



Millet consumption patterns: Insight from a feedback survey of school student's perspective



A Policy Perspective

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The study captures “millet consumption patterns of school students based on the feedback survey” aiming to provide valuable inputs for S&T and policy decision making in millet sector.

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This Policy Bulletin has been prepared under in-house OLP project-OLP/NIScPR/0044 (funded by CSIR) by Prof. Ranjana Aggarwal, Dr. Suman Ray, Dr. Manish Mohan Gore, Ayaan Husain, Ravi Roshan Kumar, Authors are affiliated to CSIR-NIScPR, New Delhi.

Millets, referred to as “nutri-cereals,” hold immense significance for children’s nutrition and health due to their exceptional nutritional profile and alignment with Sustainable Development Goals. Rich in essential macronutrients and micronutrients like vitamins, beta-carotene, manganese, and zinc, millets offer a comprehensive solution to combat malnutrition, obesity, and micronutrient deficiencies prevalent in the majority of the Indian population (Singh et al., 2012). Their resilience to harsh environmental conditions and low water requirements also contribute to their suitability for cultivation in regions facing climate challenges. In addition to ensuring nutritional security, millets provide a rich supply of macro- and micronutrients that support ecological and environmental harmony, making them a crucial component of sustainable food systems.

The declaration of 2023 as the International Year of Millets underscores their global recognition and prompts governments, including the Government of India, to prioritize their cultivation and promotion, aligning with SDG 2 (Zero Hunger), SDG 3 (Good Health and Well-being), SDG 8 (Decent Work and Economic Growth), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 17 (Partnerships for the Goals).

A feedback survey study involving 726 school students was conducted with the aim to understand their millet consumption patterns. School Children and the youth are amongst the most vulnerable groups that are affected by incorrect nutrition. For proper development and maintaining good health, they need appropriate nutrition. Today, millets are gaining popularity as substitute of rice and wheat, due to health benefits in terms of nutritional (carbohydrates, proteins, fats, fibre) and phytochemical composition (phenols, flavonoids, tannins, saponins).

Understanding millet consumption patterns among children is essential for informing evidence-based policies and interventions, ultimately contributing to the sustainable growth of the millet sector and ensuring children’s optimal health and well-being.

1. Introduction

Millets can be described as a group of small grained cereal food crops with high nutritious values. They can be grown under marginal/low fertile soils with very low inputs such as fertilizers and pesticides. In fact, they are major energy source and staple foods for people living in the dry and arid regions of the world. Millets are adaptable to diverse agro-climatic conditions, ranging from arid and semi-arid regions to high-altitude regions. They have superior drought tolerance, heat and temperature stress adaptability, and water use efficiency compared to major cereal crops (Sudhakar et al., 2016; Prasad et al., 2020). Millets also contribute to soil fertility and carbon sequestration, supporting sustainable agricultural practices and climate change mitigation (Velmourougane et al., 2018). Millets are known to be the oldest foods known to humans. However, slowly, their importance and cultivation declined due to large scale cultivation of rice and wheat. In India, various varieties of millets are cultivated, with diverse names in different states of the country (Table 1).

Table 1: Vernacular names of different millets in India (Source- Rao et al., 2017)

Millets	Hindi	Sanskrit	Kannada	Tamil	Telugu	Malayalam	Marathi	Guajarati	Bengali	Punjabi
Sorghum	Jowar		Jola	Cholam	Jonna	Cholam	Jowari	Juar	Juar	
Pearl millet	Bajra		Sajjai	Kambo	Sajjalu	Kambo	Bajri	Bajri	Bajra	Bajra
Finger millet	Mandua	Nandimukhi/ Madhuli	Ragi	Kelvaragu	Ragulu	Moothari	Nachni	Nagli/Bavto	Mandua	Madhuka/ Mandhal
Kodo millet	Kodon	Kodara	Harka	Varagu	Arikelu/ Arika	Varagu	Kodra	Kodra	Kodo	Kodra
Proso millet	Barre	China	Baragu	Panivaragu	Varigulu/ Varagulu	Panivaragu	Vari	Cheno	Cheena	Cheena
Barnyard millet	Jhangon	Shyama	Oodalu	Kuthiravaali	Udalu/ Kodisama		Shamul	Sama	Shamula	Swank
Little millet	Kutki		Same	Samai	Samalu	Chama	Sava	Gajro/Kuri	Kangani	Swank
Fox tail millet	Kangni/ Kakum	Kanguni	Navane	Tenai	Korralu	Thina	Kang/Rala	Kang	Kaon	Kangni

