Factors Influencing Millet Consumption in Odisha: An Empirical Review from Consumer Perspective

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Abstract: *Millets, a group of small-seeded annual grasses, are primarily grown as grain crops in arid regions on marginal land. The original purpose of millet, an ancient grain that is currently grown in 131 countries, was for human consumption. For approximate 60 crore people in Asia and Africa, millet is a staple food. The only crop that can potentially address issues with food, fuel, malnutrition, health, and climate change in the future is millet. Nutri cereals, also known as millet, are an excellent source of nutrients. Millets are incredible in terms of nutrition and health benefits. Millets have been shown in a recent study to reduce the risk of heart disease. Millets help people lose the body weight. the unique characteristics of millets, like the abundance of fibre these contain. The consumption of millet in Odisha offers a significant opportunity to improve nutrition and promote sustainable agriculture. Through the enhancement of awareness, the improvement of accessibility, and the celebration of traditional culinary practices, millets can significantly contribute to the health and well-being of the populace. In this paper factors were identified that influence the consumer purchase decision-making on buying millets in Odisha i.e. nutritional value (87.63%), doctor recommendations (78.88%), availability of RTE (Ready to Eat) & RTC (Ready to Cook) millet foods (69.12%), quality of foods or varieties of millets (49.74%) and Govt. initiatives (25.68%). By understanding these identified factors, stakeholders in Odisha can better design the strategies to reintegrate millets into local diets, ultimately contributing to the health and well-being of communities in Odisha.*

Keywords: *Millets, RTC, RTE, Consumption, Consumer and Protein*

Introduction

Millets, a group of small-seeded grains, have been a vital part of the human diet for thousands of years. Renowned for their resilience to harsh climates and low input requirements, millets have gained attention as a sustainable food source amidst rising global concerns about food security and climate change. Rich in nutrients, including fibre, protein, vitamins, and minerals, these grains offer significant health benefits, making them an attractive alternative to more commonly consumed staples. Despite their nutritional advantages, millet consumption has been declining in many regions due to the rise of more commercially promoted cereals like rice and wheat. This shift poses challenges to public health and agricultural diversity. Understanding the factors that influence millet consumption is crucial for reviving interest and integrating millets into modern diets. Understanding the factors influencing millet consumption in Odisha is essential for promoting these grains in modern diets. Odisha's rich agrarian culture provides a unique backdrop for understanding these factors. Traditional practices, socioeconomic status, availability, and awareness about millets play crucial roles in shaping consumer behavior. Moreover, the resurgence of interest in millets due to their resilience to climate change and rising health consciousness presents both opportunities and challenges. By examining these factors, this study seeks to provide insights that could inform policy interventions and promote the sustainable consumption of millets in Odisha, ultimately contributing to improved public health and agricultural sustainability.

Literature Review

Millets are a collection of diminutive-seeded yearly grasses cultivated as cereal crops, predominantly on infertile land in arid regions. They serve as a fundamental food source for 600 million citizens in Asia and Africa and are a highly nutritious resource. They can reduce the risk of developing cardiovascular issues, facilitate weight loss, and provide vitamin B such as Niacin, folacin, riboflavin, thiamine, and phosphorus. In recent times, millets have experienced a resurgence in popularity owing to their health benefits, minimal environmental impact, and ability to withstand climate change. Nevertheless, they are frequently overlooked and undervalued in modern diets and agricultural methods.

Classification of Millets

Millets can be classified into two main categories: major millets and minor millets. Major millets, such as finger millet, pearl millet, and sorghum, are grains that do not have a husk. Minor millets are hulled grains that require the removal of the husk before they can be consumed. Examples of such millets include kodo, browntop, barnyard, foxtail, and proso. Classification of Millets: There are approximately ten varieties of millets that can be found in the market.

I. Sorghum Millets (JOWAR)

Jowar, a Poaceae grass, is high-fiber. It grows widely in tropical and subtropical climates. This millet's high dietary fiber, antioxidant phytochemicals, calcium, and iron boost energy, bone strength, immunity, and blood sugar regulation. Food without gluten protein is gluten-free in Ayurveda. It digests easily and is light on the stomach. Jowar is gluten-free, making it safe for gluten-sensitive people.

II. Kodo Millet

Kodo millet, technically known as Paspalum scrobiculatum, is a drought-resistant annual plant cultivated in India, Nepal, Vietnam, Philippines, Indonesia, and West Africa. Kodo millet should include antioxidants to avoid lifestyle disorders. In women, kodo millet helps relieve joint discomfort and regulate menstruation. Kodo millet was anti-inflammatory and antioxidant. Phenolics increased its antioxidant activity.

III. Finger Millet

Ragi, is rich in calcium and iron, which strengthen bone density and reduce anemia risk. Finger millet is nutritious for pregnant women, babies, and the elderly. This product's high calcium content helps nursing mothers produce plenty of breast milk. Paspalum scrobiculatum, or Kodo millet, is a resistant annual plant grown in India, Nepal, Vietnam, Philippines, Indonesia, and West Africa to withstand drought.

IV. Proso Millet

It is also known as Variga, is a type of grain. Pellagra is a dermatological condition characterized by dry and scaly skin, resulting from a deficiency of niacin. Proso millet has a high concentration of vitamin B3 (niacin) and protein.

V. Foxtail Millet

It is also known as Korra, is a type of cereal grain. Consuming foxtail millet reduces the incidence of diabetes. It facilitates a well-regulated release of glucose without impacting the metabolic processes of the human body. Additionally, it is recognized as a nutritious food for the heart due to its high magnesium content.

VI. Pearl Millet

Africa and India grow drought-resistant pearl millet (Pennisetum glaucum). Small, spherical seeds thrive in poor soil in dry and semi-arid areas. Diets with pearl millet provide protein, fiber, iron, and magnesium. It makes Indian "bajra roti" and African porridges. In extreme environments, grain adaptability and resilience are crucial for food security. Pearl millet's low water usage sustains agriculture. The 4,000-year history indicates its relevance in ancient and modern agriculture. The grain can be baked, snacked, or fermented. Cultural and nutritious pearl millet is a staple.

VII. Barnyard millet

Indian and Japanese barnyard millet (Echinochloa spp.) is nourishing and hardy. This crop grows at many temperatures and in poor soil, making it vital for sustainable agriculture. Protein, fiber, iron, calcium, and phosphorus are abundant in barnyard millet. The high fiber content promotes digestion and blood glucose regulation. Khichdi, porridge, and other recipes employ grain instead of rice.

