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Diet & Nutrition Profile of Children of Gond and Kharwar Tribes Population of Eastern Uttar Pradesh

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Abstract This was a cross-sectional study designed to collect information on dietary intake and food patterns of Gond and Kharwar children of Sonbhadra district. 350 Gond and 307 Kharwar tribal children samples were selected from the rural villages of Sonbhadra district. A pretested food frequency questionnaire and 24 hour dietary recall was used to collect information on food intake and meal pattern. Average daily nutrient intake of tribes children were calculated and compared with recommended dietary allowances (RDA) for Indian. Average daily dietary intake of both Gond and Kharwar tribe's children was found significantly lower when compared with RDA. Mostly cereals were consumed by subjects and are the main source of energy. Daily consumption of milk and milk products was very low. Vegetables and fruits consumption was almost negligible. Their daily diet mostly contains cereals, pulses and little amount of milk and milk product and meat and poultry. Results indicated an overall poor nutritional status among Gond and Kharwar children of Sonbhadra. A very high incidence of under-nourishment was seen among these tribes' children. Nutritional and health professional are required to educate and encourage tribal people to improve intake of milk and milk products, fruits and green leafy vegetables. Improper cooking method and unhygienic food habit was seen in these people.

Keywords *Gond; Kharwar; dietary pattern; dietary intake; food frequency questionnaire; recommended dietary allowances*

1. Introduction

India has the largest concentration of tribal people in the world after Africa. According to census 2011 tribal population of our country is 8.6% of the total population. Most of the tribal population lives in rural areas. It is estimated that approximately 89.99% of them are living in rural areas and only 10.08% in urban areas. Gond is the largest tribe of central India and is popularly known as Gondwana. It is the second largest tribe in India and has the largest tribal population in Uttar Pradesh (census 2011). In Uttar Pradesh Gond percent is 50.16% to the total scheduled tribe's population. Kharwar on the other hand is the second populous tribe in Uttar Pradesh, constituting about 14.16% of the total ST population. In this community majority of population are agricultural labors whereas

very few are workers. The Kharwar tribes have six endogamous groups which are Surajbansi, Daulat bandi Paraband, Kharia, Bhogti and Mauijhia [1].

In the current scenario Gond and Kharwar tribes are not aloof from the outer world. Today these tribal have come in contact with the advance communities. Interaction between them leads changes in their socio-cultural settings [2]. But still these tribes are at a high risk of undernutrition due to their dependence on primitive agricultural practices, poverty, illiteracy and poor personal and environmental hygiene practices. These tribal have lots of traditional beliefs and customs which they are still following. Poor communication facilities and lack of access to healthcare makes their life more miserable. It is very important to understand each tribe's eating habits because their life style is very different from each other and also from others. Usually the habitants of tribes are far away from the rural and urban areas. They mostly lives in dense jungles and near to nature and are still not that much connected to the cities. Interaction between tribal and advanced communities didn't have much influence on their eating and dietary habits. They are still suffering from various food problems as their food habits were different from those living in urban and rural areas. Earlier several studies were conducted by various researchers' showing that their diets are nutritionally deficient [3, 4, 5, 6].

In Sonbhadra district these tribes are still living in deprivation. Still after so many years of independence they are living with no land, no education and no assets. Their economic condition and the standard of living are very low. As most of the young adults of these tribes migrate to the urban areas in search of work so they are aware of a lot of things. But due to their far away habitation from both rural and urban areas and their low economic conditions they are not able to afford it. Gond and Kharwar of Sonbhadra are highly vulnerable to undernutrition, because of their geographical isolation, socio-economic disadvantage and inadequate health facilities. They depend on minor forest produce and manual labour for livelihood. Their food consumption pattern is dependent on the vagaries of nature and varies from extreme deprivation (in the lean seasons) to high intakes (in the post-harvest period).

Little has been published on the diet and nutrition intake of these tribal children. The purpose of this study was to assess the dietary intake and food pattern of Gond and Kharwar tribal children. On the other hand information from this study will be useful in defining nutritional initiatives for these tribal children.

