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Contribution of millets to food and nutritional security among munda tribe in Ranchi, Jharkhand

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Abstract

The food system of the world especially in the India is increasingly threatened by climate change, population expansion, malnutrition and incipient health disorders. This paper discuss the role of millets in food and nutritional security of the Munda tribal people in Tamar block of Ranchi district, Jharkhand. Employing a mixed-methods approach, the study integrates qualitative insights from in-depth interviews and focus group discussions with quantitative data derived from structured household surveys. The results indicate that millets particularly finger millet contribute significantly to seasonal food access and nutritional sufficiency, especially during time of scarcity. Millets were eaten by 56 per cent of the respondents between December and April, testifying to their significance in conventional food systems. Rich in protein, dietary fiber, five essential vitamins, and vital minerals like calcium and iron, millets help address widespread micronutrient deficiencies commonly found among tribal communities. The paper emphasizes their nutritional advantages of low glycemic index, gastrointestinal benefits and capacity for anaemia prevention and diabetes management. Gathered data also shows that forest items, insects, wild animals and other foods locally available complement the tribal diet, supporting both biodiversity preservation and food diversity. Nutritional content analysis of the finger millet samples verifies its high content of nutrients, supporting its potential in under-nutrition prevention as well as in sustaining food systems. This study highlights the imperative to revive and popularize millet-based traditional diet in order to improve food and nutritional security, particularly among vulnerable tribal communities in climate-vulnerable areas.

Keywords: Millets, food security, nutritional security, Munda tribe, tribal diet, climate-resilient, micro-nutrient deficiency, traditional food system

Introduction

The global food system of world especially Indian sub-continent is facing challenges in the 21st century, issues like climate change, population pressure, hunger, malnutrition and and increased disease outbreaks have mounted (Hanjra and Qureshi, 2010) [5]. With this, the food and nutrition agenda of the world has changed towards innovative, strategic interventions to nourish an estimated nine billion people by 2025, equitably, healthily and sustainably (Beddington, 2010) [4]. World Summit on Food Security in 2009 estimated that food production has to be at least increased by 70 per cent by the year 2050 in order to serve the needs of the world's increasing population. This would involve a growth rate of 44 million tons per annum around 38 per cent more than the existing growth rate in food production annually (Tester and Langridge, 2010) [6].

Millets are the group of ancient, climate-resilient grains and have potential of food and nutritional security, which can help to address dietary deficiency and prevalent non-communicable diseases. These grains come from various form vie. Finger millet, little millet, pearl millet, sorghum, proso millet etc. which are essential for balance diet. Millets had been part of staple food in many regions of the world due to its high amount of essential nutrients including proteins, dietary fibres, vitamins, amino acids and minerals. They were also rich in micronutrients like zinc, iron, calcium, magnesium etc. furthermore, these grains are low in glycemic index, make them beneficial for managing diabetes and obesity, health issue that are increasingly prevalent worldwide (Augustin *et al.*, 2015) [7]. Keeping all the views, the study aimed to assess the contribution of millets to food and nutritional security among Munda community.

Methodology

Study locale and population

This study used a mixed-methods design to access the contribution of millets in achieving food and nutritional security among purposively selected tribal populations in Ranchi district, Jharkhand state of India. The field work was undertaken in a Tamar (Community Development Block) Ranchi district, which was chosen purposively based on its predominantly high population of Munda tribe.

Ranchi district has a geographical area of 5,097 sq.km and according to the 2011 census, a population of 2,914,253 out of which around 35.76 per cent comprise the Munda tribe community. Tamar block was selected as the study location due to its high percentage of the Munda population, providing cultural and dietary significance of millet consumption and its nutritional effects.

One village, Chipi Bandhdih was chosen for the field survey from this block. In these village, data was collected through personal interview and structured questionnaires based on food patterns in the household, consumption practices of

millets and perceptions concerning nutritional security.
This study implemented a cross-sectional community study design with a mixed-methods approach to determine the contribution of millets to food and nutritional security among the Munda population in Ranchi district, Jharkhand. The qualitative aspect of the study emphasized the understanding of cultural attitude, traditional beliefs and home-level food practices regarding millets through in-depth interviews and spontaneous discussions. The quantitative aspect endeavored to elicit structured data on the frequency of millet intake, food diversity and home-level dietary habits through structural questionnaires.
The mixed-methods design not only permitted triangulation of data, thereby enhancing validity and reliability of findings but also offered a detailed understanding of the relationship between traditional millet-based diets and nutritional outcomes in the chosen tribal population.