VIII. Little Millet

Little millet (Panicum sumatrense) is a nutritious grain produced in India and Asia. Little millet grows well in dry and rainy circumstances because of its flexibility. Protein, fiber, iron, calcium, and magnesium are abundant in it. The mild, nutty grain is used in pilafs, cereal, and rice substitutes. Little millet matures in a few months, making it perfect for short growing seasons. Patil & Reddy (2024) in his study analyzed that the incorporation of little millets into diverse food products can improve nutritional value, although it encounters obstacles such as customer acceptance and processing issues.

IX. Buckwheat

Buckwheat millet, commonly known simply as buckwheat, is not a true millet but a pseudo-cereal that belongs to the Polygonaceae family. Buckwheat is a nutrient-dense food recognized for its superior protein, dietary fiber, vitamins, minerals, and antioxidants. It is a nutritious diet for vegetarians and vegans, promoting digestive health and regulating blood sugar levels. The antioxidants, such as rutin, promote cardiovascular health and mitigate inflammation.

X. Browntop millet

A lesser-known grain, browntop millet (Brachiaria ramosa) is noted for its nutritional qualities and durability. Browntop millet, better known as "Kodo millet" in some places, is grown throughout Africa and India. Protein, fiber, iron, and calcium are abundant in browntop millet. High fiber and antioxidants enhance digestive health and general well-being.

Table 1: Comparison of Millets with Other Staples

Aspect	Millets	Rice	Wheat	Corn
Nutritional Profile	High in fiber - Gluten-free - Rich in micronutrients (iron, Mg, K) - Low glycemic index	- Low in fiber (especially white rice) - Gluten-free (like millets) - Primarily carbs - High glycemic index (esp. white rice)	- Higher protein, but not gluten-free - Moderate micronutrients - Higher protein but processed wheat is lower in nutrients - High glycemic index (refined flour)	- High in carbs, but lower in fiber - Moderate micronutrients - Lower in micronutrients than millets - High glycemic index
Cooking and Preparation	- Takes 15-20 mins to cook - Multiple preparation methods (whole, flour, porridge) - Can be unfamiliar for some consumers	- Quick cooking (esp. white rice) - Very convenient and familiar - Very familiar cooking methods	- Takes longer (e.g., bread or pasta) - Can be labor-intensive (e.g., baking bread) - Versatile but not always quick	- Versatile (meal, flour, kernels) - Some forms require special preparation (e.g., tortillas) - Relatively familiar in certain regions
Cultural Familiarity	- Often seen as traditional, niche - Not a common part of everyday diets - Perceived as an alternative food	- Staple in most cultures worldwide - Deeply ingrained in culinary traditions - Highly familiar and trusted	- Staple in many cultures worldwide - Commonly used for bread, pasta, etc. - Deeply embedded in cultures	- Staple in many regions (Latin America, Africa) - Often used in tortillas, polenta, and snacks - Deeply embedded in certain regions
Health Perception	- Seen as a "superfood" (fiber, minerals, gluten-free) - Better for blood sugar control	- Seen as a basic carbohydrate source - Often linked to obesity or diabetes	- Seen as a good protein source (but gluten concerns) - May contribute to gluten sensitivities	- High in carbs but less focused on nutrients - Common but not seen as a superfood
Market Accessibility	- Limited availability in many areas - Can be more expensive - Available mostly in specialty stores or health food shops	- Widely available worldwide - Affordable and easy to find - Available in most supermarkets	- Widely available worldwide - Affordable and easy to find - Available in supermarkets globally	- Available regionally but varies - Affordable, but region-dependent - Available globally but not as universal
Price	- Often more expensive than rice/wheat - Price can vary by region	- Relatively inexpensive - Often cheaper due to economies of scale	- Affordable - Economical in most markets	- Inexpensive (particularly in bulk) - Usually affordable

Environmental Benefits of Millet Cultivation

Millets boost soil health through their extensive root systems, which mitigate erosion, facilitate water retention, and foster biodiversity by sustaining soil microbes. Moreover, millet cultivation has a reduced carbon footprint due to its diminished requirements for irrigation and electricity, rendering it an environmentally viable option that supports sustainable agricultural practices and long-term food security. Their remarkable endurance to environmental pressures, particularly drought, establishes them as a crucial support for small farmers confronting these difficulties. Furthermore, the elevated nutritional content of millet reinforces its significance as an essential crop in ensuring food supply throughout many regions globally (Fanzo, 2014). The adaptation of millets to various climatic situations, such as drought, heat, and suboptimal soil quality, exemplifies their resilience (Satyavathi et al., 2021). Consuming less water than several other crops, they flourish in regions with limited or inconsistent water supply. These little seeds have been farmed and ingested for millennia worldwide, rendering them a crucial crop for maintaining food security in diverse places (Mane et al., 2022). Millets' capacity to flourish in water-scarce or inconsistent conditions renders them a reliable crop, ensuring food security and sustaining livelihoods in areas with low water resources (Macauley & Ramadjita, 2015). A primary benefit of millets is their abundant nutritional profile, which includes vital vitamins, minerals, and antioxidants (Sarita & Singh, 2016). Rich in iron, calcium, and zinc, these grains significantly enhance human health by fostering robust bones, teeth, and blood vessels, while strengthening the immune system. In areas facing malnutrition, millets can provide a significant amount of critical nutrients, improving the population's health (Comerford et al., 2021).

Factors affecting millet consumption in Odisha

India is the top producer of millet, contributing 42% of the global production. Furthermore, Kalaiselvi et al. (2016) discovered that the major determinant that impacts consumers' decision to buy millet is its superior suitability for individuals with diabetes. In their study, Dhevika and Saradha (2018) discovered that consumers like cereals and millet due to their ability to mitigate the risk of high blood pressure. Barratry and Rajapushpam (2018) demonstrate that consumers incorporate millets into their regular diet due to their nutritious and healthful properties. Bhagavatula et al. (2010) discovered a correlation between the consumption of millet and a reduced body mass index (BMI) as well as a more diverse dietary pattern.