Macro- and micro- nutrient profile of millets: Millets are far superior to other crops in terms of nutritional quality (Saxena R. et al., 2018). In addition to ensuring nutritional security, millets provide a rich supply of macro and micronutrients that support ecological and environmental harmony. Millets are nutritionally better than wheat and rice due to their high protein content and more well-balanced amino acid composition. Additionally, millets include a number of phytochemicals that have therapeutic benefits due to their anti-inflammatory and anti-oxidative properties. Additionally, millet grains are a fantastic source of nutrients like carbohydrates, protein, dietary fibre, healthy fats, and minerals like calcium, potassium, magnesium, iron. In addition to these macronutrients, millets are also rich in micronutrients like vitamins, beta- carotene, manganese, zinc etc. and their deficiency is causing many human ailments. Macro- and micro- nutrient profile of millets are described in Table 2.

Table 2: Description of macro- and micro- nutrient profile of millets.

Millets	Sorghum	Pearl millet	Finger millet	Foxtail millet	Proso millet	Little millet	Kodo millet	Barnyard millet	Whole wheat	Raw brown rice	White, milled rice	Maize
Proximate composition												
Moisture (g)	9.01	8.97	10.89			14.23	14.23		10.58	9.33	9.93	9.26
Protein (g)	9.97	10.96	7.16	12.3	12.5	8.92	8.92	6.2	10.36	9.16	7.94	8.8
Total dietary fibre (g)	10.22	11.49	11.18	2.4		6.39	6.39		11.23	4.43	2.81	12.24
Carbohydrates (g)	67.68	61.78	66.82	60.09	70.04	65.55	66.19	65.55	64.72	74.8	78.24	64.77
Total fat (g)	1.73	5.43	1.92	4.3	1.1	2.55	2.55	2.2	1.47	1.24	0.52	3.77
Total free sugars (g)	1.27	0.81	0.34			0.37	1.29		1.8	0.69	0.69	1.66
Carotenoids (g)	0.212	0.293	0.154			0.12	0.272		0.031	0.159	0.0169	0.893
Total saturated fatty acids (g)	0.163	0.875	0.317			0.589	0.246		0.191	0.346	0.184	0.413
Total mono unsaturated fatty acids (g)	0.314	1.047	0.585			0.868	0.297		0.141	0.203	0.117	0.706
Minerals and trace elements												
Calcium (mg)	27.6	27.35	364			16.06	15.27		39.36	10.93	7.49	8.94
Magnesium (mg)	165	137	137	81	153				138	143	64	127
Phosphorus (mg)	222	296	283	290	206				298	160	264	210
Pottasium (mg)	363	307	408	250	113				284	268		287
Iron (mg)	3.95	6.42	4.62			1.26	2.34		3.97	1.02	0.002	2.49
Sodium (mg)	2	10.9	11	4.6	8.2				17.1	4		35
Manganese (mg)	0.78	1.15	5.94	0.6	0.6				2.29		0.51	
Zinc (mg)	1.7	3.1	2.3	2.4	1.4				2.7	2.02	1.3	2.21
Copper (mg)	0.45	0.54	0.67	1.4	1.6	0.34	0.26	0.6	0.49	0.37	0.23	0.45
Vitamins												
Thiamine- B1 (mg)	0.35	0.25	0.37	0.59	0.41	0.26	0.29	0.33	0.46	0.27	0.05	0.33
Riboflavin- B2 (mg)	0.14	0.2	0.17	0.11	0.28	0.05	0.2	0.1	0.15	0.06	0.05	0.09
Niacin- B3 (mg)	2.1	0.86	1.34	3.2	4.5	1.29	1.49	4.2	2.68	3.4	1.69	2.69
Biotin- B7 (mg)	0.007	0.064	0.088			0.603	0.149		0.103	0.138	0.006	0.049

Total folic acid (mg)	0.02	0.455	0.183	0.015					0.366	0.02	0.008	
Amino acids												
Histidine	2.07	2.15	2.37			2.35	2.14		2.65	2.36	2.45	2.7
Isoleucine	3.45	3.45	3.7			4.14	4.55		3.83	4.08	4.29	3.67
Leucine	12.03	8.52	8.86			8.09	11.96		6.81	8.4	8.09	12.24
Lysine	2.31	3.19	2.83			2.42	1.42		3.13	3.63	3.7	2.64
Cystine	1.06	1.23	1.48			1.85	1.92		2.35	2.02	1.84	1.55
Threonine	2.96	3.55	3.84			4.24	3.89		3.01	3.38	3.28	3.23
Tryptophan	1.03	1.33	0.91			1.35	1.32		1.4	1	1.27	0.57

2. Methodology

The study was conducted through millet survey questionnaires to collect data for analysis from October 2023 to March 2024, involving a total of 726 school students in Delhi, NCR. Bilingual questionnaires, available in both Hindi and English, were administered based on participants’ preferences and convenience. Surveys were conducted in person, ensuring meticulous data collection with the specific consent of each participant..

