



Assessing Dietary Pattern and Nutritional Status of Small Millet Consumers in Bengaluru, Karnataka

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ABSTRACT

The study examined the dietary patterns and nutritional status of households during 2020. High-income group among urban households of the population showed more preference towards small millets consumption due to their perceived health benefits, but the population in rural regions had higher per capita consumption of small millets (2.2 kg/capita/month) as compared to urbanites (1.4 kg/capita/month). The research also highlighted that 57 percent of rural households integrated small millets into their cultural practices, whereas about 40 per cent of urban households perceived that consumption of small millets managed to regulate their blood sugar level. Furthermore, the study found that small millets constituted 32 per cent of total energy intake in case of rural households, compared to 20 per cent in urban areas. Notably, 67 per cent of urban households and 80 percent of rural households reported experiencing the health benefits of consuming small millets. With these insights, the study suggests policy measures to include small millets in the Public Distribution System (PDS) and the Mid-Day Meal scheme. Additionally, it stresses upon the importance of disseminating information about the nutritional and health advantages of small millet consumption, aiming to encourage adoption in both rural and urban households.

INTRODUCTION

Over the past few decades, the Indian economy has achieved remarkable progress, positioning itself as the world's fifth-largest economy by nominal GDP (approximately \$3.18 trillion USD as of 2021) and the third-largest economy based on purchasing power parity. Notably, the agricultural sector has maintained an impressive growth rate of over 3 per cent annually. This growth has led to a substantial increase in the country's food grain production, surging from around 130 million tons in 1980-81 to over 324 million tons by 2022-23. The estimated per capita income growth rate stands at 7.6 per cent for the year 2021-22. This rise has

reinforced the purchasing power of the population, consequently enhancing the per capita net availability of food grains to 514.6 grams per capita per day in 2021-22. Despite these advancements, the issue of hunger and undernourishment has persisted. Alas, India's rank in the Global Hunger Index of 2022 is 107th among the 121 countries assessed, reflecting a "serious" level of food security concern on a global scale.

Ensuring access to sufficient nutrition for its people is undeniably a pivotal aspect of investing in human capital. This necessity is paramount for human survival, as underscored by Dare et al., (2014). Achieving this goal involves expediting food production growth, improving economic access to food, monitoring

food prices, and providing subsidized food grains as exemplified by Srivastavaa & Chand (2017). However, consumption patterns have evolved disparately across various socio-economic groups, leading to differential access to food and subsequently widening inequalities in nutritional intake. Such disparities can exacerbate health inequalities, as observed by Torlesse et al., (2003) who note that reduced dietary diversity correlates with an increase in malnutrition prevalence. Millets are categorized into two groups: “great millets” encompassing Sorghum, Pearl millet, and Finger millet, and “Small millets” including Foxtail millet, Little millet, Proso millet, Barnyard millet, Kodo millet, and Brown top millet. This classification is not only based on grain size but also indicative of their cultivation area. Millet cultivation has been showing a trend of increased productivity, but the declining area under millets is a major concern that needs to be addressed (Sangappa et al., 2023). Recent times have witnessed increased recognition of millets by the Indian government, leading the designation of 2023 as the International Year of Millets further attests to this commitment, aiming to elevate awareness about their nutritional value and stimulate their cultivation and consumption. These “Shree Anna,” or rich grains, are nutritionally akin to major cereals, boasting substantial micronutrients, protein, dietary fiber, phenolic compounds, and medicinal photochemical. With protein content ranging from 7 to 12 per cent, fat content between 2 and 5 per cent, carbohydrates from 65 to 75 per cent, and dietary fiber at 15 to 20 per cent, millets offer a range of health benefits. Despite these virtues, millet consumption has waned in recent years due to the ascendancy of rice and wheat as staple foods. Unfortunately, this shift has resulted in decreased millet cultivation and adverse effects on the livelihoods of millet farmers.

METHODOLOGY

The study was conducted in two regions of Bangalore, namely Bangalore rural and Bangalore urban, during 2020 employing a combination of qualitative and quantitative methods. A simple random sampling technique was employed to select 60 small millet consuming households for the study representing 30 each from rural and urban areas. In the present study, finger millet has been purposefully excluded from the category of small millets. This decision is based on finger millet’s status as a staple dietary component in Karnataka, and numerous studies have already extensively examined it, prompting its deliberate omission from the small millets grouping. The small millets group includes foxtail millet, little millet, proso millet, barnyard millet, kodo millet, and brown top millet. The 24-hour recall method was employed to work out the calorie and nutrient intake of the urban and rural households in their daily diet, by adjusting for egg, meat and fruits intake from households’ monthly consumption. Thus, all the calorie and nutrient intake values were based on adjusted 24-hour recall method. The amount of energy and individual nutrients like protein, iron, calcium, fat, riboflavin, niacin, thiamine, vitamin C and carotene consumed were worked out using the standardized food composition tables (Gopalan et al., 1971 & Roopa, 2015) and this was compared with the Recommended Dietary Allowance (ICMR-NIN, 2010). Garret’s ranking technique was used to rank the constraints faced by the respondents in production and consumption of small millets.

