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Dietary intake during pre- and post –harvest season among the Munda of Sundarban, West Bengal, India

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ABSTRACT

Background and objectives

Unhealthy living conditions, and limited access to health careare the main causes of under nutrition in developing nations. The studied population Munda is a socio-economically background tribe who are landless and depend upon different kind of occupation for their subsistence economy. In this study food security and dietary intake (during pre- and post-harvest period) has been examined among the Munda tribe of Sundarbans, Southern Bengal, India.

Material and Methods

Forty-five households were considered in three rounds for dietary survey. Fifteen households were covered in each phase. Prior to each household's cooking for five days in a row, at least two visits were made to each as part of the dietary survey. A portable single-pan digital salter balance was used to measure the ingredients for the food that needed to be cooked for each home.

Results

Consumption of different nutrients is shown in terms of recommended allowance. Like pre-harvest season in post-harvest season also a high level of deficit is noticed for per consumption unit and per capita unit in terms of net energy (K Cal).Total calorie intake is much lower among them in terms of recommended daily allowance as recommended by ICMR (2017).

Conclusion

The studied population Munda is a socio-economically background tribe who are landless. It can be noted that more than 38 percent of the Munda households having less than one-month food sufficiency i.e. they

fall in the category of not producing at all. As expected, net energy (K Cal) deficiency is much lower in pre-harvest period than that of post-harvest period. This is true for both per consumption unit and per capita unit.

Keywords: *Diet. Different seasons. Calorie intake. Munda tribe. West Bengal.*

INTRODUCTION

In Indian tribes, malnutrition affects adults at a constant rate (NFHS-III, 2009). According to the FAO (2011), malnutrition is an abnormal physiological condition brought on by unacceptable, out-of-balance, or excessive consumption of the micronutrients (vitamins and minerals) necessary for physical and cognitive development as well as the macronutrients (carbohydrates, proteins, and fats) that provide dietary energy. The numerous burdens of malnutrition which often result in undernourishment and under nutrition, deficiencies in micronutrients, and overweight and obesity forcefully impose high intensity. In other circumstances, the degree of malnutrition was influenced by the economic and social positions of numerous nations. Different types of malnutrition may coexist in the same nation, state, district, neighbourhood, home, or individual, and both their prevalence and the way food systems are organised are changing quickly (FAO, 2013). The most current FAO assessments show that 8.68 billion individuals worldwide, or 12.5% of the population, are undernourished in terms of energy intake, yet these numbers only represent a small portion of the global malnutrition burden (FAO 2013).

Food consumption that is insufficient to meet dietary energy requirements for an active and healthy life is referred to as undernourishment. According to estimates from 1990 to 1992, there were 852 million fewer undernourished individuals in developing nations, and the frequency of undernourishment dropped from 23% to 15% (FAO et al. 2012). According to a recent proportionate risk assessment by the World Health Organisation (WHO, 2002), undernutrition is by far the biggest cause of the disease's worldwide burden. Since 1981, hunger and undernutrition have decreased in the majority of Asia, where the Green Revolution increased food supplies (Gupta 2004). Despite the abundance of food grains in South Asia and India, the region still has high rates of malnutrition and hunger (Gupta, 2004). According to Das and Bose (2012), it can be split into unbalanced diets and particular food deficits. Food security, household diet surveys, biochemical evaluation (estimation of physiological parameter or index), anthropometric measures, sociodemographic profiles, and ecological studies methodologies are just a few of the ways that nutritional screening and assessment can be found. According to Mitra (1985) and the World Health Organisation (1990), poverty, unsanitary living conditions, and limited access to health careare the main causes of under nutrition in developing nations. In this study food security and dietary intake (during pre- and post-harvest period) has been examined among the Munda tribe of Sundarbans, Southern Bengal, India.