3. Demographics details of school student respondents

Field visits and a comprehensive feedback collection drive was done at multiple schools (Delhi NCR based schools including both Govt. and private schools) to understand student’s perspectives on millet consumption patterns. A total of 726 responses were received, representing a diverse range of students’ views and preferences, as shown in Table 1.

Table 1: Demographic details-number of responses received from various schools.

S. No.	Surveyed Schools	Number of responses received
1	RS1	105
2	RS2	40
3	RS3	334
4	RS4	25
5	RS5	33
6	RS6	25
7	RS7	25
8	RS8	50
9	RS9	50
10	RS10	39
	Total	726

Table 2 shows Demographic details of school students-class and age wise responses. In a survey of 726 students, majority of the students were between 12 to 14 years (n=340, 46.82%) followed by students between 16 to 18 years (n= 242, 33.33%) of the total respondents. Among these, Class VIII contributed the largest number of responses, with 328 student's participants, representing 45.18% of the total responses. This was followed by Class XI students with 232 responses, making up 31.96% of the total, while Class XII contributed to 93 responses (12.81%), Class IX contributed to 45 responses (6.20%), Class VII contributed to 28 responses (3.86%) respectively. Students also shared their insights, contributing to and of the overall feedback.

Table 2: Demographic details of school students –class and age wise.

Age (in Years)	Number of Students	Class/Standard	Number of Students
Below 12	2	VII	28
12-14	340	VIII	328
14-16	131	IX	45
16-18	242	XI	232
18-20	11	XII	93
Total	726	Total	726

4. Findings from the feedback survey data analysis

4.1 Millet awareness among the school students

Of the total 726 students who participated in the feedback survey (Figure 1), majority of the students, n=697 (96.01%) had heard about millets and only 29 students (3.99%), reported that they have not heard about millets. Similarly, Figure 2 represents millets tried by school students, and figure 3 shows students like the taste of millets.

Have you heard about millet?

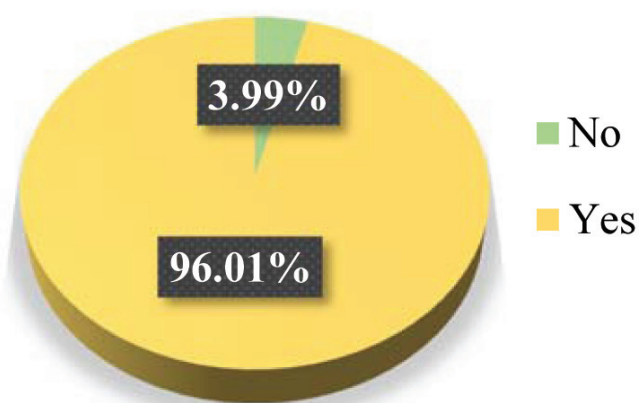


Figure 1: Response of the students on awareness millet?

Source: own survey

Have you ever tried millets?

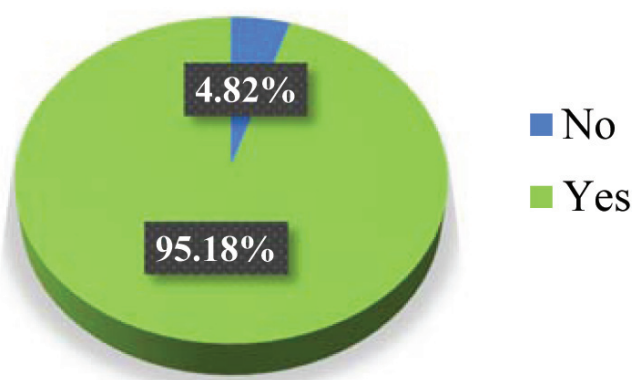


Figure 2: Response of the students on eating millets.