RESULTS

Details of small millet consumption in the study area

Millets serve as a staple food in India, deeply ingrained in the dietary practices of both urban and rural communities for centuries. The urban households consume 5.42 kg of small millets monthly, while their rural counterparts rely more significantly on these grains, with a consumption rate of 11.04 kg per household. The per capita consumption of small millets is notably higher in rural areas, averaging 2.2 kg/month compared to 1.4 kg/month in urban regions and these are in line with the findings of Anbukkani et al., (2017).

Nutritional benefits of small millets as compared with other food items in the diet of rural and urban households

Across rural and urban areas, cereals and millets were the major source of energy, among cereals rice contributed to 30 per cent of total energy derived from the consumption of all food groups. Consumption of small millets was the highest in rural area (72.86 g/CU/day) as compared to urban area (45.45 g/CU/day). In rural area the energy from consumption of small millets including ragi forms 32 per cent of total energy intake whereas, in urban area, which accounts for 20 per cent of total energy intake (Table 2). Despite the nutritional superiority of small millets over cereals, the proportion of consumption of these is negligible in both rural and urban areas.

Perceived Health benefits of small millets consumption in rural and urban areas

Urban households exhibit a higher perception that the consumption of small millets has the potential to control diabetes (66.67%) and aid in weight loss (50.00%) compared to their rural counterparts (20.00% and 30.00%, respectively). Millet has demonstrated potential advantages in diabetes management owing to its abundant fiber content and gradual digestion, which can be beneficial for individuals with diabetes (Padulosi et al., 2015; Kumari et al., 2021). On the other hand, rural households had a

Table 1. Details of small millets consumption in the study area

S.No.	Particulars	Urban	Rural
I.	Monthly consumption of small millets (kg/month/household)	5.42	11.04
II.	Per capita consumption of small millets (kg/capita/month)	1.4	2.2
III.	Reasons for preferring to consume small millets (%)		
a.	Diabetes	40.00	20.00
b.	Obesity	20.00	6.66
c.	To stay healthy and fit	26.67	16.67
d.	Food habit	13.33	56.67
IV.	Motivation for consumption of small millets (%)		
a.	Dietician and Nutritional Experts	30.00	16.67
b.	Ayurveda clinics	13.33	0.00
c.	Friends/neighbours and relatives	10.00	43.33
d.	Television/Newspaper/mass media	10.00	16.67
e.	Millets and Organic melas	36.67	23.33

Table 2. Share of different food groups in the energy intake of households

Food groups	Rural households (n=30)			Urban households (n=30)		
	Quantity (kg/capita/month)	Energy (kcal/capita/day)	Per cent share to total energy intake	Quantity (kg/capita/month)	Energy (kcal/capita/day)	Per cent share to total energy intake
Rice	5.9	695.97	29.02	5.4	644.11	27.58
Wheat	1.6	179.47	7.48	3.4	386.69	16.56
Ragi	4.3	473.78	19.76	2.8	303.70	13.01
Small millets	2.2	284.20	11.85	1.4	158.18	6.77
Pulses	0.9	111.52	4.65	0.8	98.75	4.23
Vegetables	4.0	30.99	1.29	4.5	36.00	1.54
Fruits	2.2	85.07	3.55	2.9	112.13	4.80
Oil	0.7	210.00	8.76	0.9	272.73	11.68
Milk	4.2	93.65	3.90	3.7	82.49	3.53
Sugar and sweets	0.3	43.51	1.81	0.4	44.62	1.91
Egg and meat	1.1	189.99	7.92	1.1	195.68	8.38
Total energy Intake		2398.15			2335.10	

higher perception that the consumption of small millets assisted in controlling gastric problems (50.00%) and promoting agility (80.00%) compared to urban households (43.34% and 63.34%, respectively). Interestingly, while a significant portion of both urban (33.34%) and rural (56.67%) households perceives no change in health status, a relatively lower percentage of households perceived that they experienced other health benefits such as managing hypertension and heart problems (33.34% in urban and 26.67% in rural areas).

