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## Assessment of nutrient intakes of tribal children of Palghar district, Maharashtra, India, aged 10-15 years

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### Abstract

**Background:** According to the National Family Health Survey 4, 25.6% of rural population is below 15 years of age. In spite of various kinds of policies and programs they remain the most excluded and live in miserable conditions due to various factors such as geographical isolation, poor healthcare delivery systems, beliefs and customs.

**Objective:** To assess the nutritional intake of Warli tribe children using 24-hour dietary recall and food frequency questionnaire and comparing it with Recommended dietary allowance.

**Methodology:** Cross sectional study involving 300 children (150 Boys and 150 girls) of age group 10-15 years were interviewed and a questionnaire relating food frequency and diet was asked using 24-hour dietary recall. Random sampling method was used. The study was completed in 3 months.

**Result:** Higher consumption of energy, protein, carbohydrates, fats, calcium and iron was seen in girls ( $p < 0.05$ ). Consumption of food groups like cereals, vegetables, pulses was found to be more in boys ( $p < 0.05$ ).

**Conclusion:** The tribal children were found to be extremely undernourished. Higher consumption of outside food than home-made ones. Nutritional awareness amongst them is to be provided.

**Keywords:** Nutrition, Palghar, rural area, scheduled tribes, tribal children, Warli

### 1. Introduction

The native people of India have been referred to as Adivasis or Scheduled Tribes. India has the second largest population of tribals. 705 ethnic groups have been identified as Scheduled Tribes [1]. A study showed that 27 percent of households were food secure and had malnourished children [2]. The study results indicated a strong socioeconomic gradient, and note that food insecurity continues to be widely prevalent among tribal populations: nearly half of the households either face direct risks of food insecurity or constitute the borderline group. Schedule Tribes were considered under the lowest income group of India. Over 94 million tribals live in rural areas. According to the National Family Health Survey 4, 25.6% of rural population is below 15 years of age [3]. In India, they form approximately 8.6% of the total Indian population [4].

National Nutritional Monitoring Bureau (2011-12) stated that the dietary pattern of rural communities revealed that they were on a lower side and had inadequate diets. It was also noted that, the daily intake of food was lower than recommended dietary allowance [5].

### 2. Methodology

#### 2.1 Study design

**2.1.1 Study type:** It was a cross sectional study of 300 tribal children.

#### 2.1.2 Sample size and selection

The age group of 10-15 years was decided. The statistician provided a validated sample size of 300 children (150 boys and 150 girls).

#### 2.1.3 Study population

The Warli tribe resides in the coastal area of Maharashtra-Gujarat border. For the study, children living in the Palghar district, Maharashtra were selected. The caste certificate of the children was referred to know their caste.

### 2.1.4 Site of the study

1. K.D. Tandel English Medium School, Zai. Taluka-Talasari. Dist- Palghar. Maharashtra
2. Lakhani Adivasi School, Borigaon. Taluka- Talasari. Dist-Palghar. Maharashtra

### 2.1.5 Consent form

A formal letter from the Principal was provided to seek permission from the school to conduct the study and submitted to the principal of both the schools. A consent form was prepared with the language best suited for the target population (English and Marathi). It was used on the day of data collection to ask permission to interact with the child. The consent form had the information and the rules that are followed to maintain the child's privacy. The children and their parents were explained about the study. The consent form was signed by the student/parent/guardian and the principal.

**2.1.6 Sampling method:** Purposive sampling method.

### 2.1.7 Selection criteria

#### 2.1.7.1 Inclusion criteria

1. Children within the age group of 10-15 years of age.
2. Children belonging to the Warli population

#### 2.1.7.2 Exclusion criteria

1. Child suffering from any clinical condition

### 2.1.8 Ethics approval

- Ethical clearance was obtained from an independent Inter System Bio Medica Ethics Committee (ISBEC) for the study.