Source: own survey

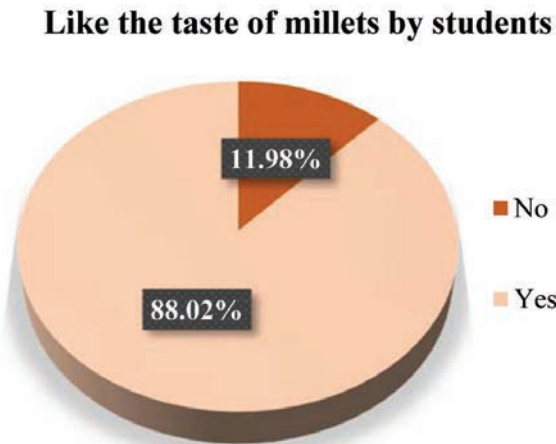


Figure 3: Students like the taste of millets.
Source: own survey

4.2 Awareness of different type of millets among school

Figure 4 shows the varying levels of awareness among the 726 school students, and different types of millets is reflected independently. Figure 4 provides valuable insights into the knowledge levels among school students regarding various millet types. This indicates the need to enhance strategies for promoting awareness and consumption of these nutritious grains..

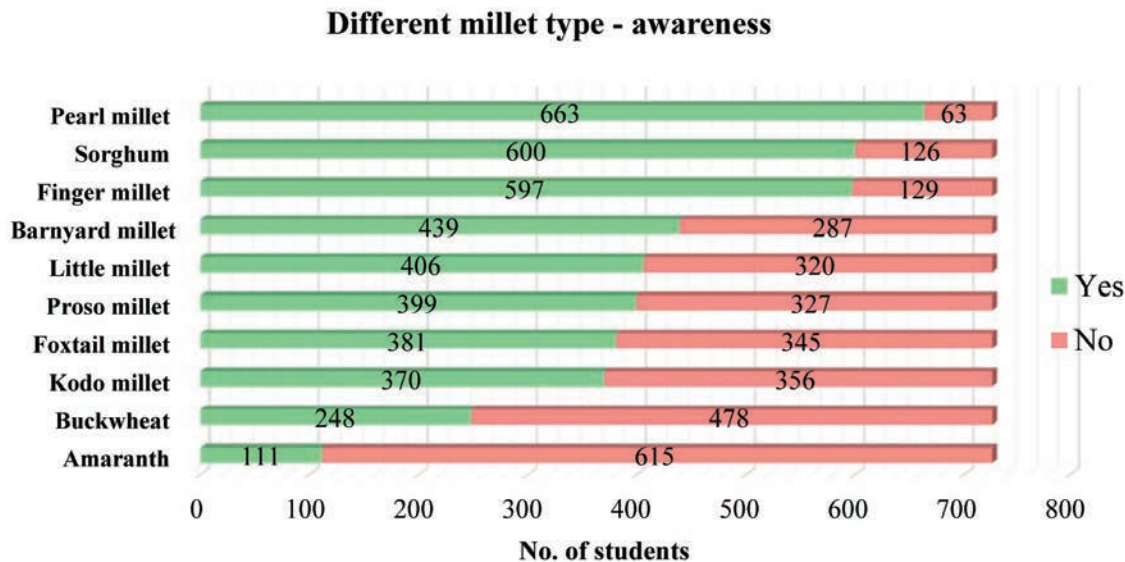


Figure 4: Awareness of different type of millets among school students.
Source: own survey

4.3 Varieties of millets utilized by school students at home

Out of the 726 students surveyed, data was collected on the types of millets used by the students at home. Among these students, the most commonly used millet type was pearl millet, with 560 students reporting its use in their households. Following, sorghum was used by 404 students, and finger millet was used by 301 students. Figure 5 shows that varieties of millet are utilized in students at home, highlighting the diversity of millet consumption patterns and the potential for promoting wider adoption of these nutritious grains.