2. Materials and Methods

Three hundred fifty (350) Gond children and three hundred seven (307) Kharwar children in age group 4 to 11 years were selected from various villages of Sonbhadra district. Out of the 350 Gond children 190 children were male and 160 were female where as in Kharwar out of 307, 161 children were male and 146 were female. Villages from rural areas were purposively selected with having larger number of Gond and Kharwar tribes' population. From the entire three Tahsil of Sonbhadra district i.e. Ghorawal, Robertganj and Dudhi villages were purposively selected. One stage cluster sampling method was implied for collecting data. Thus the present investigation has been conducted by using pre tested, structured interview schedule. Visits were made to the selected areas and all available subjects lying in our selection criteria were taken. Two questionnaires were made which include a food frequency questionnaire (FFQ) and a 24-hour dietary recall. These questionnaires were filled in a personal interview and dietary intake data was calculated on all food items and beverages. Food consumption frequency was recorded in terms of cereals, pulses, milk and milk products, green leafy vegetables (GLV), roots and tubers, fruits, meat and poultry, fat and oils and sugars. The average daily nutrient intake was calculated with the help of the food composition tables of Gopalan. In addition to questionnaire food habit and dietary pattern e.g. the consumption pattern of breakfast, lunch and dinner was also recorded.

Statistical Method Data were coded, entered in MS Excel 2007 and unpaired t-test and one sample t-test were used to know the significance of data between the two tribal groups. $P < 0.05$ was considered to be statistically significant.

3. Results

The age range of Gond and Kharwar children was from 4 to 11 years. As shown in Table 1 all children were non-vegetarian (100 percent). This means that all tribal children are taking non-vegetarian food available in their locality. Dietary pattern of these children shows total respondent (100 percent) with a dietary pattern of breakfast+ lunch+ dinner.

Table 1: *Food habit and Dietary pattern of Gond and Kharwar tribal children*

Sr. No.	Particulars	Gond (No. of children)	Gond (%)	Kharwar (No. of children)	Kharwar (%)
1.	**Food Habit**				
	Vegetarian	-	-	-	-
	Non-vegetarian	350	100	307	100
	Eggetarian	-	-	-	-
2.	**Dietary pattern**				
	Breakfast+Lunch+Dinner	350	100	307	100
	Breakfast + Lunch + Evening tea+ Dinner	-	-	-	-
	Breakfast + Mid-morning + Lunch + Evening tea+ Dinner+ Bed time	-	-	-	-

Note: All children from both groups were non-vegetarian and having a dietary pattern of Breakfast+Lunch+Dinner.

Food consumption chart of Gond and Kharwar tribes was given in Table 2 and 3 respectively. From Table 2 we can conclude that Gond children were taking only three food groups daily i.e. cereals (100%) and pulses (32.86%) and milk (59.43%). Half of populations (43.71%) were also taking meat, fish and poultry frequently. But their daily diet is lacking in vegetables and fruits. Only 19.14% children were taking fruits 4-6 times in a week and rest of them (80.86%) were taking it infrequently.

Table 3 shows the frequency consumption of Kharwar tribes, in which we could see that only three food groups were taken on daily basis. Cereals were taken on daily basis by 100% children, pulses by 37.80% and milk and milk products by 29.14%. Fruits and vegetables were taken by very few children on daily basis. Consumption of fruits and vegetables were frequent only in 9.71% and 18.57% of Kharwar children respectively whereas meat, fish and poultry was frequent only in 35.50% and rest of them taking it either occasionally or 3 times a week.