Study procedures
The research utilized a mixed-methods strategy, combining qualitative as well as quantitative study. This methodology facilitated data triangulation and strengthening the validity of the results as well as offering detailed information on the food and nutritional habits of the Munda tribes.
Qualitative data were gathered through personal interviews, enabling a deeper understanding of traditional knowledge, cultural practices and perceptions about millet consumption. A purposive sampling method was adopted to select participants relevant to the study to identify respondents from tribal homes. The sample comprised both individuals who were directly involved in in agricultural activities and food preparation, ensuring a complete understanding of household food system and millets use.

Selection of respondents
The survey and interview had done by respondents of different age groups such as young, middle and old age men and women of village. Respondents were personally interviewed according to their millet farming, their accessibility, use and other related information.

Table 1: Profile of Santhal respondents in four villages of East Singhbhum district

Name of the block	Name of the village	Number of respondents	Age group			Gender	
			Young age	Middle age	Old age	Men	women
Ranchi	Chipi Bandhdih	50	18	23	09	25	25

Table 1 shows that the study was carried out in a Community Development Block, i.e. Tamar, of Ranchi district, Jharkhand. A single village Chipi Bandhdih was purposively chosen from the Tamar block. Fifty respondents were randomly selected from the village and so the sample size for the selected district remained 50. Data were obtained by administering personal interviews based on a pre-prepared interview schedule.

Results and Discussion
The study explain that the potential of millets in respondents to food and nutrition security, specifically in the context of tribal populations in Jharkhand. This is an important to topic that millets are nutrient-rich and has the potential to help in fight against malnutrition and food security.
Both qualitative and quantitative data were gathered through observation and interviews. Secondary data were gathered from books and authentic internet sources. Using the mixed-methods design allowed for a broad insight into the role of millets in the food habits and nutritional health of these populations.

Contribution of millets in food and nutritional security
Millets have long been known as an important component of food security, especially in regions where access to other staple grains may be limited. Its offer many benefits for food security, both at the individual and community levels. The month-wise contribution of millets was shown in Table 2.

Table 2: Month-wise contribution of millets and other crops to food in the selected tribe Jharkhand

Month's name	Food materials (Item-wise)
January	Rice, pulses, vegetables, forest products, Finger millet
February	Rice, pulses, vegetables, forest products, Finger millet
March	Rice, pulses, vegetables, forest products, Finger millet
April	Rice, wheat, pulses, vegetables, forest products, Finger millet
May	Rice, wheat, pulses, vegetables, forest products
June	Rice, wheat, pulses, vegetables, forest products
July	Rice, wheat, pulses, vegetables, forest products
August	Rice, pulses, vegetables, forest products
September	Rice, pulses, vegetables, forest products
October	Rice, pulses, vegetables, forest products
November	Rice, pulses, vegetables, forest products
December	Rice, pulses, vegetables, Finger millet

Table 2 highlights different dietary patterns and food security situations among Munda tribe. They access to staple foods and supplementary grains throughout the years, which reflects regional and cultural food practices, agricultural conditions and possibly social and economic factors.
Year-round availability of rice, pulses, vegetables and forest products: This indicates a relatively stable and diverse food source which can contribute to nutritional balance. Forest products could include wild fruits, nuts were important for

seasonal variation in diet.

Wheat for only four months (April to July) which indicated that the limited wheat availability was a less reliable or seasonal crop for the Munda respondents. This reflected agricultural practices or reliance on external sources for wheat during certain time of the year.

Finger millet for five months (December to April) indicated that finger millet was a highly nutritious and drought-resistant crop, making it an important staple in Munda people's diets. Its availability for five months suggests that it was a more locally produced or accessible food. The long period of finger millet availability also indicates its central role in the Munda diet during specific months.

Month-wise contribution of millets and other crops as food

The contribution of millets to food consumption varies depending on factors such as seasonality, availability and regional preferences. The month-wise distribution of millet availability is given in Table 3

Table 3: Percentage distribution of month-wise contribution of millets and other food items in food security among selected tribal groups (N=200)

