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Knowledge, Awareness and Consumption of Millets among the Rural Women of Bichoon Village, Jaipur District of Rajasthan, India

Aastha Garg[1], Dr. Pramod K. Raghav[2]
[1]Research Scholar, [2]Professor
Department of Food & Biotechnology, Jayoti Vidyapeeth Women's University, Jaipur-303122
Corresponding Author I.D: pramodraghav31@gmail.com

Abstract
Purpose: Millets due to their enriched nutritional profile are gaining importance as 'nutri-cereals'. However, reduced consumption of millets among the population is being observed in the present time. Thus, there is a growing need to assess knowledge, awareness and consumption of millets that could help develop strategies promoting awareness and consumption of millets among the people. The present study was conducted with an objective to assess the knowledge, awareness and consumption of millets among the rural women of Rajasthan.
Design/methodology/approach: The present study was conducted among women (n=100) of >21 years of age belonging to Bichoon village (Rajasthan). A structured questionnaire was used for data collection related to knowledge, awareness and consumption of millets among the subjects. Additionally, anthropometric measurements were recorded and 24-hour dietary recall was conducted. Mean, SD, chi-square and odds ratio were used for statistical analysis of the data.
Findings: A significant association of income group with knowledge (p=0.024) and consumption (p=0.033) was observed. Frequent consumption of millets being more than once a week had significantly (p=0.000) lesser odds (OR=0.075) of developing diseases including constipation, thyroid and others. Though, greater knowledge and frequent consumption was observed among majority of women, still it was limited to only pearl millet.
Originality/value: The present study highlights the level of knowledge, awareness and consumption of millets among the women of Bichoon village of Rajasthan. No such study has been conducted, specifically including rural women belonging to village of Rajasthan.

Keywords: Millets, rural women, knowledge, awareness, consumption of millets.

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Introduction
Millets are gaining importance as "yesterday's coarse grains and today's nutri-cereals" (Gowda *et al.*, 2022). Millets are characterized as the group comprising larger varieties of small-seeded grasses chiefly produced in Asia. Millets are categorized into major millets including sorghum, pearl millet and finger millet and minor millets including foxtail millet, little millet, kodo millet, proso millet and barnyard millet. Millets have an enriched nutrition profile composed of greater amounts of proteins, vitamins, minerals, flavonoids and polyphenols (Singh *et al.*, 2019). They are rich in vitamins including thiamine, riboflavin, niacin and beta carotene (found in yellow pearl millets) and minerals including calcium, magnesium, zinc, iron and copper (Rotela *et al.*, 2021). Millets are gluten free and therefore are beneficial for patients with celiac disease (Kumari and Kumar, 2020). Millets also contain higher amounts of dietary fibre and phytochemicals including flavonoids, catechins, phenolic acids, phytic acid, and phytosterols (Himanshu *et al.*, 2018). Millets because of such enriched nutritional profile possess disease preventive role against several diseases including diabetes, CVDs, alimentary tract disorder, malnutrition, (Rotela *et al.*, 2021) and cataract genesis (Himanshu *et al.*, 2018).

Millets were consumed as the part of staple diet in different regions of India. Although, in the present scenario, the consumption of millets is reducing with the increase of production and intake of fine cereals including wheat and rice, increased earnings and urbanization (Kane-Potaka *et al.*, 2021). However, with growing health concerns among people specially associated to increased prevalence of obesity and non-communicable diseases, the consumption of whole grains is being promoted (Giri *et al.*, 2025). The interest is also growing in encouraging increased consumption of millets in India. With reference to this, the government of India took an initiative and declared 2018 as a National Year of Millets (Kane-Potaka *et al.*, 2021). Further, on approval of proposal given by India, the year 2023 was declared as International Year of Millets by United Nations General Assembly (UNGA) (Porwal *et al.*, 2023).

The transitional phase resulting in change in the insight of people with relation to millets, there is a growing need to assess knowledge, awareness and consumption of millets among the people. This could be beneficial in developing more strategies and policies by the government to promote increased consumption of millets both among urban and rural people. This will overall help in improving the nutritional and health status of people of India. The present study was thus conducted with an objective to assess the knowledge,

awareness and consumption of millets among the rural women of Rajasthan.