Table 2: *Frequency of consumption from each food group by Gond children*

Food groups	Frequent consumption			Infrequent consumption			
	D %(n)	4-6x/wk %(n)	Total %(n)	<3x/wk %(n)	O %(n)	Never %(n)	Total %(n)
1. Bread and cereals	100(350)	-	100(350)	-	-	-	-
2. Pulses	32.86(115)	67.14(235)	100(350)	-	-	-	-
3. Vegetables	-	14.28(50)	14.28(50)	45.71(160)	25.71(90)	14.28(50)	85.72(300)
4. Fruits	-	19.14(67)	19.14(67)	35.71(125)	48.14(158)	-	80.86(283)
5. Milk and milk Products	59.43(208)	12(42)	71.43(250)	2.86(10)	25.71(90)	-	28.57(100)
6. Meat, fish and Poultry	-	43.71(153)	43.71(153)	29.71(104)	26.57(93)	-	56.29(197)
7. Soft drinks, sweets and beverage	-	18(63)	-	24.86(87)	57.14(200)	-	82(287)

D: Daily, n: total number of respondents, 4-6x/wk: 4-6 times per week, O: occasionally, <3x/wk: less than three times per week

Table 3: *Frequency of consumption from each food group by Kharwar children*

Food groups	Frequent consumption			Infrequent consumption			
	D %(n)	4-6x/wk %(n)	Total %(n)	<3x/wk %(n)	O %(n)	Never %(n)	Total %(n)
1.Bread and cereals	100(307)	-	100(350)	-	-	-	-
2. Pulses	37.80(109)	62.54(182)	94.78(291)	4.57(16)	-	-	4.57(16)
3. Vegetables	-	18.57(65)	18.57(65)	12(42)	52.86(185)	4.29(15)	69.14(242)
4. Fruits	-	9.71(34)	9.71(34)	32.86(115)	45.14(158)	-	78(273)
5. Milk and milk products	29.14(102)	12.86(45)	42(147)	17.14(60)	24.29(85)	4.29(15)	45.71(160)
6. Meat, fish and Poultry	-	31.14(109)	35.50(109)	33.71(118)	22.85(80)	-	56.57(198)
7. Soft drinks, sweets and beverage	-	15.43(54)	-	38(133)	34.29(120)	-	72.29(253)

D: Daily, n: total number of respondents, 4-6x/wk: 4-6 times per week, O: occasionally, <3x/wk: less than three times per week

Average daily consumption of all food groups of Gond and Kharwar were calculated. For calculating this we first classified all children (4 to 11 years) into three group's i.e. 4 to 6, 7 to 9 and 10 to 12 years. This categorization is in line with RDA guidelines as children within each group have same dietary requirement. While comparing average daily consumption of food groups between Gond and Kharwar children aged between 4 to 6 years the difference was found significant in all groups except in roots and tuber and other vegetables as shown in Table 4. Whereas children aged 7 to 9 years, it was not found significant in 3 food groups (roots and tubers, other vegetable, fats and oils).

Table 5 shows the average daily consumption of children aged 10 to 12 years of both tribes. It was found highly significant except for one food group i.e. roots and tubers. From the mean of all food groups given in table we can say that the intake of Kharwar children was low as compared to the Gond.

Table 4: *Average daily consumption of food groups by Gond and Kharwar tribal children (age 4 to 9 years)*

Food groups	Gond (4-6 years) N=114	Kharwar (4-6 years) N=99	t-value	p-value	Gond (7-9 years) N=119	Kharwar (7-9 years) N=107	t-value	p-value
Cereals (g)	183.07±24.56	167.67±20.56	4.91	<0.0001*	195.78±31.21	176.78±20.12	5.37	<0.0001*
Pulses(g)	22.45±3.78	18.56±2.45	8.76	<0.0001*	24.34±3.54	21.32±2.56	7.27	<0.0001*
Green leafy vegetable(g)	12.32±5.89	10.67±4.32	2.30	<0.0224*	15.67±6.89	12.67±3.67	4.01	<0.0001*
Roots and tubers(g)	30.65±12.76	27.89±8.98	1.79	0.0734	32.65±15.76	31.45±9.78	0.67	0.4980
Other vegetables(g)	21.76±20.87	18.67±15.43	1.21	0.2265	16.56±22.87	15.87±18.98	0.24	0.8065
Fruits(g)	12.98±12.76	8.76±6.98	2.93	<0.0037*	13.65±12.87	10.56±7.87	2.14	<0.0328*
Milk and milk products (ml)	290.67±20.67	205.67±16.78	32.6	<0.0001*	324.76±45.87	276.45±28.67	9.10	<0.0001*
Fats and oils (g)	6.67±3.76	5.45±5.34	1.94	<0.0529*	7.98±4.98	6.98±5.87	1.38	0.1674
Sugar and jaggery(g)	10.67±4.78	12.43±4.89	2.65	<0.0086*	10.87±5.98	7.87±3.87	4.42	<0.0001*
Animal products(g)	26.87±12.98	21.56±4.76	3.85	<0.0002*	28.56±17.65	29.45±11.65	0.44	0.6588