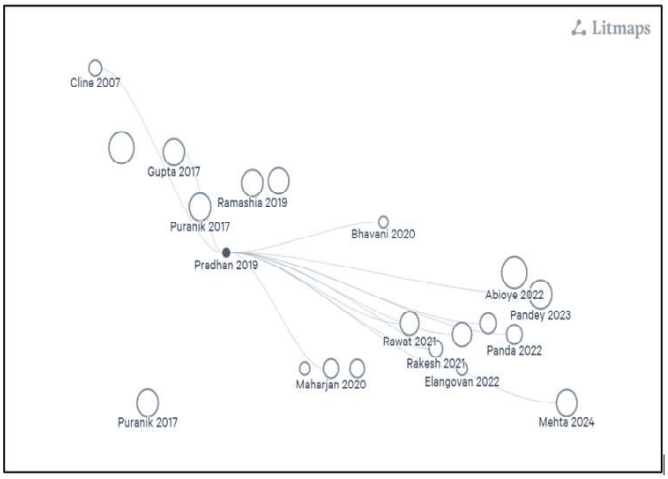

Figure 1: Literature related to consumption of Millet in Odisha

Source: Lit Map

Kumar et al. (2021) found millets have more fiber than rice and wheat. Rice has 30 times less calcium than any other millets have at least twice as much. Ancient grains have a better nutritional balance, and consumer awareness is growing. Demand for protein, complex carbs, and fiber-rich meals is driving millet's appeal. Millets' robust root systems allow them to withstand extreme temperatures, droughts, and floods, according to "Assessment of the State of Millet Farming in India". Chande et al. (2021) found that increasing caretakers' understanding of pearl millet's nutritional benefits may improve school-aged children's intake. Millets were among the first cereal grains utilized for domestic uses (Durgad et al., 2021). Foxtail, tiny, and Kodo millets are minor millets. With its high lecithin content, kodo millet is the coarsest grain, and benefits from Millet consumption in India has increased during the previous decade. Millet-based goods are widely available and their health advantages are becoming more well known. Millet is nutritious, however, production is much lower than consumption (Kumar et al., 2022). Gluten-free, high-fiber millets aid digestion, control bowel motions, and satisfy hunger (Mohan et al., 2022). India, the 12th largest producer of high-yield millet, is struggling to incorporate it into daily diets, affecting population health (Kumar et al., 2022). Padmalini et al. (2023) examined urban South Indian women's awareness of millet grains and their nutritional benefits. They found that most individuals eat millet for health. Gluten-free millets benefit people with diabetes, cancer, oxidative stress, obesity, coeliac disease, and gastrointestinal disorders (Sangappa et al., 2023). Vahini et al. (2023) found that age, gender, awareness of benefits, taste perception, nutritional value, education, prices, and income affect millet consumption in Coimbatore. Urban households eat more millet per person due to health, price, and flavor. Venkataramanan (2023) found that family diets, influence millet adoption. Reddy and Patel (2023) revealed that 96% of Vizianagaram district residents knew at least one millet variety, with Sorghum, Bajra, and Korra being the most prevalent. Supermarkets are the favorite alternative for acquiring value-added millet items, whereas Kirana stores are preferred for purchasing raw millets. Millets provide vitamin B complex, calcium, iron, folic acid, and sulfur (Rizwana et al., 2023).

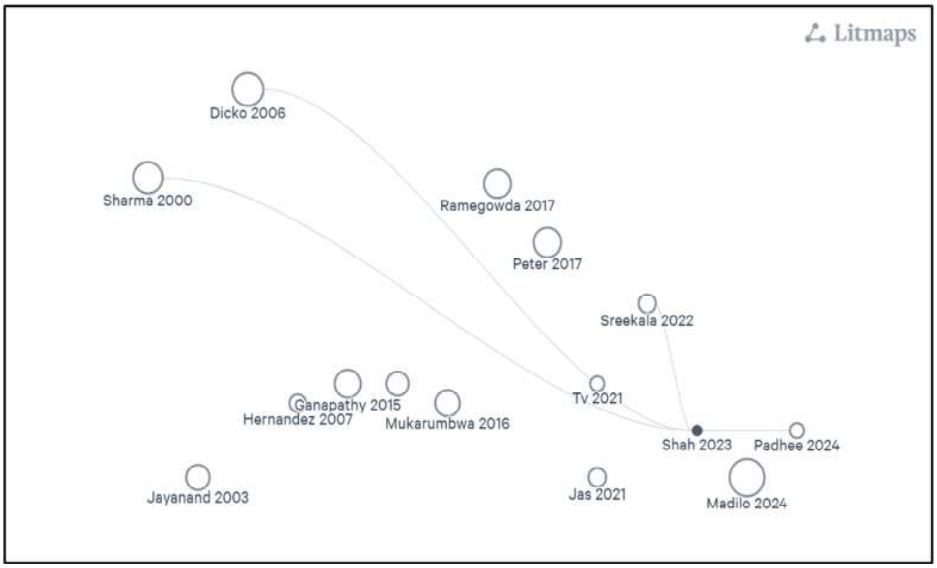

Figure 2: Literature related to Factors affecting the consumption of Millet in Odisha

Source: Lit Map

Table 2: Identified Factors Affecting Consumption of Millet

Sl. No.	Identified factors	Authors
1	Recommended by Doctors	Ahamed et al. (2024) Sonawane et al. (2024) Agarwal et al. (2023) Srivastava et al. (2021)
2	Availability of RTC & RTE foods	Pravallika et al. (2020) Deshpande et al. (2021) Takhellambam et al. (2015) Dhumal et al. (2014) Chaudhury et al. (2010)
3	Affordability	Harish et al. (2024) Yadav (2023) Jyrwa et al. (2024)
4	Taste	Jyrwa et al. (2024) Kotecha (2023) Vahini (2023) Karunakaran (2020)
5	Appearance	Kumbar et al. (2023) Hema et al. (2022) Taylor et al. (2019)
6	Quality	Soni et al. (2024) Tewari et al. (2023) Raj et al. (2024) Cabrera et al. (2022)
7	Awareness	Manimozhi (2024) Mehta and Taterway (2024)
8	Nutritional Value	Agarwal et al. (2023) Ahamed et al. (2024) Vanishree et al. (2018)
9	Individual Promotion	Acharya (2023) Jadhav and Londhe (2023) Pathak et al. (2023)
10	Packaging	Wadekar (2024) Shree (2022) Chinnappan (2024)
11	Conventional dietary pattern	Pandey et al. (2024) Theodoro et al. (2024) Panja et al. (2023) Bisht. (2022)
12	Govt. Initiatives	Pandey (2023) Pathak et al. (2023) Jadhav and Londhe (2023)

Objectives of the study

1. To study consumer perception and awareness regarding millet consumption in Odisha.
2. To explore the demographic variables regarding millet consumption in urban and rural areas of Odisha.