MATERIALS AND METHODS

In three rounds, 45 households were considered for dietary survey. Each phase covered 15 households. Prior to each household's cooking for five days in a row, at least two visits were made to each as part of the dietary survey. A portable single-pan digital salter balance was used to measure the ingredients for the food that needed to be cooked for each home. Visitors who shared food from the home and family members who ate outdoors while away on the day of the investigation were also noted. Information on cooked or uncooked food waste was also documented. The amount of intake of fats, oils, sugar, jaggery, and other ingredients was calculated based on their weekly or monthly use. Based on the food consumption tables included in the ICMR publication (Gopalan, 2017), the nutritional value of the

ingested food item was computed. Each household's daily average intake of various foods and nutrients was calculated. It enables us to compute the consumption of various foods and nutrients per capita and per consumption unit. The basis for estimating the consumption unit is the individual's calorie need. Therefore, a healthy working reference man with a body weight of 55 kg is used as the benchmark. The moderately active reference man needs 2800 calories, which is equal to one consumption unit. Therefore, a person who needs X calories represents X 2800 units. The calorie requirements of each household's members were used to calculate the consumption unit. For the purpose of estimating calorie requirements, the woman's pregnancy and lactation status were also taken into account.

RESULTS

Table 1 depicts that more than 94 percent of the households eat vegetables including leafy vegetables regularly. And more than 84 percent of the households eat fish and egg regularly. It is interesting to note that about 68 percent of them consume handia (country liquor) regularly. Whereas, they consume fruits and pulses once in a week. They consume handia once in a week. However, a very high percent of them consume milk, pulses, fruits and sweets once in a month

Consumption of different food groups (in gm) in pre and post-harvest season is expressed in terms of per consumption and per capita unit for the Munda in Table 2. It can be seen that most of them consumed cereals, mainly rice and wheat during pre- and post-harvest season. As a result, per consumption and per capita unit both are very high in this category. However, they consume different vegetables, roots and tubers in considerable percentage. However, they consume pulses and different kinds of milk product in lesser amount.When compared to the post-harvest season, it appears that there is a reduction in cereal food consumption of roughly ten percent (10%). Similar to this, the post-harvest season sees a considerably higher intake of green vegetables. Consumption of dietary groups such as pulses, non-leafy vegetables, roots, and tubers (primarily potato and onion) does not alter significantly with the seasons.

Food groups	Eating regularly (at least 3 days in a week)	Eating frequently (at least once in a week)	Eating occasionally often once or twice in a month or never
Pulses	5.6	19.9	74.5
Vegetables including leafy vegetables	94.5	5.6	--
Fish and Egg (occasionally)	84.5	15.5	--
Milk	1.2	3.1	95.7
Sweets	--	14.9	87.23
Fruits	--	23.9	79.50
Handia/ Country Liquor	67.98	34.6	--

Table 1. The consumption of various food groups in the studied households (N = 30) during two distinct seasons, namely pre-harvest and post-harvest (mean in gm)

Table 2. Consumption of different food groups (in gram) expressed in terms of per consumption and per capita unit

	Seasons	Post-harvest		Pre-harvest	
Consumption of food groups in gm.	Expressed in	Per consumption unit per Capita	Per Capita	Per consumption unit per Capita	Per Capita
	Cereal mainly rice & wheat	642.5	509.9	576.4	464.5
	Pulses	7.6	6.0	5.6	4.4
	Leafy vegetables	44.4	34.0	23.5	19.0
	Other vegetables	67.4	54.0	69.6	56.0
	Roots & Tubers	98.1	77.8	96.9	78.8
	Milk & Milk-product	1.8	1.6	1.6.	1.4
	Fish and Egg	43.5	34.4	54.3	43.4
	Oil and Fat	6.0	4.9	7.4	6.0

Quantitative aspect of nutrient intake:

It can be seen from Table 3 that in case of all the nutrients the calorie value calculated to be lower than recommended value. This is true for protein, calcium, fat, iron and vitamin A, B and C. However, in post-harvest season calculated calorie value is found to be higher than that of pre-harvest season.