*** = significant**

Table 5: *Average daily consumption of food groups by Gond and Kharwar tribal children (age 10 to 12 years)*

Food groups	Gond (10-12 years) N=117	Kharwar (10-12 years) N=101	t-value	p-value
Cereals (g)	236.67±23.76	217.56±31.76	5.06	<0.0001*
Pulses(g)	28.65±2.76	25.98±1.23	8.98	<0.0001*
Green leafy vegetable(g)	18.89±5.76	16.56±3.21	3.60	<0.0004*
Roots and tubers(g)	37.78±43.34	36.56±26.45	0.24	0.8059
Other vegetables(g)	20.65±5.78	18.54±3.67	3.15	<0.0018*
Fruits(g)	21.23±4.12	16.87±3.76	8.11	<0.0001*
Milk and milk products (ml)	350.54±45.65	289.67±36.76	10.72	<0.0001*
Fats and oils (g)	6.23±2.32	4.65±3.12	4.27	<0.0001*
Sugar and jaggery(g)	12.87±3.54	16.34±1.65	9.03	<0.0001*
Animal products(g)	30.76±12.87	24.23±15.87	3.35	<0.0009*

*** = significant**

Average daily nutrient intake of both tribes' children aged 4 to 6 years were compared with recommended dietary allowances (RDA) in Table 6. A highly significant difference was seen in between the average daily intake and RDA of both Gond and Kharwar tribe's children for all the nutrients. Means of calorie, protein and iron of both Gond children are 1089.34, 17.56 and 9.34 and Kharwar children are 998.56, 17.56 and 7.45. Average daily intake of calcium is all very low in both Gond (401.21) and Kharwar (354.85).

Average daily nutrient intake of 7 to 9 years children were shown in Table 7. Average daily nutrient intake of Gond children of calorie (1232.12kcal), protein (21.21g), calcium (356.45mg), iron (12.76mg), carotene (1376.4µg), thiamine (0.4mg), vitamin C (24.87mg) and riboflavin (0.4mg) was very less than their RDA. On the other hand average daily nutrient intake of Kharwar children of calorie (1232.12kcal), protein (21.21g), calcium (356.45mg), iron (12.76mg), carotene (1376.4µg), thiamine (0.4mg), vitamin C (24.87mg) and riboflavin (0.4mg) was also very less than their RDA.

Table 8 shows the average daily nutrient intake of boys and girls age 10 to 12 years of Gond tribes. boys average daily intake of calories (1693.75%), protein (31.1%), calcium (401.56%), iron (17.5%), carotene (1900.6%), thiamin (0.3%), vitamin c (21.5%) and riboflavin (0.6%) was very low than their RDA requirement. Again in girls their intake of calories (1424.5%), protein (30.2%), calcium (382.54%), Iron (16.6%), carotene (1610.5%), thiamin (0.4%), vitamin c (21.5%) and riboflavin (0.6%) was also very low than the RDA.

