility, affordability, and convenience. Government initiatives—such as including millets in public food programs, providing price support, and promoting low-cost, easy-to-cook millet products—along with Strengthening nutrition education and government initiatives promoting millet farming, processing, and availability can enhance consumption and support healthier, sustainable diets.

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Conflict of interest : There are no conflicts of interest.

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