Materials and Methods

Research Design and sampling

The study was a cross-sectional study conducted to assess the awareness and consumption pattern of millets among the rural women of Rajasthan. A total number of 100 women belonging to >21 years of age were selected for the study through random sampling. This study was conducted in Bichoon village located in Mauzamabad tehsil of Jaipur district in Rajasthan, India (Fig 1). The village is extended in the 2375.06 hectares of overall geographical area. The total population is 5,583 people and 927 sex ratio recorded as per the Census 2011 for Bichoon village (villageinfo.in, 2025).

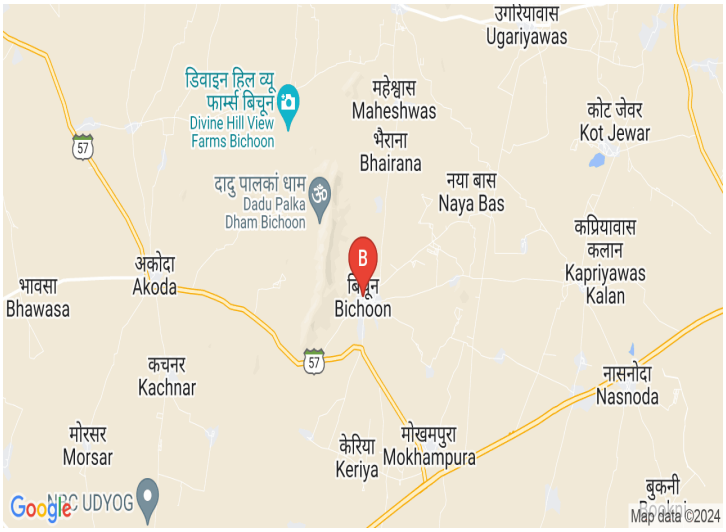

Fig 1. Map of Bichoon village

Inclusion and exclusion criteria for sample selection

Women belonging to Bichoon village and of ≥21 years of age were included in the study. Additionally, women willing to participate in the study were included in the study. Women <21 years of age were excluded from the study. Women not willing to participate in the study or those who provided incomplete information were excluded from the study.

Tools for data collection

A structured questionnaire was used for collecting data related to background information of the subjects, and information related to awareness about the millets and their consumption pattern. Anthropometric measurements including height, weight, BMI, waist circumference, hip circumference and waist hip ratio of the subjects were recorded. Height, weight, waist circumference, hip circumference and waist hip ratio were measured using the anthropometry procedure manual (2011). BMI was calculated through the formula of body weight (kilograms) divided by height (square meters) (Nuttall, 2015). The background information included the age, marital status, occupation, approximate monthly household income and total number of family members. The information related to awareness about different types of millets and frequency of consumption of these millets was also collected through the questionnaire. Moreover, information related to presence of any diseases among the women subjects was also collected through the questionnaire. The 24-hour dietary recall method was used to collect information related to detailed intake of foods commonly consumed by the subjects within a day. Further, the data was entered and per day nutrient intake was calculated as per Indian Food Composition Tables (2017).

Ethical consideration for data collection

Informed consent forms were collected from all the study subjects prior to data collection. The ethical guidelines as per the World Medical Association Declaration of Helsinki (2017) were adhered to for data collection.

Statistical analysis

SPSS V20.0 was used for statistical data analysis (IBM SPSS statistics for Windows V20.0, IBM Corp., Armonk, NY, USA). The mean, standard deviation, chi-square and odds ratio (OR) were used for statistical analysis of the data. The p-values were considered to be statistically significant at $p<0.05$. Chi square was used to assess the significant association between the socio-demographic variables and knowledge and consumption among the subjects. Odds ratio was used to assess the risk of developing diseases associated with frequency of consuming millets among the subjects.

Results and Discussion

The women in the present study belonged to age group of ≥21 years to up to >51 years respectively. The largest proportion of women (n=38) belonged to >51 years of age group followed by those belonging to 31-40 years (n=29), 41-50 years (n=21) and 21-30 years (n=12). The mean age of the subjects was 43.74±12.67. Table I represents the background information of the subjects. Majority of the subjects were married (n=84), housewives (n= 48), had approximate household income of 21-30,000 INR per month (n=41) and had medium size family of 5-8 members (n=56).