3. To identify the factors influencing the consumption of millet and its products in Odisha.

Methodology

The study was conducted to evaluate the perception, consumption patterns, and traditional practices related to millets in Odisha. The process of gathering primary data involved both structured and non-structured questions obtaining the perspectives of the participants regarding millets. A total of 274 respondents were selected for the proposed study in Odisha. Random sampling was used to select respondents. Only those who expressed their willingness to participate were included. The data was further subjected to statistical analysis by presenting the information in terms of frequency and percentages. An observational study was conducted to evaluate general background information and assess the consumption patterns of millets in Odisha.

Table 3: Reliability Statistics Test

Cronbach's Alpha	N of Items
.921	33

Table 4: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.721
Bartlett's Test of Sphericity	Approx. Chi-Square	8933.088
	df	210
	Sig.	.000

The data first underwent reliability and validity testing. According to Table No. 2, the data is reliable, as indicated by a Cronbach's Alpha of 0.921. The table also shows a Kaiser-Meyer-Olkin (KMO) value of 0.721, confirming that the data is valid and adequate for analysis. Since the P-value is less than 0.05 ($p<0.05$), the data is ready for further examination. The next step involves conducting exploratory factor analysis to extract factors.

Data Analysis

Data for this research study were collected using a random purposive sampling technique. In this method, the researcher employs random sampling to select participants from a specifically targeted population. The focus was on selecting respondents who met certain eligibility criteria: individuals who had purchased millet products for consumption within the past six months. The study targeted respondents aged 18 to 70 who met these criteria and invited them to participate in an online survey. The use of an online survey offered several advantages, notably broader public outreach and real-time access to the survey link. Out of 300 responses received, 274 were deemed valid for inclusion in the study.

Table 5: Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	136	49.6	49.6	49.6
	Male	138	50.4	50.4	100.0
	Total	274	100.0	100.0	

Source: Field Survey

In this study, Table No. 3 presented that 50.4% of the respondents are Male and 49.6% are female highlighting balanced gender representation.

Table 6: Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-30 years	37	13.5	13.5	13.5
	31-40 years	89	32.5	32.5	46.0
	41-50 years	100	36.5	36.5	82.5
	Above 50 years	48	17.5	17.5	100.0
	Total	274	100.0	100.0	

Source: Field Survey

The sample consisted of 13.5% respondents from the age group of 18 to 30 years, 32.5% between ages 31 to 40 years, 36.5% between ages 41 to 50 years, and 17.5% above the age of 50 years.

Table 7: Place

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Municipal	78	28.5	28.5	28.5
	Rural	5	1.8	1.8	30.3
	Semi Urban	43	15.7	15.7	46.0
	Urban	148	54.0	54.0	100.0
	Total	274	100.0	100.0	

Source: Field Survey

The majority 54% of participants were from urban areas, 28.5% were from Municipal areas, 15.7% were from semi-urban areas and only 1.8% was from rural areas.

Table 8: Educational Qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	12th	10	3.6	3.6	3.6
	Others	62	22.6	22.6	26.3
	Graduation	97	35.4	35.4	61.7
	Post Graduation	105	38.3	38.3	100.0
	Total	274	100.0	100.0	

Source: Field Survey

In terms of education, 3.6% possessed only a higher secondary school certificate, 35.4% a bachelor's degree, 38.3% had a master's, and 22.6% others like a doctorate.

Table 9: Income Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	10,000-20,000	47	17.2	17.2	17.2
	21,000-50,000	193	70.4	70.4	87.6
	Above 50,000	34	12.4	12.4	100.0
	Total	274	100.0	100.0	

Source: Field Survey

The highest number of sample respondents (70.4%) belonged to the income groups of 21,000-50,000 INR, 17.2% belonged to the 10,000-20,000 INR per month income group and 12.4% belonged to the income group of above 50,000 INR per month.

Table 10: Total Spend

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than Rs. 500	52	19.0	19.0	19.0
	More than Rs. 1000	46	16.8	16.8	35.8
	Rs. 500 to Rs. 1000	176	64.2	64.2	100.0
	Total	274	100.0	100.0	

Source: Field Survey

The majority 64.2% of participants spent Rs. 500 to Rs. 1000, 19% respondents spent Less than Rs.500/- and only 16.8% spent more than Rs.1000/- monthly on millet products purchase.

Table 11: Satisfaction Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Dissatisfied	12	4.4	4.4	4.4
	Highly Dissatisfied	5	1.8	1.8	6.2
	Highly Satisfied	55	20.1	20.1	26.3
	Neutral	48	17.5	17.5	43.8
	Satisfied	154	56.2	56.2	100.0
	Total	274	100.0	100.0	

Source: Field Survey

Out of the 274 respondents, only 1.8% of them were highly dissatisfied, 17.5 % were neutral, 56.2% were satisfied, 20.1% are highly satisfied, and 4.4% were dissatisfied with the millet products.

Table 12: Family Members

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	12	4.4	4.4	4.4
	2	77	28.1	28.1	32.5
	3	64	23.4	23.4	55.8
	4	58	21.2	21.2	77.0
	More than 4	63	23.0	23.0	100.0
	Total	274	100.0	100.0	

Source: Field Survey

The data elucidates the distribution of family sizes among participants. Families including two people are the predominant category, accounting for 28.1% of the total responses (77 out of 274). Subsequently, households including three members constitute 23.4% (64 respondents), and those with more than four members represent 23.0% (63 respondents). Families consisting of four individuals account for 21.2% (58 respondents), but the lowest family size of one person is the least prevalent, with just 4.4% (12 respondents). A total of 274 respondents provided data, illustrating a varied spectrum of family sizes within the questioned population.

Table 13: Food Preference

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	RTC	138	50.4	50.4	50.4
	RTE	136	49.6	49.6	100.0
	Total	274	100.0	100.0	

Source: *Field Survey*

Among all the respondents 50.4% preferred Ready to Cook (RTC) millet products and 49.6 % preferred Ready to Eat (RTE) millet products.