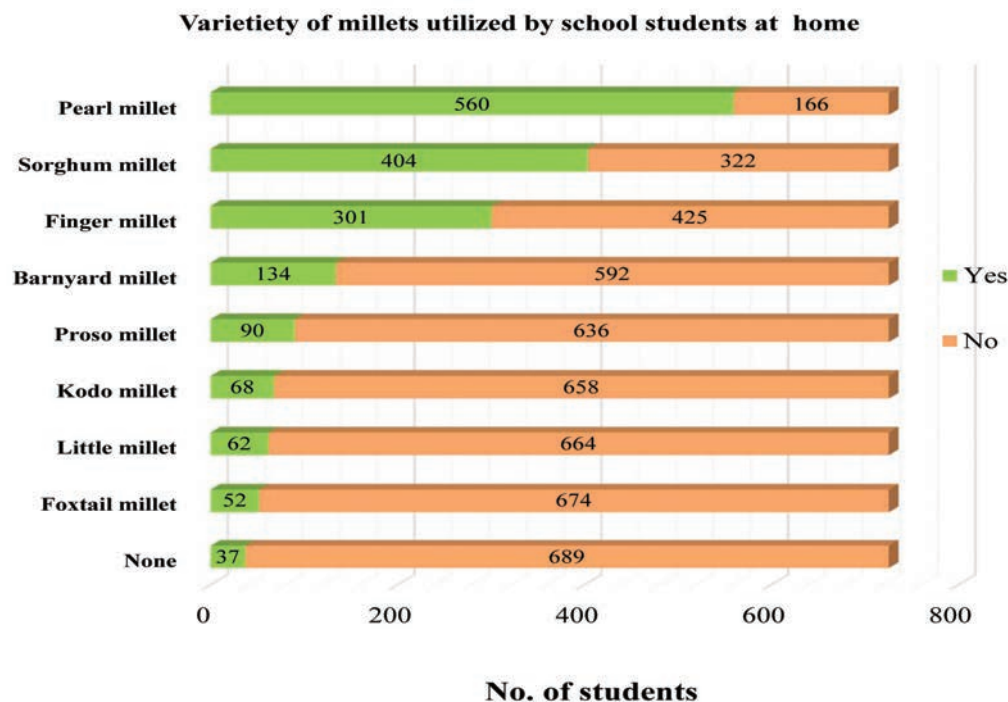


Figure 5: Varieties of millets utilized by school students home

Source: own survey

4.4 Consumption pattern of millets by school students

Millet consumption pattern data was collected on the frequency of millet consumption among school students, $n=726$ (total students surveyed during field visits). Figure 6 shows 197 students (27.13%) with daily millet consumption, following 187 students (25.76%) consuming millets 2-3 times a week. Consumption frequency of millets provides valuable insights into the regularity of millet consumption among school students, highlighting the potential for promoting more frequent millet-based diets to enhance nutritional diversity and health benefits. Figure 7 shows that school students mostly consume millets at different time of the day- breakfast, lunch dinner etc.