Table I: Background information of the subjects

Background information		Subjects n (%)
Marital status	• Unmarried • Married • Widowed	10 (10.00) 84 (84.00) 6 (6.00)
Occupation	• Housewife • Labor • Aanganwadi worker • Blue pottery worker • Others	48 (48.00) 31 (31.00) 5 (5.00) 4 (4.00) 12 (12.00)
Approximate household income per month (INR)	• ≥ 50,000 • 41,000-50,000 • 31,000-40,000 • 21,000-30,000 • 11,000-20,000 • ≤10,000	5 (5.00) 14 (14.00) 11 (11.00) 41 (41.00) 27 (27.00) 2 (2.00)
Family members	• <5 members • 5-8 members • ≥9 members	12 (12.00) 56 (56.00) 32 (32.00)

Table II depicts the results for the anthropometric assessment of the subjects. The subjects had their height in between 123 cm to 168 cm and weight in between 40 kg to 75 kg. Nearly half of the subjects (n=47) had waist circumference of >80 cm that indicates higher risk of metabolic diseases. About two fifth of the subjects (n=41) had waist-hip ratio of >0.85 indicating higher health risk among the subjects. Figure I shows the classification of the subjects according to the BMI classification provided for the Asian adults (Girdhar *et al.*, 2016). Nearly one third of the subjects (n=30) had BMI of more than normal range. Additionally, some of the subjects (n=18) also had BMI of less than normal range. These were considered to be unhealthy and had higher risk of associated comorbidities.

Table II: Anthropometric assessment of the subjects

Measurements	Mean±SD
Height (cm)	154.60±0.07
Weight (Kg)	54.66±11.19
BMI (kg/m^2)	24.21±8.75
Waist Circumference (cm)	83.4±12.51
Hip Circumference (cm)	98.32±10.30
Waist Hip Ratio	0.85±0.06

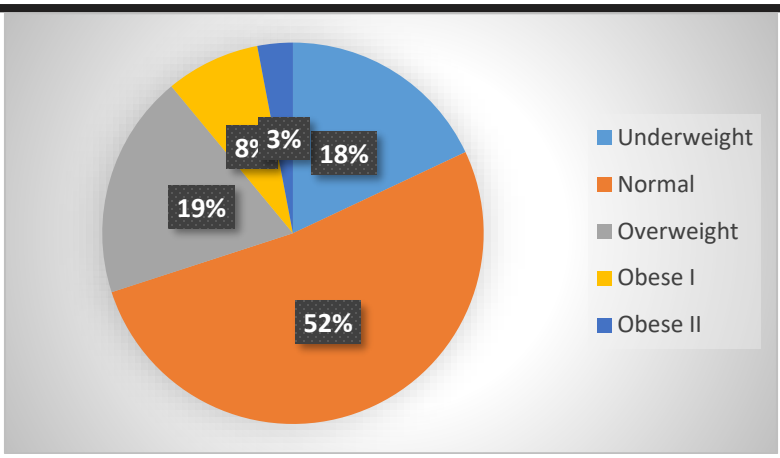

Figure I: BMI classification of the subjects

As per the results obtained for the food habits of these subjects, majority of the women (n=84) were vegetarian followed by non-vegetarian (n=12) and ovo-vegetarian (n=4). Additionally, as per the data obtained for the knowledge of the subjects related to millets showed that though majority of the subjects (n=73) recognized millets, most of these subjects (n=68) only recognized pearl millet and others recognized sorghum along with pearl millet (n=5). A significant association (p=0.024) was observed between the income group and knowledge of the subjects about millets (table III). The proportion of the subjects having knowledge about the millets was more in middle and upper middle income group when compared to lower and lower middle income group.

Table III: Distribution of the subjects based on their income group and knowledge about millets

Income group	Knowledge	
	Yes	No
	n(%)	
Lower income group	19 (19.00)	13 (13.00)
Lower middle income group	27 (27.00)	12 (12.00)
Middle income group	21 (21.00)	2 (2.00)
Upper middle income group	6 (6.00)	0 (0.00)

The subjects were unaware about the various nutritional and health benefits of consuming millets and majority of them (n=82) marked providing energy as their nutritional benefit. More than ninety percent of these subjects (n=92) were not at all aware about any government initiatives or programmes promoting millet cultivation and consumption. However, majority of these subjects (n=96) were interested in receiving more information related to health benefits and uses of millets. A similar study (Sreedhar and Shaji, 2017) was conducted on assessing the knowledge of millets among south Indian women (n=260) and in accordance to the results of present study, the women had lack of knowledge related to nutritional benefits of finger millet.