Table 14: Time of Millet Consumption

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Break Fast	73	26.6	26.6	26.6
	Dinner	115	42.0	42.0	68.6
	Lunch	86	31.4	31.4	100.0
	Total	274	100.0	100.0	

Source: Field Survey

From the Table 14 it is clear that 42% respondents were consuming millet for dinner, 31.4% were consuming for Lunch and 26.6% preferred millet for Breakfast.

Table 15: Level of Awareness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High	137	50.0	50.0	50.0
	Low	23	8.4	8.4	58.4
	Medium	114	41.6	41.6	100.0
	Total	274	100.0	100.0	

Source: Field Survey

Among all respondents 50.0% responded that they have high level of awareness, 41.6% were having medium level awareness and 8.4% responded that they have low level of awareness.

Table 16: Information Source

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Friends and Relatives	66	24.1	24.1	24.1
	Others	17	6.2	6.2	30.3
	Print Media	49	17.9	17.9	48.2
	Social Media Platforms	128	46.7	46.7	94.9
	Television	14	5.1	5.1	100.0
	Total	274	100.0	100.0	

Source: Field Survey

The largest source of information is social media platforms, with 46.7% (128 individuals). Friends and relatives are the second most common source with 24.1% (66 individuals). Print media is the third source of information with 17.9% (49 individuals), while 6.2% (17 individuals) depend on other unspecified sources. Television is the least source of information, with only 5.1% (14 individuals).

Narrative Analysis of Qualitative Interviews

From the non-structural interview technique, the study can generalise the below-mentioned points.

Examining how consumers see millets reveals a range of opinions; some consider them to be "superfoods," traditional foods, or strange objects. Consumers' knowledge of millets' health advantages—such as their high fiber content, gluten-free status, and rich micronutrient content—as well as their connections to different cultures and cuisines, can be gleaned through interviews. Concerns regarding taste, texture, and accessibility are some of the obstacles to millet consumption; many customers are either ignorant of where to get millet goods or are deterred by the price differential when compared to other staple grains like wheat or rice. Adoption may also be hampered by cultural preferences and false information regarding the nutritional content or preparation simplicity of millets. Interviews can reveal educational possibilities, such as offering basic cooking advice, and point out sources of false information, like social media or word-of-mouth. According to Gc and Hall (2020), policies that are specifically designed to assist smallholder millet farmers such as training on cultivation.

Table 17: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.103	43.349	43.349	9.103	43.349	43.349	5.395	25.689	25.689
2	3.531	16.815	60.164	3.531	16.815	60.164	5.052	24.055	49.744
3	3.096	14.741	74.905	3.096	14.741	74.905	4.069	19.378	69.122
4	1.401	6.673	81.579	1.401	6.673	81.579	2.050	9.761	78.882
5	1.271	6.052	87.631	1.271	6.052	87.631	1.837	8.749	87.631

Source: Field Survey

Extraction Method: Principal Component Analysis

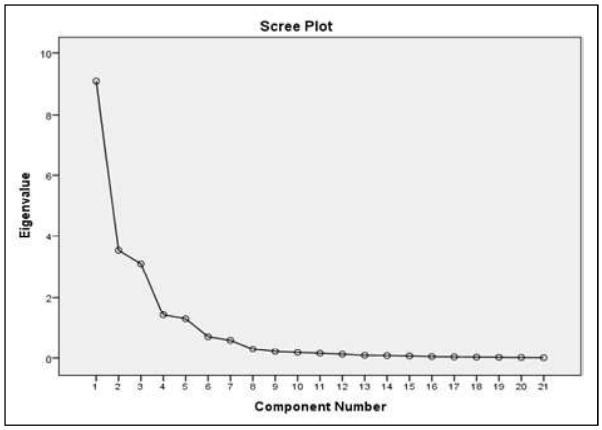

Figure 3: Scree plot showing the identified factors having Eigenvalue >1

	Component				
	1	2	3	4	5
X4	.952				
X3	.863				
X6	.830				
X1	.809				
X7	.802				
X2	.707				
X5	.680				
X20		.933			
X21		.921			
X15		.912			
X16		.837			
X19		.807			
X18		.686			.529
X11			.961		
X12			.929		
X14			.898		
X10	.544		.655		
X13			.629		
X8				.889	
X9				.574	
X17					.828

Extraction Method: Principal Component Analysis**Rotation Method:** Varimax with Kaiser Normalization

Rotation converged in 6 iterations.

Findings and Discussion

From the Rotated matrix component analysis, Table No. 2, it is observed that five special factors are identified that influence the consumer purchase decision-making on buying millets in Odisha i.e. nutritional value (87.63%), doctor recommendations (78.88%), availability of RTE (Ready to Eat) & RTC (Ready to Cook) millet foods (69.12%), quality of foods or varieties of millets (49.74%) and Govt. initiatives (25.68%).

As more people become health-conscious, they seek foods with high nutritional value. Millet is rich in essential nutrients like fiber, protein, vitamins (such as B vitamins), and minerals (including magnesium, iron, and calcium). Consumers aware of these benefits may be more inclined to purchase millet over other grains. Trends such as gluten-free diets or plant-based eating can boost millet consumption. Since millet is naturally gluten-free and plant-based, it aligns with these dietary preferences, appealing to consumers looking for alternatives to wheat or animal-based products. Awareness campaigns and nutritional education can play a crucial role.

Doctors often provide personalized dietary advice based on individual health needs. If a doctor recommends millet for managing conditions such as diabetes, anaemia, or digestive issues, patients are likely to follow that advice and incorporate millet into their diets. In regions where health literacy is still developing, doctors play a crucial role in educating patients about the benefits of specific foods. When doctors highlight millet's nutritional advantages and its role in a balanced diet, patients are more likely to understand and value millet's benefits. In some cases, doctors and healthcare institutions participate in public health campaigns that promote the consumption of nutrient-rich foods like millet. These campaigns can raise awareness about millet's benefits, leading to increased consumer interest and purchases.

The availability of ready-to-eat (RTE) and ready-to-cook (RTC) millet products can significantly impact purchasing decisions in Odisha, as in many other regions. Consumers looking for quick and convenient meal options may prefer RTE millet products. These products require minimal preparation and are ideal for busy lifestyles or for those who want to reduce cooking time. RTC millet items offer a balance between convenience and a degree of home preparation. They typically require some cooking but are pre-prepped, which reduces cooking time and effort compared to starting from raw millet. RTE and RTC millet products that are easy to prepare and integrate into daily meals can help increase acceptance among consumers who might be unfamiliar with cooking millet from scratch.