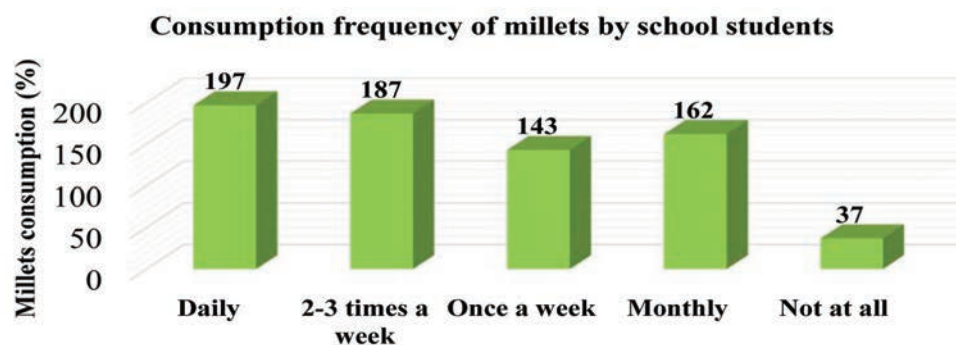


Figure 6: Consumption frequency of millets by school students

Source: own survey

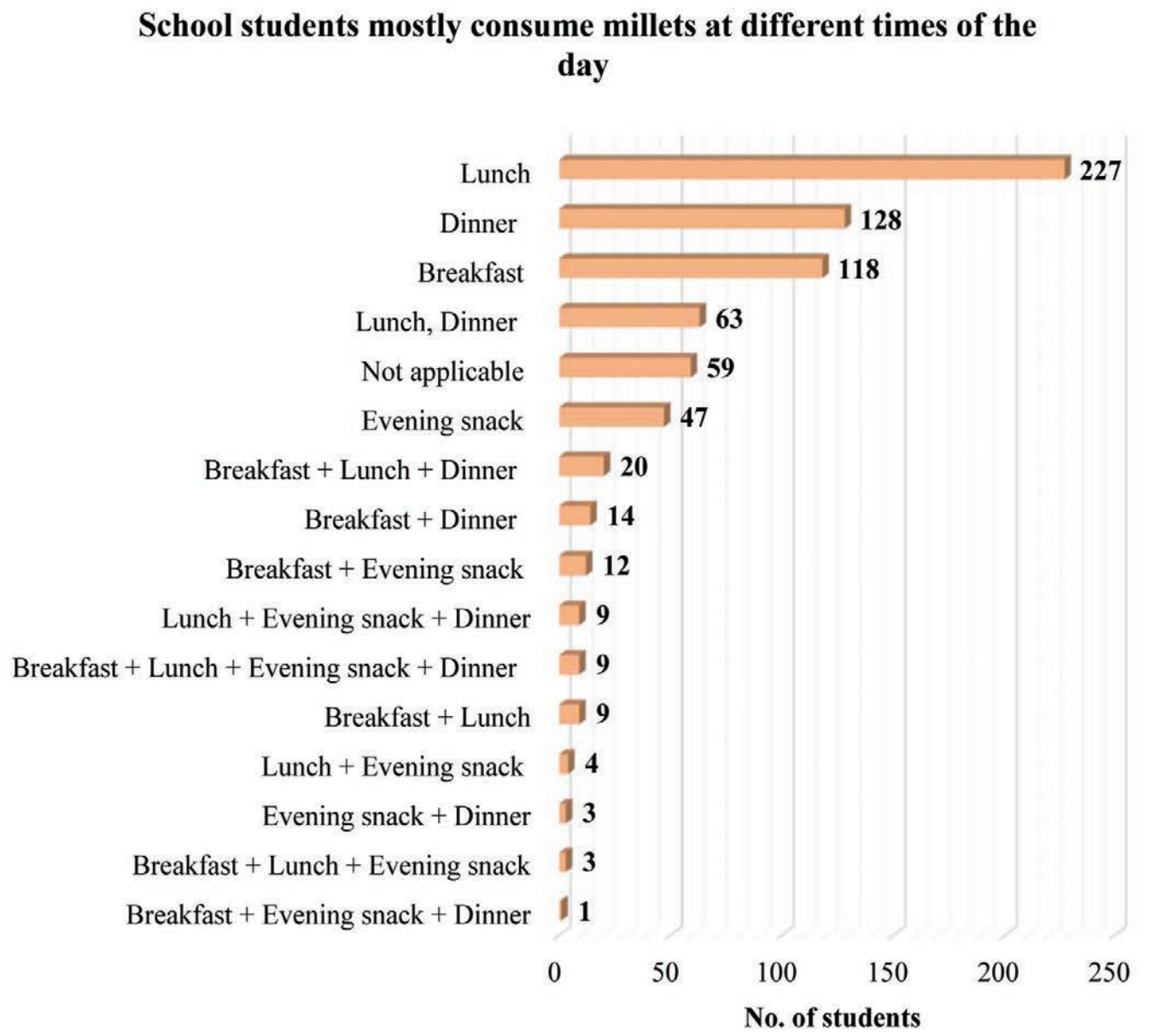


Figure 7: School students mostly consume millets at different times of the day
Source: own survey

4.5 Millet consumption in different form by school students at home

Millet consumption pattern data was collected (feedback survey) on the types of millets consumed by school students, n=726 total responses. The most preferred millet-based food items by the students included cookies, with preference by 235 students (32.37%). This was followed by pasta, preferred by 124 students (17.08%), and cake was favoured by 118 students (16.25%). Among other popular choices of millet based items were dosa, oats, noodles, and food in other forms. Additionally, millets chocolate, poha, idli, namkeen, millets drinks, upma, muesli, and ice cream were also consumed by few students, with varying percentages ranging from 0.14% to 1.24%. Figure 8 demonstrates varieties of millet based items utilized by students at home..