### 2.2 Tools for data collection

A structured questionnaire was administered to collect information from the children. According to purpose of the study, the questionnaire was divided into 2 sections

1. **Demographic information:** Information about child, name, age, gender, family members, parent's occupation and contact details.
2. **Nutrient intake assessment:** Using, 24-hour diet recall and food frequency questionnaire, micro and macronutrients were calculated. Ntuitive software was used to calculate the nutrients from the diet.

#### 2.2.1 Nutrient intake assessment

Questions were based upon their daily diet routine, type of diet i.e. vegetarian or non-vegetarian, frequency of meal consumption, frequency of skipping of meals, reason of skipping meals, and snacking patterns were included.

#### 2.2.2 24-Hour home recall

The subjects were asked about their food intake the previous day since morning to night i.e. from waking up to falling asleep at night. Standardized cups were used as a tool to measure what they had been consuming. The cups had been standardized before using them. The macro and micronutrients were calculated using a software called "Ntuitive calculator". Macronutrients including energy, carbohydrates, protein and fat. Micro nutrients including calcium, iron, Vitamin A,  $\beta$  carotene, B12, folate, Vitamin C, Vitamin D were calculated.

To understand the portion size, nearby households were visited. Their portion size, cooking methods were noted. Accordingly, the nutrient intake was calculated.

### 2.2.3 Food frequency questionnaire

The questionnaire aimed to assess the frequency of consumption of the food. The options used in the food frequency questionnaire were "daily", "twice a week", "once a week", "once in 15 days", "once a month" and "rarely".

### 2.3 Analysis of data

Analyses were performed using SPSS software for Windows (version 25, 2017, IBM Corporation, Armonk, New York, United State). Data are presented as Mean  $\pm$  SD or Mean (minimum-maximum) or percentage. The frequency distributions were tabulated for food frequency questionnaire and food habits according to gender and were compared using cross tabulations and chi-square test. Independent Sample T test was used to analyse the difference in nutrient intake when classified according to gender. Mann Whitney U test was used to analyse the difference in portion size of various foods when classified according to gender.  $p < 0.05$  was considered to be statistically significant with a confidence interval of 95%.

## 3. Results and Discussions

### 3.1 Socio-demographic profile

#### 3.1.1 Gender distribution

The study was conducted on 300 tribal children of which 150 were boys and 150 were girls.

#### 3.1.2 Age distribution

10-12-year-old boys (n=86) were in the group 1A. 13-15-year-old boys (n=64) formed group 2A. 10-12-year-old girls (n=70) were 1B and 13-15-year-old girls (n=64) were 2B.

#### 3.1.3 Occupation of Parents

It was observed that 33.3% males were factory workers, 26.3% were into fishing business and 12.7% were farm labourers. Among females, 43.7% were housewives, 22% were working in farm and 21.7% were factory employees.

### 3.2 Nutrient intakes in children

#### 3.2.1 Food habits

Amongst 300 children, only 3% were vegetarian. 97% children consumed non-vegetarian food such as fish, egg, and chicken on regular basis.

#### 3.2.2 Meal patterns of children

A variation in the meal pattern was observed, 58.7% boys consumed 4-5 meals and 2.7% consumed 2-3 meals in a day. 29.3% boys had 5-6 meals per day. Similar pattern was observed in girls. 5-6 meals were consumed by 38% girls. 47.3% girls were consuming 4-5 meals in a day. 2-3 meals per day were consumed by 1.3% girls.

#### 3.2.3 Skipping of meals in children

34% girls skipped and 26.7% boys skipped meals. This clearly showed that, girls had a larger frequency of skipping meals than boys.

22.3% subjects skipped meals because of lack of appetite. It was noted that both the parent was working, because of which, mothers may not get enough time to cook for the child or family.