High-quality millet, known for its nutritional benefits, such as being rich in fiber, protein, vitamins, and minerals, is likely to attract health-conscious consumers. If millet is perceived as having superior nutritional value, it can influence buyers to choose it over other grains. The quality of millet affects its texture and taste. A millet that cooks to a desirable texture and has a pleasant flavour is more likely to be favoured by consumers. Consistent quality ensures that consumers have a positive experience, leading to repeat purchases. Millet that is well-processed, clean, and free from contaminants is preferred.

In Odisha, the government has undertaken several initiatives to promote the production, purchase, and consumption of millet. These efforts aim to support local farmers, enhance food security, and encourage healthier dietary choices among the population. The government provides subsidies and financial assistance to millet farmers to encourage millet cultivation. This includes support for seeds, fertilizers, and other agricultural inputs.

Limitation of the Study

Research should take into account the effects of several variables in other states in India, Furthermore, the geographical limitation imposed by the online survey's administration in Odisha means that the study's conclusions cannot be applied to a broader population. The study suggests using a combination of qualitative and quantitative methods to examine the impacts of different variables on the demographic factors

separately. A hypothesized model can be developed by taking into account different dependent and independent variables.

Policy Recommendations

To increase yields and resilience, millet research and development should get significant financial assistance from governments and international organizations. This funding should be directed towards boosting genetic diversity, seed quality, and inputs (Padulosi et al., 2015). To connect millet producers with consumers and guarantee fair pricing, infrastructure investments—such as storage facilities, transportation networks, and marketplaces—are essential. This will encourage additional investment in millet cultivation (Bjornlund et al., 2020). Governments, international organizations, and non-governmental organizations must work together to increase consumer demand by promoting the nutritional advantages of millets and their variety in meals (Gruère et al., 2009).

Research Recommendations

A comprehensive investigation into the nutritional advantages of millets is desperately needed because of their high fiber, protein, and vitamin content, which may help prevent malnutrition. By becoming aware of these benefits, millet consumption can be raised, potentially increasing consumer demand. Additionally, to discover the best farming practices and increase yields, especially in regions that are prone to drought, focused research on sustainable millet production methods is required. By sharing these techniques, farmers can be encouraged to make millet cultivation investments and increase production. Examining cutting-edge millet processing methods is also essential to improving the calibre of millet-based goods and increasing their customer appeal. The market can offer a wider variety of millet goods thanks to innovative processing techniques, which will increase demand.

Practical Implication of the Research

The practical implications of studying millet consumption in Odisha can be far-reaching, affecting public health, agriculture, economic development, and cultural practices. By leveraging the insights gained from such a study, stakeholders can implement targeted interventions and policies to promote millet consumption, support local economies, and contribute to overall well-being and sustainability. Understanding consumer preferences and barriers to millet consumption can help in developing marketing strategies that increase demand. This can include product innovation, branding, and marketing campaigns tailored to consumer needs.

Conclusion

Historically, millets were a staple in the diets of rural communities in Odisha. They were traditionally used to make a variety of local dishes, but their consumption has declined with the increased availability of rice and wheat. The government of Odisha and various NGOs have been working to revive millet cultivation and consumption. Initiatives include promoting millets in public distribution systems and integrating them into mid-day meal schemes in schools. One of the major challenges is the lack of awareness about the nutritional benefits of millet. There is a need for educational campaigns to inform the public and encourage the adoption of millet in daily diets. Developing market infrastructure for millets, including processing facilities and distribution channels, is essential to make millet-based products more accessible and affordable.

Reference

A, Cabrera., J.C.A., Salinasal., Nonna, Fatima, H., Abello. (2022). 5. Quality evaluation of millet (Panicum miliaceum) instant cereal product in Cebu, Philippines. *Food Research,* doi: 10.26656/fr.2017.6(2).242.

Akhil, C., Asit, Panja., Nisha, Gupta. (2023). 3. Conventional ayurveda recipes & products: a review. *Global journal for research analysis*, doi: 10.36106/gjra/4304265.

Alekhya, P. and Shravanthi, A. R. 2019. Buying behaviour of consumers towards millet based

food products in Hyderabad district of Telangana, India. Int. J. Curr. Microbiol. *Appl. Sci.,* 8(10): 223-236.

Anju, Bisht. (2022). 4. Small-Millet-Based Traditional and Unconventional Food Products. doi: 10.1007/978-981-16-9306-9_5.

Ansar, Ahamed, V.P.., Abhishek, Joshi., Abhay, Mudey., Sonali, G, Choudhari., Juhi, Raut., S., Ahmed. (2024). Unlocking the Potential: Millets and Their Impact on Diabetes Management. *Cureus,* doi: 10.7759/cureus.59283.

Barratry, D. and Rajapushpam, R. 2018. A study on perception of millet products among household consumers in Salem district. IOSR J. Bus. *Manag.,* 20(8): 67-76.

Basavaraj G, Rao PP, Bhagavatula S, Ahmed W. Availability and utilization of pearl millet in India. *SAT eJournal,* 2010, 8.

Bharathy, D. and Rajapushpam, R. 2020. A study on purchasing behaviour of millet products among consumer on Salem region. *IJSTR.*, 9(2): 230-234.

Bjornlund, V., Bjornlund, H., & Van Rooyen, A. F. (2020). Why agricultural production in sub-Saharan Africa remains low compared to the rest of the world–a historical perspective. *International Journal of Water Resources Development,* 36(sup1), S20-S53.

Chanda, Vilas, Dhumal., P., P., Sutar., M., Tech., I., L., Pardeshi. (2014). (4) Development of Potato and Barnyard Millet Based Ready to Eat (RTE) Fasting Food.

Charlotte, G, Karunakaran., Asna, Urooj. (2020). 6. Millets the "Wonder Nutricereal" - As Complimentary Food.

Comerford, K. B., Miller, G. D., Boileau, A. C., Masiello Schuette, S. N., Giddens, J. C., & Brown, K. A. (2021). Global review of dairy recommendations in food-based dietary guidelines. *Frontiers in Nutrition,* 8, 671999.