Varieties of millet based items utilized by students at home

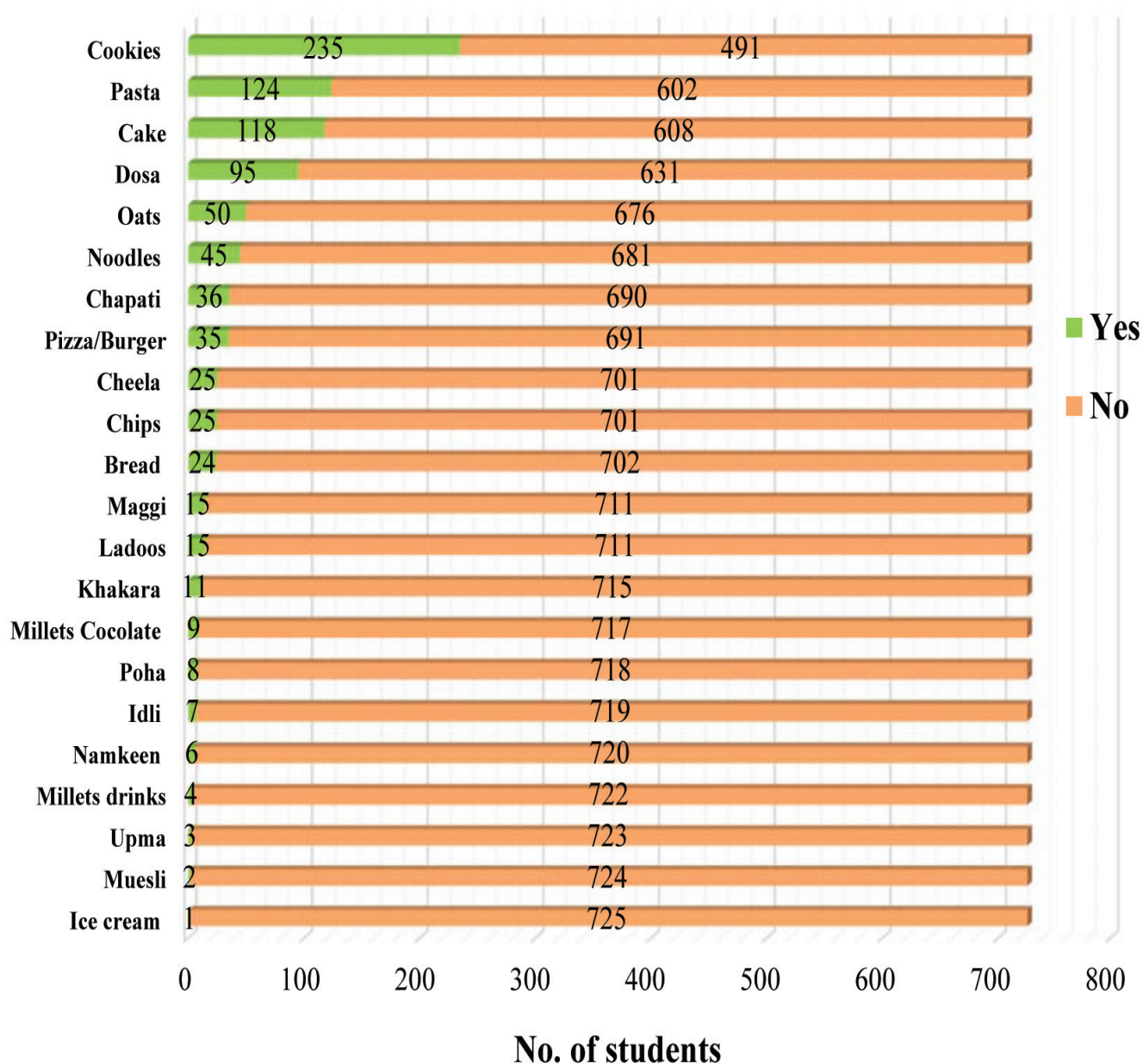


Figure 8: Millet consumption in different form by school students at home.

Source: own survey

4.6 Millet benefit awareness sources used by school students

Figure 9 shows that students were aware of the benefits of millet from a variety of sources as revealed by the feedback survey of students (n=726). Most common sources about millet awareness were parents, schools, social media, friends etc.