Table 3. Mean values of consumption of different nutrients with standard deviation in pre-harvest and post pre-harvest among the Munda

Nutrients	Post-harvest				Pre-harvest				Recommended Daily Allowance ICMR (1987) per adult
Expressed in	Per consumption unit		Per capita		Per consumption unit		Per capita		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Calorie	2492	446	1977	419	2266	433	1827	420	2800
Protein (gm) Animal	7.2	6.0	--	--	9.3	6.5	7.5	5.2	
Protein (gm) Vegetable	54.8	13.1	--	--	46.3	12.2	37.4	11.0	
Total Protein (gm)	62.0	14.8	49.7	13.0	55.6	14.3	44.9	12.6	55.0
Fat (gm)	12.5	4.7	10.1	4.4	13.6	4.6	11.0	4.0	--
Calcium(mg)	305	147	245	126	403	238	323	194	500
Iron (mg)	40.1	11.3	31.8	9.6	35.1	35.1	28.3	9.5	24
Vitamin A (microgram)	702	543	555	439	1205	653	948	1436	3000
Vitamin B_1(mg)	1.95	0.50	1.55	0.44	1.60	0.48	1.29	0.43	1.4
Vitamin B_2 (mg)	0.80	0.36	0.63	0.30	0.63	0.30	0.51	0.26	1.7
Nicotinic acid (mg)	26.9	5.0	21.3	4.6	24.4	4.8	19.7	4.7	19
Vitamin C (mg)	86.6	52.0	69.	43.8	40.5	24.2	32.5	20.3	40

Table 4: Consumption of different nutrients with recommended allowance: pre-harvest season
*Excess consumption in terms of recommended allowance

Nutrients	Pre-harvest						Recommended daily allowance ICMR (1987) per adult
Expressed in different units	Per consumption unit			Per capita			
	Mean	SD	Deficiency of the nutrients (in CU)	Mean	SD	Deficiency of the nutrients (in per capita)	
Net energy (Kcal)	2266	433	534	1827	420	973	2800
Protein (gm) Animal	9.3	6.5	-	7.5	5.2	-	-
Protein (gm) Vegetable	46.3	12.2	-	37.4	11.0	-	-
Total Protein (gm)	55.6	14.3	*	44.9	12.6	10.1	55.0
Fat (gm)	13.6	4.6	26.4	11.0	4.0	29	40
Calcium(mg)	403	238	97	323	194	177	500
Iron (mg)	35.1	35.1	*	28.3	9.5	*	19.0
Vitamin A Retinol (microgram)	1205	653	*	948	1436	52	1000
Vitamin B_1 Thiamin (mg)	1.60	0.48	0.2	1.29	0.43	1.37	1.8
Vitamin B_2 Riboflavin (mg)	0.63	0.30	1.87	0.51	0.26	1.99	2.5
Vitamin B_3 Nicotinic acid (mg)	24.4	4.8	*	19.7	4.7	*	18
Vitamin C Ascorbic Acid (mg)	40.5	24.2	39.5	32.5	20.3	47.5	80

In Table 4 consumption of different nutrients is shown in terms of recommended allowance during pre-harvest season among the Munda. A high level of deficit is noticed for per consumption unit (534 K Cal) and per capita unit (973 K Cal) in terms of net energy (K Cal). Deficit is noticed for per consumption unit for the nutrients like fat (26.4 gm), calcium (97 gm), vitamin B1 (0.2 mg), vitamin B_2 (1.87 mg) and vitamin C (39.5 mg). Side by side, deficit is noticed for per capita unit for the nutrients like total protein (10.1 gm), fat (29gm), calcium (177 gm), vitamin A (52 microgram) vitamin B1 (1.37 mg), vitamin B_2 (1.99 mg) and vitamin C (47.5 mg). In case of other nutrients excess consumption is noticed in terms of recommended allowance.

In Table 5 consumption of different nutrients is shown in terms of recommended allowance during post-harvest season among the Munda. Like pre-harvest season in this season also a high level of deficit is noticed for per consumption unit (308 K Cal) and per capita unit (534 K Cal) in terms of net energy (K Cal). Deficit is noticed for per consumption unit for the nutrients like total protein (3.0 gm), fat (27.5 gm), calcium (195 gm), vitamin A (298 microgram) and vitamin B_2 (1.7 mg). Side by side, deficit is noticed for per capita unit for the nutrients like total protein (5.3 gm), fat (29.9 gm), calcium (255 gm), vitamin A (445 microgram) vitamin B_1 (0.25 mg), vitamin B_2 (1.87 mg) and vitamin C (11 mg). In case of other nutrients excess consumption is noticed in terms of recommended allowance.