Table 9 shows the average daily nutrient intake of boys and girls of Kharwar tribes aged 10 to 12 years. From the given table we can see that the average daily dietary intake of boys of calorie (1545.76%), protein (30.56%), calcium (354.87%), iron (15.56%), carotene (2190.5%), thiamin (0.6%), vitamin C (18.76%) and riboflavin (0.4%) was very from their RDA. On the other hand intake of girls for calories (1365.45%), protein (29.65%), calcium (354.87%), iron (15.56%), carotene (2190.5%), thiamin (0.6%), vitamin C (18.76%) and riboflavin (0.4%) was also very low in comparison to RDA standards.

Table 6: *Average daily nutrient intake of Gond and Kharwar children (4- 6 years)*

Group	Particular	Calories (kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Carotene (µg)	Thiamin (mg)	Vitamin C (mg)	Riboflavin (mg)
Gond (4-6years) N=114	Average Intake	1089.34±93.67	17.56±2.67	401.21±53.87	9.34±2.23	1698.34±332.65	0.3±0.3	23.34±5.76	0.4±0.2
	RDA	1350	20.1	600	13	3200	0.7	40	0.8
	Difference	-260.66	-2.54	-198.79	-5.66	-1501.66	-0.4	-16.66	0.4
	t-value	29.71	10.16	39.40	17.52	48.19	14.23	30.88	21.35
	p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Kharwar (4-6years) N=99	Average Intake	998.56±99.78	16.45±3.54	354.85±32.65	7.45±2.76	1465.45±242.67	0.4±0.2	21.45±7.67	0.2±0.3
	RDA	1350	20.1	600	13	3200	0.7	40	0.8
	Difference	-351.44	-3.65	-245.15	-7.55	-1834.55	-0.3	-18.55	-0.6
	t-value	35.04	10.25	74.70	20.00	71.11	14.92	24.06	19.89
	p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

RDA Source: ICMR, NIN, 2009

Table 7: *Average daily nutrient intake of Gond and Kharwar children (7- 9 years)*

Group	Particular	Calories (kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Carotene (µg)	Thiamin (mg)	Vitamin C (mg)	Riboflavin (mg)
Gond (7-9 years) **N=119**	Average intake	1232.12±98.56	21.21±4.45	356.45±37.76	12.76±3.59	1376.4±95.6	0.4±0.3	24.87±10.2	0.4±0.2
	RDA	1690	29.5	600	16	4800	0.8	40	1.0
	Difference	-457.88	-8.29	-243.55	-3.24	-3423.6	-0.4	-15.13	-0.6
	t-value	50.67	20.32	70.36	9.84	390.65	14.54	16.18	32.72
	p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Kharwar (7-9 years) **N=107**	Average intake	1065.32±78.98	18.87±5.87	287.32±26.78	10.65±4.76	1198.5±67.7	0.3±0.4	18.76±9.87	0.2±0.4
	RDA	1690	29.5	600	16	4800	0.8	40	1.0
	Difference	-624.68	-10.63	-312.68	-5.35	-3601.5	-0.5	-21.24	-0.8
	t-value	81.81	18.73	120.7	11.62	550.28	12.93	22.26	20.68
	p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

RDA Source: ICMR, NIN, 2009

Table 8: *Average daily nutrient intake of Gond children (10- 12 years)*

Group	Particular	Calories (kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Carotene (µg)	Thiamin (mg)	Vitamin C (mg)	Riboflavin (mg)
Boys (10-12 years) N=62	Average intake	1693.75±56.87	31.1±4.34	401.56±39.56	17.5±3.27	1900.6±54.7	0.3±0.4	21.5±8.45	0.6±0.2
	RDA	2190	39.9	800	21	4800	1.1	40	1.3
	Difference	-496.25	-8.8	-398.44	-3.5	-2899.4	-0.8	-18.5	-0.7
	t-value	68.70	15.96	79.30	8.42	359.78	15.74	17.23	27.55
	p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Girls (10-12 years) N=55	Average intake	1424.75±45.98	30.2±4.87	382.54±31.98	16.6±2.76	1610.5±45.65	0.4±0.2	18.9±9.87	0.5±0.3
	RDA	2010	40.4	800	27	4800	1.0	40	1.2
	Difference	-585.25	-10.2	-417.46	-10.4	-3189.5	-0.6	-21.1	-0.7
	t-value	94.39	15.53	96.80	27.94	518.15	22.24	15.85	17.30
	p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