Awareness sources about millet benefits

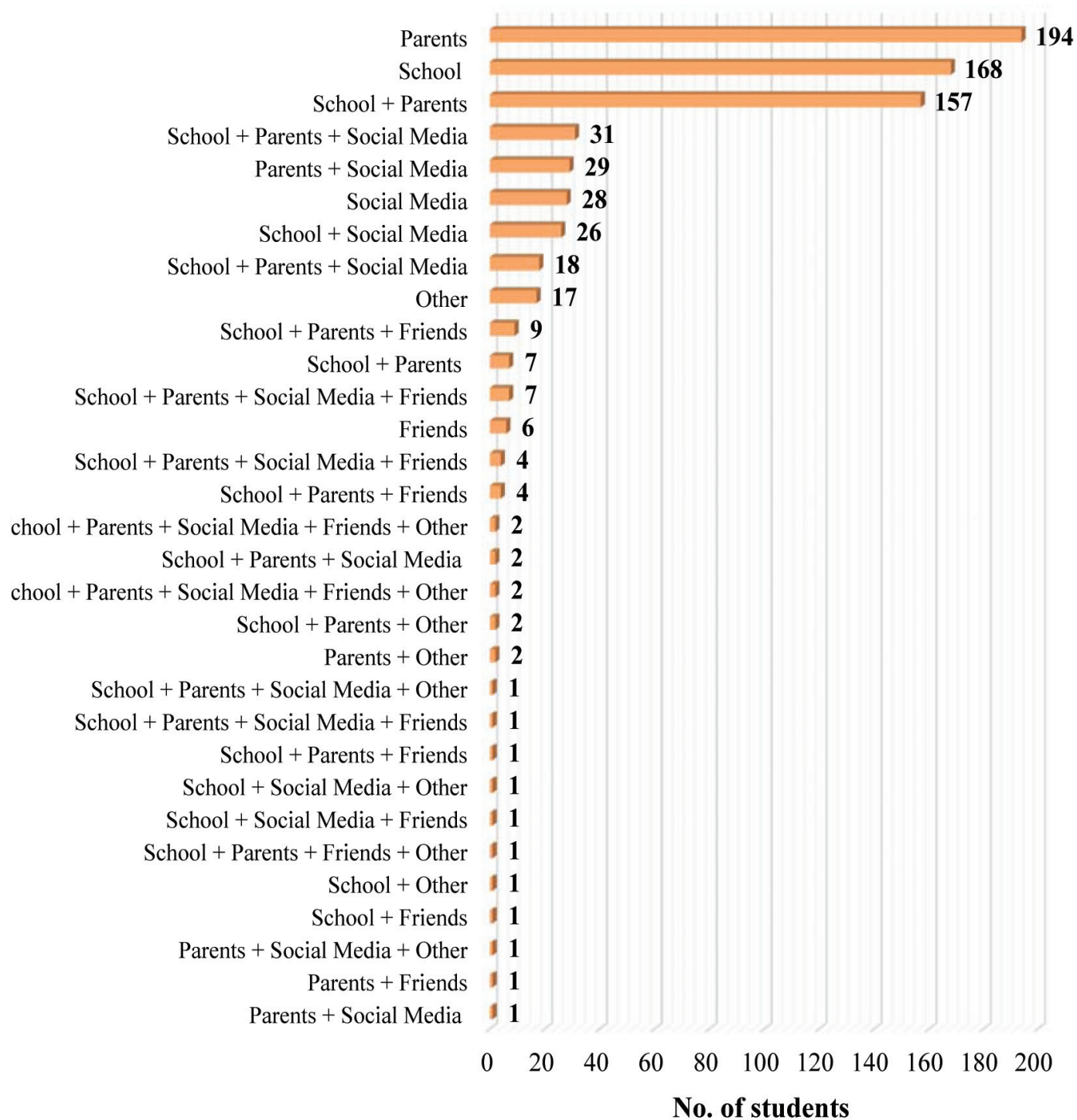


Figure 9: Millet benefit awareness sources by school students.

Source: own survey

5. Policy Recommendations based on survey findings:

- * **Introduce/Enhance Millet Education Programs/Campaigns:** Development and implementation of educational programs in schools is needed to increase/enhance awareness about the nutritional benefits of millets, their diverse culinary uses, and their importance in sustainable food systems. Collaboration with educators to integrate millet-related topics into the curriculum, including cooking classes, nutrition lessons, and agricultural studies is to be emphasized.
- * **Promote Millet-Based School Meals:** Advocate for the inclusion of millet-based dishes in school meal programs to expose students to healthy and nutritious food options. Work with school administrators, food service providers, and policymakers to ensure the availability and affordability of millet-based meals in cafeterias.
- * **Organize Taste Testing Sessions:** Conduct regular taste testing sessions within schools to familiarize students with different millet varieties and encourage them to incorporate millets into their diets. Partner with local millet producers and chefs to showcase creative and delicious millet-based recipes that appeal to students' tastes.
- * **Engage Parents and Guardians:** Collaborate with parents, guardians, and community members to promote millet consumption at home. Share information about the benefits of including millets in family meals, provide recipes and cooking tips, and encourage parents to purchase millet products from local markets or online platforms.
- * **Facilitate Farmer-School Partnerships:** Facilitate partnerships between local millet farmers and schools to create hands-on learning experiences for students. Organize field trips to millet farms, host farmer visits to schools, and engage students in activities such as seed planting, harvesting, and processing millets.
- * **Celebrate Millet Culture and Heritage:** Organize events, festivals, and campaigns to celebrate the cultural significance of millets and raise awareness about their role in traditional diets and culinary heritage. Engage students in cultural activities, storytelling sessions, and cooking competitions centered around millet-based cuisines.

Reference

1. Singh, K.P., Mishra, A., & Mishra, H.N. (2012). Fuzzy analysis of sensory attributes of bread prepared from millet based composite flours. *LWT-Food Science Technology*: 48:276-82.
2. Sudhakar, P., Latha, P., Reddy, Y. T. N., & Sailaja, B. (2016). Genetic and physiological basis for drought tolerance in millets. In *Climate Change and Food Security with Emphasis on Wheat* (pp. 119-144). Springer, New Delhi.
3. Velmourougane, K., Swain, S., Kundu, S., & Jambhulkar, N. (2018). Millets for nutrition security and climate resilience: Proceedings of a global consultation. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT).
4. Prasad, P. V., Staggenborg, S. A., Ristic, Z. (2020). Impacts of drought and heat stress on crop physiology and breeding for tolerance. In *Advances in Agronomy* (Vol. 161, pp. 203-272). Academic Press.

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