Sl. No	Food materials (Item-wise)	Munda (N=50)	Overall current status
1.	**January**		
	Finger Millet	45 (90)	***
	Little millet	-	**
	Sorghum	-	**
	Rice	50(100)	*****
	Wheat	-	*
	Pulses	30 (60)	****
	Vegetables	50(100)	*****
	Forest products	45 (90)	*****
2.	**February**		
	Finger millet	45 (90)	**
	Little millet	-	*
	Sorghum	-	**
	Rice	50(100)	*****
	Wheat	-	*
	Pulses	30 (60)	****
	Vegetables	50(100)	*****
	Forest products	35 (70)	****
3.	**March**		
	Finger millet	45 (90)	**
	Little millet	-	*
	Sorghum	-	*
	Rice	50(100)	*****
	Wheat	-	*
	Pulses	20 (40)	***
	Vegetables	46 (96)	*****
	Forest products	35 (70)	*****
4.	**April**		
	Finger Millet	32 (64)	**
	Little millet	-	*
	Sorghum	-	*
	Rice	50 (100)	*****
	Wheat	11 (22)	*
	Pulses	20 (40)	***
	Vegetables	40 (80)	****
	Forest products	48 (96)	*****
5.	**May**		
	Finger millet	-	*
	Little millet	-	*
	Sorghum	-	*
	Rice	50(100)	*****
	Wheat	11 (22)	*
	Pulses	20 (40)	***
	Vegetables	22 (44)	****
	Forest products	45 (96)	*****
6.	**June**		
	Finger millet	-	*
	Little millet	-	*
	Sorghum	-	*
	Rice	50 (100)	*****

	Wheat	5 (10)	*
	Pulses	20 (40)	**
	Vegetables	20 (40)	****
	Forest products	5 (10)	***
7.	**July**		
	Finger millet	-	*
	Little millet	-	*
	Sorghum	-	*
	Rice	50 (100)	*****
	Wheat	5 (10)	*
	Pulses	20 (40)	**
	Vegetables	40 (80)	****
	Forest products	5 (10)	****
8.	**August**		
	Finger millet	-	*
	Little millet	-	*
	Sorghum	-	*
	Rice	50 (100)	*****
	Wheat	-	*
	Pulses	20 (40)	*
	Vegetables	40 (80)	****
	Forest products	48 (96)	*****
9.	**September**		
	Finger millet	-	*
	Little millet	-	*
	Sorghum	-	*
	Rice	50(100)	*****
	Wheat	-	*
	Pulses	20 (40)	**
	Vegetables	42 (84)	****
	Forest products	45 (90)	*****
10.	**October**		
	Finger millet	-	*
	Little millet	-	*
	Sorghum	-	*
	Rice	50 (100)	*****
	Wheat	-	*
	Pulses	20 (40)	*
	Vegetables	50 (100)	*****
	Forest products	35 (70)	*****
11.	**November**		
	Finger millet	-	*
	Little millet	-	*
	Sorghum	-	*
	Rice	50 (100)	*****
	Wheat	-	*
	Pulses	35 (70)	***
	Vegetables	50 (100)	*****
	Forest products	5 (10)	****
12.	**December**		
	Finger millet	45 (90)	***
	Little millet	-	**
	Sorghum	-	***
	Rice	50 (100)	*****
	Wheat	-	*
	Pulses	36 (72)	***
	Vegetables	50 (100)	*****
	Forest products	-	***

Figures in parentheses indicate percentages

***** Highly adequate (> 80%)

**** Adequate (61-80%)

*** Moderately adequate (41-60%)

** Less adequate (21-40%)

* Inadequate (<20%)

Table 3 revealed that food consumption patterns of Munda tribe in Jharkhand highlights interesting seasonal variations, cultural practices and the dependency on local agricultural production. The analysis of the food consumption trends and some key insights:

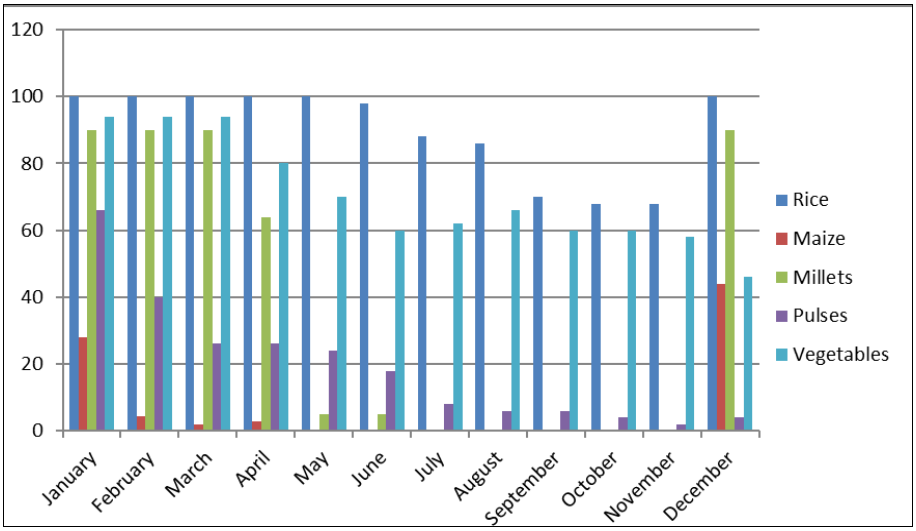

Fig 1: Month-wise contribution of millets and other food items among Munda tribe

Table 3 and Figure 1 for the month-wise contribution of finger millet and other food items among Munda respondents where the consumption was seasonal and the detail of the food items were given below

56 per cent of Munda respondents were consumed finger millet in month of December, January, February, March and April. There a sharp drop from May to November where millets are not available.