D., P., Tewari., Savita, Rani, Singhal. (2023). 2. Organoleptic and Nutritional Evaluation of Pearl Millet (Bio-Fortified, Var. HHB-299) Value Added Products. *Annals of Arid Zone,* doi: 10.59512/aaz.2023.62.2.9.

D., R., Pravallika., B., Dayakar, Rao., Seema., D., Srinivasa, Chary., N., Sri, Devi. (2020). (1) Market Strategies for Promotion of Millets: A Critical Analysis on Assessment of Market Potential of Ready to Eat (RTE) and Ready to Cook (RTC) Millet Based Products in Hyderabad. *Asian Journal of Agricultural Extension, Economics and Sociology,* doi: 10.9734/AJAEES/2020/V38I1230507.

Dhevika, D. and Saradha, J. 2018. Health awareness about organic cereals and millets among women college teachers, Tiruchirappalli. J. *Exclus. Manag. Sci*., 7(10): 1-8.

Dr., Sridhanya, Venkataramanan. (2023). Trend analysis of millet consumption in south india. *EPRA international journal of multidisciplinary research,* doi: 10.36713/epra14960.

Fanzo, J. (2014). Strengthening the engagement of food and health systems to improve nutrition security: Synthesis and overview of approaches to address malnutrition. *Global food security,* 3(3-4), 183-192.

Gayathri, M., K., Manimozhi. (2024). (2) Bridging the Knowledge Gap: Enhancing Awareness among Farmers about Millet Cultivation. *Current agriculture research journal,* doi: 10.12944/carj.12.1.23.

Gc, R. K., & Hall, R. P. (2020). The commercialization of smallholder farming—a case study from the rural western middle hills of Nepal. *Agriculture,* 10(5), 143.

Gruère, G., Nagarajan, L., & King, E. O. (2009). The role of collective action in the marketing of underutilized plant species: Lessons from a case study on minor millets in South India. *Food Policy,* 34(1), 39-45.

Harjeet, Singh., Zubair, Aalam., Sandip, R, Baheti., Anurag, Chaudhary., Alok, Sharma., S., N., Murthy. (2024). (10) Exploring Scientific Validation of Millets in Contemporary Healthcare: A Traditional Food Supplement. *Recent advances*

in food, nutrition and agriculture, doi: 10.2174/012772574x265711231109195603.

Hema, V., Ramaprabha, M., Saraswathi, R., Chakkaravarthy, P.N., Sinija, V.R. (2022). Millet Food Products. In: Anandharamakrishnan, C., Rawson, A., Sunil, C.K. (eds) Handbook of Millets - Processing, Quality, and Nutrition Status. *Springer, Singapore.* https://doi.org/10.1007/978-981-16-7224-8_12.

Hulas, Pathak., Kumaravelu, Chandu, Kiran., AK, Gauraha. (2023). 3. Consumer Awareness and Consumption Pattern of Millets and Millet-Based Products in Raipur City, *Chhattisgarh. Indian journal of agricultural economics,* doi: 10.63040/ijae.vol.78.issue.03.012.

Jaqueline, Maciel, Vieira, Theodoro., Bárbara, Pereira, da, Silva., Renata, Celi, Lopes, Toledo., Mariana, Grancieri., Pietra, Vidal, Cardoso, do, Prado., Izabela, Maria, Montezano, de, Carvalho., Carlos, Wanderlei, Piler, Carvalho., Hércia, Stampini, Duarte, Martino. (2024). 2. Conventional and germinated pearl millet flour (Pennisetum glaucum (L.) R. Br.) improves iron metabolism and antioxidant capacity in Wistar rats. *Journal of Cereal Science,* doi: 10.1016/j.jcs.2023.103840.

Jay, Kant, Yadav. (2023). 2. Why Millets?. *African Journal of Food, Agriculture, Nutrition and Development,* doi: 10.18697/ajfand.117.cy045.

John, R.N., Taylor., Kwaku, G., Duodu. (2019). 3. Traditional Sorghum and Millet Food and Beverage Products and Their Technologies. doi: 10.1016/B978-0-12-811527-5.00009-5.

Kalaiselvi, A., Fathima, L. R. and Parameswari, M. 2016. Awareness and consumption of millets by women - A study on Coimbatore city. *Indian J. Appl. Res.,* 6(2): 96-99.

M., S., Harish., Axay, Bhuker., Bhagirath, Singh, Chauhan. (2024). 1. Millet production, challenges, and opportunities in the Asia-pacific region: a comprehensive review. *Frontiers in sustainable food systems,* doi: 10.3389/fsufs.2024.1386469.

Macauley, H. and Ramadjita, T. (2015) Les cultures céréalières: Riz, maïs, millet, sorgho et blé. Nourrir l'Afrique, Centre International de Conférences Abdou Diouf de Dakar-Sénégal, Dakar, Sénégal, 21-23 Octobre 2015, 38 p.

Mita, Kotecha. (2023). 1. Millets: Ayurveda's time-honored wisdom. *Journal of drug research in ayurvedic sciences,* doi: 10.4103/jdras.jdras_350_23.

MK, Vahini., S., Rani., A., Vidhyavathi., S., Hemalatha., R., Vasanthi. (2023). A study on factors influencing consumption of millets in Coimbatore district of Tamil Nadu. *International Journal of Statistics and Applied Mathematics,* doi: 10.22271/maths.2023.v8.i5sa.1160.

Monica, Chande., Happiness, Muhimbula., Ruth, Mremi., Y., C., Muzanila., Nelson, Kumwenda., John, Msuya., Harry, W., Msere., Mateete, A., Bekunda., Patrick, Okori., Wanjiku, N., Gichohi-Wainaina. (2021). *Drivers of millet consumption among school aged children in central Tanzania.* 5 doi: 10.3389/FSUFS.2021.694160.

Mr., Prasad, R., Sonawane., Mr., Pranav, Sandip, Wadge., Ms., Laxmi, Ananda, Sanas., Mr., Suyash, Narendra, Patil., Ms., Priyanka, Rajendra, Mahale., Dr., Sucheta, C., Bidve. (2024). (3) Healthful Millets. *International Journal of Advanced Research in Science, Communication and Technology,* doi: 10.48175/ijarsct-15644.

Mridula, Pandey., Sadhna, Singh., Rahul, Tripathi., Ayush, Mishra., P., K., Singh., Himanshu, Tiwari., P., Dwivedi., Suneel, Kumar. (2024). 1. *Millets for Food and Nutrition Security: A Review.* doi: 10.9734/ijpss/2024/v36i24385.