The results obtained for the consumption of millets among the subjects showed that nearly half of the subjects (n=48) were rarely or not at all consuming the millets. Some of the subjects were consuming pearl millet inspite of not being aware about it as millet. Among the subjects consuming them frequently (n=52), majority of the subjects consumed them once a week (n=38), followed by 2-3 times a week (n=14). The millet frequently consumed by the subjects was only pearl millet and was consumed preferably during winters. A significant association (p=0.033) was observed among the income group and consumption of the subjects (table IV). The proportion of subjects consuming millets frequently was observed to be more in lower and lower middle income groups when compared to middle and upper middle income groups. These results highlighted the fact that the subjects belonging to higher income groups were not consuming millets frequently inspite of being more aware about them. However, the lower income groups, though were not much aware about the millets but were still consuming them frequently as alternatives to common cereals. Imparting the right knowledge and awareness about millets in rural women thus becomes important. In a similar study conducted by Singh *et al.* (2025) on evaluating the awareness and consumption of millets among women of Udaipur, a significant association was observed between the awareness of millets and socio-economic status (p=0.0008).

About two fifth (n=42) of the women were reported of having diseases including body pain, acidity and constipation, thyroid, irregular

menstruation cycles, and others including hypertension and diabetes. Frequent consumption of millets being more than once a week had significantly (p=0.000) lesser odds (OR=0.075) of developing diseases including constipation, thyroid and other diseases compared to those rarely or not at all consuming them.

Table IV. Distribution of the subjects based on their income group and consumption of millets

Income group	Consumption			
	2-3 times a week	Never	Once a week	Rarely
	n(%)			
Lower income group	6 (6.00)	4 (4.00)	17 (17.00)	5 (5.00)
Lower middle income group	7 (7.00)	6 (6.00)	14 (14.00)	12 (12.00)
Middle income group	0 (0.00)	6 (6.00)	4 (4.00)	13 (13.00)
Upper middle income group	1 (1.00)	1 (1.00)	3 (3.00)	1 (1.00)

Among the subjects consuming millets (n=83), majority were consuming them in the form of flour to make chapattis (n=71) followed by remaining subjects (n=12) using it to make porridge or *upma*. The major barrier marked by the subjects in consuming millets was lack of awareness (n=93%) followed by preference for wheat or rice (n=7%). However, majority of the subjects (n=94%) were interested in learning more about the millet related recipes and their preparation methods. In a study conducted by Arora and Singh (2024), women avoided consumption of millets majorly due to taste preference followed by cooking challenges, cost related issues and limited availability.

Table V shows the per day consumption of various nutrients by the subjects according to the information based on their 24-hour dietary recall. On comparing the per day nutrients intake with recommended dietary allowances (RDA) for adult women (RDA, 2020), it was analysed that though the requirements for energy and protein were being fulfilled, the intake of micronutrients majorly including calcium, iron, zinc and magnesium was very less than the recommended values.

Table V. Daily nutrient intake of the subjects based on 24-hour dietary recall method

Nutrients	Mean±SD
Energy (kcal/d)	2145.29±156.12
Carbohydrates (g/d)	193.65±34.02
Protein (g/d)	36.28±11.31
Fat (g/d)	41.57±18.82
Fibre (g/d)	32.47±7.32
Calcium (mg/d)	535.22±12.16
Iron (mg/d)	18.90±34.56
Zinc (mg/d)	8.68±18.51
Potassium (mg/d)	2367.31±521.55
Sodium (mg/d)	110.49±40.03

Phosphorous (mg/d)	1134.23±112.54
Magnesium (mg/d)	321.45±21.32

Overall, the results emphasize that the awareness and consumption related to millets is very scarce among the rural women. However, they are also willing to gain more knowledge about millets. Thus, more initiatives and strategies by the government and policy makers are required to be formed for rural population, especially women as they are the backbone of every household.

Conclusion

The present study was an effort to study about the knowledge, awareness and consumption of millets among the rural women of Rajasthan. The growing attention towards increasing the consumption of millets among every person of India necessitates the importance of conducting such surveys. The present survey highlighted the fact that though government has taken many initiatives and measures for promoting awareness and consumption of millets, the rural women are still lacking the required knowledge and awareness related to millets. However, they are also willing to know more about millets. Thus, there is a growing need of actively promoting millets related awareness including their diverse benefits and culinary uses. More awareness campaigns specially targeting the rural population are required. People associated with health and nutrition sector including health workers, nutritionists, researchers and extension workers need to take such initiatives towards increasing awareness and consumption of millets among the rural people.

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