Table 5: Consumption of different nutrients with recommended allowance: post-harvest season

Nutrients	Post-harvest						Recommended daily allowance ICMR (1987) per adult
Expressed in different units	Per consumption unit			Per capita			
	Mean	SD	Deficiency of the nutrients (in CU)	Mean	SD	Deficiency of the nutrients (in per capita)	
Net energy (Kcal)	)2492	446	308	1977	419	534	2800
Protein (gm) Animal	7.2	6.0	-	-	-	-	-
Protein (gm) Vegetable	44.8	13.1	-	-	-	-	-
Total Protein (gm)	52.0	14.8	3.0	49.7	13.0	5.3	55.0
Fat (gm)	12.5	4.7	27.5	10.1	4.4	29.9	40

Calcium(mg)	305	147	195	245	126	255	500
Iron (mg)	40.1	11.3	*	31.8	9.6	*	19.0
Vitamin A Retinol (microgram)	702	543	298	555	439	445	1000
Vitamin B_1 Thiamin (mg)	1.95	0.50	*	1.55	0.44	0.25	1.8
Vitamin B_2 Riboflavin (mg)	0.80	0.36	1.7	0.63	0.30	1.87	2.5
Vitamin B_3 Nicotinic acid (mg)	26.9	5.0	*	21.3	4.6	*	18
Vitamin C Ascorbic Acid (mg)	86.6	52.0	*	69.	43.8	11	80

*Excess consumption in terms of recommended allowance

When the recommended daily allowance and actual consumption of nutrients per consumption unit by the different communities of Eastern India is taken into consideration it is found that the study population Munda shows lesser value than most of the eastern Indian populations (Table 6). As this Table is quite self-explanatory it needs no further description.

Community	Calorie kcal	Protein (gm)	Fat (gm)	Calcium (mg)	Iron (mg)	Vitamin A (mg)	Vitamin B_1 (mg)	Vitamin B_2 (mg)	Vitamin B_3 (Niacin) (mg)	Vitamin C (mg)	Reference
Pasi	2476	55	29	34	33	1423	1.9	0.6	4	57	Chowdhury&Haque,2009
BrahmakalpitBrahman	2536	66	41	61	44	1130	2.3	1.2	22	45	Haque&Chowdhury,2009
Bhumihar	3273	89	36	82	43	1086	2.6	1.3	2	70	Chowdhury&Chowdhury,2009
Gorait	2350	60	14	207	23	1595	1.8	0.9	6	71	Bhattacharya&Chowdhury, 2009
Ghasi	1995	41	9	53	25	1279	1.3	0.4	21	53	Chowdhury& Bhattacharya, 2009
Bauri	2494	55	14	437	33	637	1.9	0.5	7	32	Haque & Samanta, 2009
Kora	2860	62	18	257	35	1049	1.9	0.6	30	70	Samanta & Haque, 2009
Munda	2138	9	19	329	18	837	1.8	0.8	2	39	Haque,Mandal,Bhattacharya,2009
Oraon	2395	2	20	24	17	984	2.0	0.8	24	33	Bhattacharya,Mandal, Haque,2009
Chasa	2413	4	15	75	19	932	1.8	0.6	27	99	Bhattacharya&Chowdhury,2009
Pano	2027	2	10	119	8	645	1.3	0.4	21	42	Chowdhury Bhattacharya &, 2009, NSIP: Eastern India.
Saora	2742	6	17	04	34	810	1.7	0.5	28	30	S.K.Chowdhury & Chowury,2009
Ganda	2843	8	25	16	35	919	1.7	0.5	27	42	Chowdhury& , Chowdhury,2009
Kuikhond	2322	7	9	28	11	995	1.1	0.6	18	4	Bhattacharya& Haque, 2009
Domo	2419	7	16	40	12	418	1.0	0.7	13	33	M.Haque &Bhattacharya,2009
Munda (Preharvest)	2266	5.6	13.6	03	35.1	1205	1.60	0.63	24.4	40.5	Present Study
Munda(Post harvest)	2492	62.0	12.5	05	40.1	702	1.95	0.80	26.9	86.6	Present Study
Region	2486	8	20	51	26	856	1.74	0.98	25	51	Eastern India
Recommended allowance	2875	60	20	00	28	2400	1.4	1.6	18	40	Adult

Table 6. Recommended daily allowance and actual consumption of nutrients per consumption unit by the different communities of Eastern India