RDA Source: ICMR, NIN, 2009

Table 9: *Average daily nutrient intake of Kharwar children (10- 12 years)*

Group	Particular	Calories (kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Carotene (µg)	Thiamin (mg)	Vitamin C (mg)	Riboflavin (mg)
Boys (10-12 years) N=56	Average Intake	1545.76±.95.67	30.56±3.76	354.87±89.56	15.56±4.76	2190.5±321.6	0.6±0.3	18.76±4.32	0.4±0.3
	RDA	2190	39.9	800	21	4800	1.1	40	1.3
	Difference	-644.24	-9.34	-445.13	-5.44	-2609.5	-0.5	-21.24	-0.9
	t-value	50.39	18.58	37.19	8.55	60.72	12.47	36.79	22.44
	p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Girls (10-12 years) N=45	Average Intake	1365.45±68.76	29.65±4.21	356.45±45.76	17.56±3.65	1898.8±234.4	0.3±0.5	16.87±4.65	0.4±0.5
	RDA	2010	40.4	800	27	4800	1.0	40	1.2
	Difference	-644.55	-10.75	-443.55	-9.44	-2901.2	-0.7	-23.13	-0.8
	t-value	62.88	17.12	65.02	17.34	83.02	9.39	33.36	10.73
	p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

RDA Source: ICMR, NIN, 2009

4. Discussion

Nutrition during early years of child's life is linked to performance in later years. Effects of nutrition on the brain begin before birth with the nutrition of mother. Early age nutrition is very important for the cognitive development of children. Many aspects of nutrition, from entire diets to individual nutrients, have been implicated in cognition, mental health, dysfunction and disease [7-11]. Tribal populations are more vulnerable to undernutrition as their food intake is influenced by vagaries of nature, with large seasonal variations, depending upon availability of agricultural and forest produce. Several studies have documented a close relationship between the tribal ecosystem and their nutritional status [12-14]. The result of present study revealed that the dietary intake of foods as compared to balanced diets was very poor and less than the recommended level. Calorie, protein and fat are the main source of energy from diet. Gond and Kharwar children diet was deficit in calorie, protein and fat. From our study we can say that their everyday diet include only three food groups which are cereals, pulses and milk and milk products. The extent of deficit in the intakes was relatively higher with respect to micronutrients such as vitamin A, vitamin B_1, vitamin B_2 and iron. The mean intake of all the foodstuffs, especially the income elastic foods such as pulses, milk & milk products, oils & fats and sugar & jaggery were lower than the recommended levels of ICMR. Intake of green leafy vegetables

was very low in both tribes and was highly dependent on roots and tubers. Intake of fruits is almost negligible in tribal children. Tribal children of Sonbhadra are still highly suffering from both stunting and wasting [15]. Our study also reveals that over nutrition is very rare among tribal population.

5. Conclusion

Tribes of Sonbhadra district of Uttar Pradesh are living a life of deprived condition. Poor economic condition makes their life style very poor. They have no lands and no education. Lack of access to healthcare, poor communication, traditional beliefs and customs aggravate the situation. These are main difficulties which haunt them. They are known as backward by the society. Lack of awareness about the nutritional values of food and also about the role of healthy food in growing children is the main cause of under nourishment among them. The overall nutritional status of children of both the tribes is not satisfactory. Average daily nutrient intake of these children was very less in comparison of RDA standards. FFQ shows a very low consumption of vegetables and fruits. Hence the present study reveals a high incidence of under-nutrition and dietary inadequacy in respects of energy, protein and micronutrients.

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Conflicts of Interest

There are no conflicts of interest.

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