Food habits of the respondents shows that rice was cent-per-cent house-hold food items were consumed throughout the year. Wheat was seasonally available and only 10 to 22 per cent respondents to be available in April to July. Pulses were available more regularly and 40 to 60 per cent of the respondents had it available throughout the year. Vegetable availability was highly variable (40-100%), indicating that although some months had almost universal access, other had restricted availability. Forest products contribute importantly to the diet with 10 to 96 per cent of respondents depending on them at various times of the year, including a high reliance on local forest for nutritional purposes.

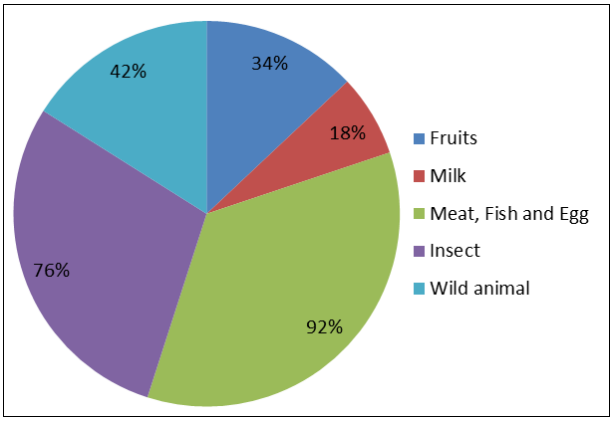

Fig 2: Contribution of other food items among Munda tribe

Figure 2 shows that Munda respondents consumed fruits (34%) from forests and local markets, followed by milk (18%) and meat, fish and egg (92%) sourced from livestock and local markets. Insects (76%) and wild animals (42%) were also consumed, obtained from nearby fields, forests and local markets.

The consumption of insects and wild animals highlights the community's deep connection to their natural environment and reliance on foraging and hunting which contributions to the sustainability of their food sources.

Table 4: Nutritional content of finger millet grown in Ranchi district through lab test (50 grams)

Sl. No.	Nutrient content (50 grams of dry grains)	Finger millet
1.	Moisture (%)	12.76
2.	Ash content (ODB%)	0.872
3.	Crude fiber (%)	4.47
4.	Dietary fiber (%) As-Is	1.8
5.	Dietary fiber (%) ODB	4.22
6.	Protein (%) As-Is	7.3
7.	Protein (%) ODB	8.37
8.	Fat (%) As-Is	1.3
9.	Fat (%) ODB	1.49

Source: Test from the State Food Testing Centre, Namkum, Ranchi

*ODB: On dry basis (All nutritional content are calculated after removing moisture content)

The nutritional test was carried out at the State Food Testing Centre, Namkum, Ranchi, on 50 grams each of finger millet samples. All samples were collected from Ranchi districts and are typical, non-hybrid seed types grown by native tribal communities of Jharkhand. The seeds were indigenous species cultivated using traditional practices, exemplifying the rich agricultural culture and biodiversity conserved by these tribal communities.

Table 5: Nutrient chat of Little millet, finger millet and sorghum (100 grams of dry grains)

Sl. No.	Nutrient content (100 grams of dry grains)	Finger millet
1.	Protein (g.)	7.3
2.	Carbohydrate (g.)	72
3.	Fat (g.)	1.3
4.	Minerals (g.)	2.7
5.	Crude fiber (g.)	3.6
6.	Calcium (mgs.)	344
7.	Phosphorous (mgs.)	283
8.	Iron (mgs.)	3.9
9.	Energy (K.cal.)	336

(Source: Nutritive value of Indian foods, NIN 2007)

A comparison of nutritional content was made between selected millets (little millet, finger millet and sorghum) of Jharkhand (Table 4) with the national data on contents of selected millets (Table 5). The lab test information delivers proximate composition such a moisture, ash content, crude fiber, dietary fiber, protein and fat which are essential properties of the grains. The sample of three millets for lab test was taken of 50 gram/sample whereas the NIN, 2007 report the sample size of the grains was 100 gram/sample.