Narayan, Jadhav., Deepak, Londhe. (2023). 4. Policy support for the promotion of millets: Current status and its impact. *Journal of drug research in ayurvedic sciences,* doi: 10.4103/jdras.jdras_181_23.

Nidhi, Soni., Mamta, Singh., Namrata, Jain. (2024). 1. Development and quality evaluation of millet based extruded product. *International journal of advanced biochemistry research,* doi: 10.33545/26174693.2024.v8.i2b.550.

Padulosi, S., Mal, B., King, O. I., & Gotor, E. (2015). Minor millets as a central element for sustainably

enhanced incomes, empowerment, and nutrition in rural India. *Sustainability,* 7(7), 8904-8933.

Patel, J. R., & Shah, P. A. (2023). Processing Technologies for Enhancing the Nutritional Profile of Sorghum Millets. *Journal of Agricultural Science,* 15(1), 74-88. https://doi.org/10.5539/jas.v15n1p74.

Pragya, Agrawal., Brij, Raj, Singh., Ujwal, Gajbe., Minal, Kalambe., Maithili, Bankar. (2023). (1) Managing Diabetes Mellitus With Millets: A New Solution. *Cureus,* doi: 10.7759/cureus.44908.

Rabina, Acharya. (2023). 3. Innovations on millets research: Need of the hour. *Journal of drug research in ayurvedic sciences,* doi: 10.4103/jdras.jdras_355_23.

Rajesh, Reddy., Deval, Patel. (2023). A Study on Consumers' Awareness and Preference towards Millets and Its Products in Vizianagaram District, Andhra Pradesh, India. *Asian Journal of Agricultural Extension, Economics and Sociology,* doi: 10.9734/ajaees/2023/v41i61915.

Ranjita, Devi, Takhellambam., Bharati, V., Chimmad. (2015). (3) Study on physico-functional and nutrient composition of ready-to-cook (RTC) millet flakes.. *Asian Journal of Home Science,* doi: 10.15740/HAS/AJHS/10.2/327-331.

Rosamund, Jyrwa., Ananta, Choudhury., Freddy, Teilang, Nongkhlaw. (2024). 3. Millets: ancient grains with modern nutritional value and sustainable potential. doi: 10.58532/v3bgpn11p1ch13

S., D., Deshpande., P., K., Nishad. (2021). (2) Technology for Millet Value-Added Products. doi: 10.1007/978-981-16-0676-2_14

S., Padmalini., M, I, Rizwana., Thiruvengadam, Mohanasundaram., Seetharampalayam, Chettiannan, Vetrivel. (2023). Traditional food consumption in the modern era: assessing the millet consumption behaviour among south Indian urban women. *Food Research,* doi: 10.26656/fr.2017.7(2).823

S., Vanishree., G.N., Maraddi., Aravind, Rathod. (2018). 5. Promotion of Foxtail Millet for Food Security through Front Line Demonstration. *International Journal of Current Microbiology and Applied Sciences,* doi: 10.20546/IJCMAS.2018.708.418

Sangeeta, Shree. (2022). 2. Effect of Packaging Materials and Moisture Level on Pearl Millet Stored Under Ambient Condition. *International Journal of Research Publication and Reviews,* doi: 10.55248/gengpi.2022.3.9.48.

Sarita, E. S., & Singh, E. (2016). Potential of millets: nutrients composition and health benefits. *Journal of Scientific and Innovative Research,* 5(2), 46-50.

Sarita, Srivastava., Anju, Bisht. (2021). (6) Millet-Based Value-Added Food Products for Diabetics. doi: 10.1007/978-981-16-0676-2_16.

Satyavathi, C. T., Ambawat, S., Khandelwal, V., & Srivastava, R. K. (2021). Pearl millet: a climate-resilient nutricereal for mitigating hidden hunger and provide nutritional security. *Frontiers in Plant Science,* 12, 659938.

Seetha, Anitha., Takuji, W., Tsusaka., D., I., Givens., Joanna, Kane-Potaka., R., Botha., Nurulahda, binti, Sulaiman., Shweta, Upadhyay., Mani, Vetriventhan., Anantha, Kumar, Rajendran., Devraj, J., Parasannanavar., Thingnganing, Longvah., Kowsalya, Subramaniam., Raj, Kumar, Bhandari. (2024). Does millet consumption contribute to raising blood hemoglobin levels compared to regular refined staples: a systematic review and meta-analysis. *Frontiers in Nutrition,* doi: 10.3389/fnut.2024.1305394.

Shravani, R, Wadekar., Manish, Hate., Ramesh, Chaughule. (2023). 1. Increasing shelf life of millets by developing bio-nanocomposite films (bioplastic) as an alternative to conventional plastic. *Brazilian Journal of Development,* doi: 10.34117/bjdv9n11-079.

Soumen, Pandey., Ankita, Bharti., Prity, Bharti. (2023). 1. Central and State Government initiatives for mainstreaming millets and millets based products. *Pharma innovation,* doi: 10.22271/tpi.2023.v12.i9o.22837.

Sudha, Kumbar., Usha, Devi., Navneetha., R. (2023). 5. Development of Value Added Multi Millets Namkeens. *International Journal For Multidisciplinary Research,* doi: 10.36https://doi.org/10.1007/s12571-022-01234-4 948/ijfmr.2023.v05i06.10434.

Suheli, Mehta., Deepika, Taterway. (2024). (3) A study on awareness and utilisation pattern of millet. *International journal of home science,* doi: 10.22271/23957476.2024.v10.i1e.1591.

Tirath, Raj., K, Samraj., Rajalakshmi, Shanmugavelan., Vignesh, Malaisamy., Radha, Sudalaimani., Arunachalam, Krishnasamy. (2024). 3. A review of Siddha smart foods millet products for a healthy lifestyle. *Journal of Research in Siddha Medicine,* doi: 10.4103/jrsm.jrsm_14_23.

Vinodhini.J., Chinnappan, Ambrose, Kalpana. (2024). 3. Eco-Friendly Alternatives to Conventional Plastics – Finger Millet Based Soluble Food Folds. *Journal Kesehatan Lingkungan (Jurusan Kesehatan Lingkungan, Fakultas Kesehatan Masyarakat Universitas Airlangga),* doi: 10.20473/jkl.v16i2.2024.137-143.