DISCUSSION

The main food consumed by all Munda household in Sundarban is rice. However, they have grown accustomed to receiving wheat from various organizations (both government and non-government) in exchange for their employment as part of the *Food for Work* schemes in modern times. Few households consume rice and wheat as their primary sources of sustenance. They can't afford to buy pulses frequently because of their dire financial situation, so they eat them sometimes only. They regularly eat inexpensive local seasonal vegetables which are easily accessible from their kitchen garden or surrounding. Typical vegetables they eat include pumpkin, brinjal, cauliflower, ladies' finger, various legumes including beans and peas, and leafy vegetables like sweet and sour spinach, cabbage, and other vegetables. Meat is consumed only on certain occasions, and most of the people eat tiny fish. They occasionally eat eggs in place of fish. Milk and milk products are consumed occasionally only.

In the months leading up to harvest, there is a relatively high diet of animal proteins such as meat, eggs, and fish (mostly small fish) among the Munda. During the pre-harvest season, it also looked like more oils and fats were being used. Due to inadequate storage of staple foods and relatively high market prices, which force people to choose an alternative diet that can be easily obtained from the market with the limited resources they have, there is a low consumption of staple foods during the pre-harvest season. The post-harvest season gives the population access to a variety of leafy vegetables, including spinach, cabbage, latus, etc., which are abundantly grown in the study region and whose market prices are affordable. In the post-harvest season, green vegetables are specifically consumed at a substantially higher rate for this reason. A portion of the pre-harvest period's relatively low consumption of leafy vegetables is made up for by the period's relatively higher consumption of fish and meat. The margin of variance in terms of calorie intake is also reduced by a slight increase in the consumption of oils and fats in the pre-harvest phase.

The fluctuation in food consumption by season eventually has an impact on caloric intake. To understand a population's nutritional condition, a basic understanding of calorie intake is necessary. To further understand the seasonal change in calorie consumption, the data were analysed independently for each season. It demonstrates that the amount of calories consumed during the pre-harvest season is around 10% lower than during post-harvest season. This is consistent with the difference in staple food consumption. The main source of calories and, to a large extent, protein for the various communities in Sundarban is cereals, primarily rice. As a result of eating less cereal during the pre-harvest season, 10% less total protein was consumed. The modest rise in fish consumption during the pre-harvest season is the cause of the slight increase in animal protein intake.

Pre-harvest calcium intake has been discovered to be higher than usual, which can be attributed to a significantly higher fish intake. Pre-harvest season consumption of vitamin A was significantly higher than post-harvest season consumption. The consumption of a significant amount of pumpkin, which was a staple meal for the locals during the time of scarcity, is what led to this rise in vitamin A intake during the pre-harvest season. A high standard deviation also suggests more diversity in vitamin A intake between households.

The pre-harvest season saw relatively low consumption of other nutrients outside of animal protein, fat, and vitamin A. The findings show that vitamin C consumption varies significantly by season.

It was discovered that people took this vitamin more than twice as much in the post-harvest season than they did in the pre-harvest season. This was caused by the simple accessibility of numerous leafy and non-leafy vegetables, which are the main source of vitamin C and include spinach, tomatoes, drumsticks, etc. These vegetables are abundantly grown in this region during the post-harvest season and are offered at lower prices. Other important nutrients like iron, vitamin B_1, vitamin B_2, and nicotinic acid were discovered to be consumed at substantially lower levels during the pre-harvest season.

It appears from the present study that calorie deficit is more pronounced in pre-harvest season than that of post-harvest season. This corroborate the availability of food items in more quantity in post-harvest season than that of pre-harvest season among the studied population Munda.

CONCLUSION

The studied population Munda is a socio-economically background tribe who are landless and depend upon different kind of occupation for their subsistence economy. It can be noted that more than 38 percent of the Munda households having less than one-month food sufficiency i.e. they fall in the category of not producing at all. Total calorie intake is much lower among them in terms of recommended daily allowance as recommended by ICMR (2017). As expected, net energy (K Cal) deficiency is much lower in pre-harvest period than that of post-harvest period. This is true for both per consumption unit and per capita unit.

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Verbal agreement from local administrators and members of the community

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