#### 3.2.4 Prevalence of outside food consumption in children

Children get easily influenced by their peers or advertisements and by taste for consuming outside food. As seen before, mom doesn't cook and the taste of food are the two reasons for skipping meals, because of which the children

crave for outside food. Thus, a higher rate of consumption of outside food was seen. The highest consumption was of Vada pav. 41.7% subjects consumed Vada pav everyday. 52.7% boys and 45.3% girls consumed Vada pav. 12% subjects were having a samosa on daily basis. The subjects also consumed biryani, Chinese and kachori.

A similar study was conducted on the school going children of rural Himachal Pradesh. Their outside food preference and frequency were noted. 36% children were consuming outside junk food. 22% children were consuming more than two junk food in 24 hours [6].

### 3.2.5 Frequency of outside food consumption in children

An increase in trend of outside food consumption was seen. The study indicated that 62% girls and 58% boys consumed outside food daily. This showed that girls consumed such foods more often than boys. In the diet recall, upon asked about consumption of such food, it was noted that the child had consumed minimum of 1 outside food in last 24 hours. Another reason could be that the working parents gave money to the children instead of tiffin. The children then went ahead and purchased junk food. All these factors have led to

increase in junk food consumption in these tribal children.

### 3.2.6 Meal pattern of children

It was observed that 79.3% girls and 78% boys consumed breakfast every day. It was also depicted that 92% boys and 84.7% girls consumed lunch every day. It was observed that girls skipped lunch and dinner more than boys. 86% girls and 93.3% boys were consuming dinner on a regular basis.

### 3.2.7 Consumption of in-between snacks

All the subjects had 3 major meals i.e. breakfast, lunch and dinner and in-between snacks. Snacks were consumed during school breaks and evening. Consumption of outside food like Vada pav and samosa, wafers and biscuits were consumed on a daily basis. It was noted that, a subject was consuming on an average 1 packet of biscuit or wafer.

Influence of non Tribals i.e. outsiders living in rural or neighbouring region of the Tribals had a greater impact on the food choices of the subjects. So instead of indulging in locally available healthy food, they opt for junk food and cause a negative impact on their health [7].

**Table 1:** Nutrient consumption in children according to gender and age (10-12 years)

	Boys (10-12 YRS) (n=86)	Girls (10-12 YRS) (n=70)	(p< 0.05)
Energy (Kcals)	1477±324	1466±344	0.839
Protein (gm)	38.9±12.2	38.6±17.1	0.887
Carbohydrates (gm)	209.2±44.8	206.2±52.8	0.698
Fats (gm)	50.29±15.7	51.47±15.7	0.643
Calcium(gm)	369.6±175.5	365.64±166.2	0.893
Iron (mg)	8.8±2.9	8.4±3.1	0.471
Vit B12 (mg)	0.36±0.4	0.26±0.32	0.115
Folate (mg)	214.2±162.8	212.6±141.9	0.947
Vit C (mg)	80.6±71.6	114.1±95.1	0.013*
Betacarotene (mg)	1791±314	1944±321	0.735
% energy from CHO	56.9±5.8	56.3±6.5	0.551
% energy from protein	10.4±1.8	10.4±1.8	0.899
% energy from fats	30.4±5.6	31.4±5.6	0.279

(\* shows significant correlation)

The consumption of Vitamin C was more in 1B than in group 1A ( $p=0.013$ ). There was no significant correlation and had the same nutrient intake between the two groups.

A study was conducted on the girls of Wardha region and was found that they consumed approximately 1400Kcals and

39.5gm protein. Iron intake amongst them was 13.2±2.5 mg/day [8]. A study carried on the girls of rural Rajasthan, that girls in the age group of 10-12 years were protein deficit by 29% and 13-15 years were deficit by 32% [9].