Constraints faced by households in consumption of small millets

The primary challenges faced by urban consumers in incorporating small millets into their diets are limited accessibility to both the grains and their processed products, compounded by elevated prices compared to more mainstream cereals, such as rice. Typically, the cost of millets tends to be double or even triple that of rice in the market. Another significant barrier is the lack of awareness regarding the cooking techniques and diverse recipes associated with small millets, coupled with their perceived low palatability, which contributes to their underutilization in urban areas. Furthermore, a notable factor hindering the widespread consumption of small millets is the limited knowledge among consumers about the health and nutritional benefits associated with these grains. Additionally, the absence of readily available

Table 3. Households perception on health benefits of small millets consumption

Health benefits	Urban households (%)	Rural households (%)
Control of diabetes	66.67	20.00
Weight loss	50.00	30.00
Control of gastric problems	43.34	50.00
Facilitate digestion	60.00	40.00
Agile	63.34	80.00
Other health benefits (Hypertension, heart problems etc.)	33.34	26.67
No change	33.34	56.67

ready-to-eat and ready-to-cook processed millet products further diminishes their integration into urban diets. Many consumers highlighted that small millets are primarily perceived as medicinal food, leading to their confinement to specific consumer groups (Table 4). Easy availability of food grains such as rice and wheat in PDS was the most and important criteria that had affected the consumption of small millets. This suggests that ensuring that millets are easily available through the public distribution system (PDS) is crucial for increasing their consumption. Lack of easy accessibility of grains and their processed products. This implies that making millets more accessible, perhaps by improving their

Table 4. Constraints in consumption of small millets among rural and urban consumers

S.No.	Constraints	Urban		Rural	
		Score	Rank	Score	Rank
1.	Lack of access of grains and their processed products	68.20	I	69.87	II
2.	High price compared to other cereals	68.13	II	-	-
3.	Lack of knowledge about the cooking procedure and variability in the dishes	67.30	III	35.10	VI
4.	Low palatable	65.20	IV	53.27	IV
5.	Lack of awareness about the health and nutritional benefits of millets	56.53	V	67.60	III
6.	Non-availability of ready to eat and ready to cook foods of millets	43.90	VI	32.93	VII
7.	Considered as medicinal food only	37.76	VII	-	-
8.	Less tasty compared to other major cereals	31.90	VIII	46.93	V
9.	Belief that not suitable for all age categories	31.83	IX	-	-
10	Easy availability of food grains in PDS	-	-	70.27	I

distribution and marketing, is also a key factor in increasing their consumption. Lack of awareness about health and nutritional benefits. Additionally, there is a need to foster healthy habits related to the consumption of nutritious food among rural households to ensure food and nutritional security. This suggests that educating people about the health benefits of millets could also play a significant role in increasing their consumption.

DISCUSSION

This disparity arises because urban households tend to blend small millets with other cereals like rice for consumption. In contrast, in rural areas, small millets are a regular dietary staple intricately woven into their culture and tradition. Millets and organic melas, dietician and nutrition experts and ayurveda clinics played a pivotal role in bringing back small millets into the diet of rural and urban households. About 30 per cent in urban and 17 per cent of households in rural area were motivated by a food and nutrition experts. About 36.66 per cent and 23.33 per cent of households are influenced by Melas in urban and rural areas; respectively (Table 1). The resurgence of small millet consumption in India reflects a dynamic interplay between cultural traditions, nutritional awareness, and the influence of various stakeholders. The nutritional superiority of millet especially pearl millet is an added advantage which will help in creation of its space and demand in the food industry (Kumari et al., 2019; Singh et al., 2020). As the urban-rural disparity persists with respect to income, health consciousness and consumption preferences, understanding these consumption patterns is crucial for developing targeted strategies to promote the nutritional and cultural value of small millets in both settings. Regarding health benefits, similar results were consistently observed in multiple studies after the consumption of millet-based recipes (Sreeramulu et al., 2018; Krishna et al., 2019; Gururaj et al., 2019; Vijayalakshmi et al., 2020). Small millets are rich in antioxidants, including phenolic acids, flavonoids, and carotenoids, known for their anti-inflammatory, anti-cancer, and anti-diabetic properties. The consumption of millets leads to a notable reduction in fasting and postprandial blood sugar levels, accompanied by a decrease in diabetic symptoms. Furthermore, millet consumption positively influences gut health, resulting in increased levels of beneficial gut bacteria and improved digestive function. Muligan & Samsai (2023) study also highlighted the similar constraints that consumers faced in the Coimbatore city, Tamil Nadu.

CONCLUSION

Recognizing millets' historical significance in the Indian diet, the research revealed challenges in both urban and rural areas, such as blending with other cereals and limited awareness in urban households, and accessibility issues in rural settings. To address this, policies should prioritize increasing awareness of millets' health benefits, promoting diverse recipes, and ensuring product availability through public distribution systems. Government initiatives must enhance affordability and accessibility, encourage consumption, and popularize millet's nutritional aspects. The International Year of Millets presents a crucial opportunity for coordinated efforts to revive cultivation and consumption, paving

the way for a healthier, more sustainable future in India and contributing to the global goal of eliminating malnutrition by 2030.

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