Little millet is unique with its elevated crude fiber (10.62%) and fat (5.23%), protein (8.57%) and dietary fiber content. According to common values (NIN,2007) little millet has 7.7 gram protein, 4. Gram fat and 67 gram carbohydrate per 100 gram of grains and also 220 mg of phosphorous and 9.3 mg iron which beneficial to populations at risk micronutrient deficiency.

Finger millet, as per the laboratory analysis it contains moderate protein (8.37%), lowest fat (1.49%) and crude fiber (4.47%) which is highly suitable for low-fat, high fiber diet. The average nutritional value indicate its protein (7.3 g), fat (1.3g) and crude fiber (3.6g) and remarkable calcium (344mgs), 283 mg of phosphorus and 3.9 mg of iron. Finger millet nutrient content aids in bone health and enhances immunity.

Sorghum has the highest protein (11.69%) value of the three millet in the 50g laboratory test and a well balanced crude fiber (1.99%) and fat (3.48%). According to the NIN data, sorghum contains 10.4g protein, 70.7g carbohydrates and 3.1g of fat for every 100g. it contains 5.4 mg of iron and 222 mg of phosphorus which underscoring its relevance in cardiovascular health and brain function.

Finger millet has exceptionally high calcium content (344 mg) that promotes bone health, little millet has the highest iron content (9.3 mg) that fights iron-deficiency anemia and sorghum contributes to everyday intake of protein, fiber and micronutrients like magnesium and phosphorus that promote heart health and metabolic processes. These millets are good sources of sulfur amino acids which are important for protein synthesis, detoxification and maintenance of healthy skin and hair.

Little millet is noted for high content of crude fiber (7.6 g.), which is good for digestive health and blood sugar regulation. Millets are inherently low in fat, making them the best for heart-healthy diets. Little millet and finger millet have no measurable fat content whereas sorghum is a source of moderate amounts of healthy fatty acids.

This means these traditional grains are already staples in the diets of tribals are not only wonderful foods that enrich tribal diets but also good candidates for fostering sustainable and healthy food system

The finding discussed in the foregone paragraphs lead to conclude that Millet particularly finger millet, little millet and sorghum have an important seasonal contribution toward increasing food and nutritional security among Munda tribe of Jharkhand. The Munda respondents indicated regular consumption of finger millet between December to April months. Rice was found to be staple and available throughout the year in all communities. Pulses, vegetables and forest products also played an important role in food diversity and seasonality. The study identified that millet intake goes hand in hand with local cultivation patterns and seasonal access and meaningfully adds to dietary resilience particularly during lean periods when other grains are comparatively less accessible. Also little millet, finger millet and sorghum grown by tribal farmers in Jharkhand traditionally which account for nutritional security.

A comparative study of Jharkhand indigenous millet sample tested in the laboratory and national data (NIN,2007) throws light on the higher nutritional value of these millets. little millet in Gumla exhibited high crude fiber (10.62%), fat (5.23%) and protein (8.57%) content favorable to gut health and micronutrient adequacy. Ranchi, finger millet was characterized by its protein (8.37%) and high calcium level (344 mg/100g) which was vital for bone health an immunity. Godda, sorghum had the highest protein content (11.69%) of the three with equilibrating fiber and fat and is thus useful for cardiovascular and metabolic activities. Although national averages (on 100g samples) give a comparable data with Jharkhand sample was analyzes in 50g quantities. Emphasize the national richness and dietary value. The fact is millets perform well in rainfed and marginal lands to.

Conclusion

The research identifies the high potential of millets as an integral part of food and nutrition security of tribal communities in Jharkhand. Millets are nutrient-rich, drought-tolerant and acceptably consumed by tribal communities, thus a sustainable and economic food source in areas of food security and malnutrition. The pattern of month-wise availability and consumption reveals that millets particularly finger millet make an important contribution towards diet supplementation along with staple food items such as rice, pulses and forest product.

Nutritionally millets are very rich in proteins, vitamins, minerals (like calcium, iron, phosphorous etc.) dietary fiber and antioxidants which play a crucial role in avoiding malnutrition, anaemia and diet-related disorders. They have high fiber which is beneficial for metabolic balance, weight and control of diabetes. The traditional farming and use of millets by tribal communities not only maintain the traditional methods of farming but also ensure environmental sustainability.

In all, encouraging millet production and utilization can boost dietary diversity, improve health outcome and consolidate food and nutrition security among vulnerable tribal groups in Jharkhand, make millets a vital crop in the struggle against malnutrition and food insecurity.

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