**Table 2:** Nutrients consumption in children according to gender and age (13-15 years)

	Boys (13-15 YRS) (n=64)	Girls (13-15 YRS) (n=80)	(p< 0.05)
Energy (Kcals)	1353.9±284.4	1525±352.4	0.002*
Protein (gm)	33.6±10.3	39.9±13	0.002*
Carbohydrates (gm)	192.6±45.2	209.8±50.2	0.034*
Fats (gm)	48.06±12.3	56.2±15	0.001*
Calcium (gm)	338.16±131.2	404.5±162.2	0.009*
Iron (mg)	8.2±2.9	9.7±3.4	0.007*
Vit B12 (mg)	0.37±1.06	0.33±0.31	0.726
Folate (mg)	197.8±131.1	281.03±169.11	0.002*
Vit C (mg)	117.1±90.6	139.3±90.3	0.147
Betacarotene (mg)	1802.7±300.4	2617.9±292.7	0.056
% energy from CHO	56.8±5.04	55.19±4.81	0.005*
% energy from protein	9.83±1.61	10.38±1.77	0.055
% energy from fats	31.9±3.68	33±3.21	0.064

(\* shows significant correlation)

A significant correlation was found between 2A and 2B. Calories ( $p=0.002$ ), protein ( $p=0.002$ ), carbohydrates ( $p=0.0034$ ), fats ( $p=0.001$ ), calcium ( $p=0.009$ ), folate ( $p=0.002$ ) and iron ( $p=0.007$ ) consumption was more in girls (group 2B)

than boys. But boys had higher intake of calories from carbohydrates than in girls ( $p=0.005$ ).

A study on Kumar tribal children of Chhattisgarh, showed that boys consumed higher proportion of energy than girls. As

the age increased, protein consumption of girls decreased as compared to boys of same age group <sup>[10]</sup>.

### 3.2.8 Percent RDA comparison of nutrient intake in children

Maximum of subjects were consuming calories approximately 50-75% of Recommended Dietary Allowance (RDA) and protein were 75-100% of RDA. 29.33% boys consumed calories less than 50% of RDA. 66.67% boys and 54.67% girls consumed calcium <50% RDA. 84.67% boys and 92% girls consumed <50% RDA of iron. Higher consumption of black tea was observed, which could hinder the absorption of iron. The subjects live near Konkan Coast line, so consumption of fish was on a higher side. Fishes like King

Mackerel (Surmai), Indian Mackerel (Bangda) and Prawns were locally available and consumed by them. So, intake of Vit B12 was found to be near RDA. 64% girls and 53.33% boys consumed more than 100% RDA of folate and vitamin C as they consumed egg, pulses and fruits. Beta carotene was consumed <50% of RDA by 85.33% boys and 82% girls.

The study conducted on the Soliga tribe had results indicating that their vitamin C consumption was almost 91% of RDA. They had calcium intake of more than RDA where in the present study the calcium consumption was <50% <sup>[11]</sup>.

### 3.2.9 Portion size intake of cooked food according to gender

**Table 3:** Portion size intake according to gender

	Total (N=300)	Boys (n=150)	Girls (n=150)	(p< 0.05)
Wheat (roti)	1.95 (1-7)	2.19 (1-7)	1.7 (1-6)	0.001*
Rice (gm)	281 (100-500)	312 (100-500)	294 (100-300)	0.001*
Moong (gm)	117.9 (50-200)	126.9 (50-200)	109.1 (50-200)	0.003*
Chana (gm)	144.6 (50-300)	124.2 (50-300)	105.4 (50-200)	0.005*
Milk (ml)	188.7 (50-350)	195.2 (50-350)	182.9 (75-300)	0.254*
Groundnuts (gm)	78.2 (5-100)	74 (5-100)	81.6 (10-100)	0.071*
Egg (pc)	1.2 (0.5-3)	1.3 (0.5-3)	1.1 (0.5-2)	0.001*
Fish (gm)	150.2 (50-200)	150.1 (50-200)	150.5 (50-250)	0.777*
Capsicum (gm)	93.2 (50-200)	98.2 (50-200)	88.2 (50-200)	0.018*
Chickoo	2.2 (1-5)	2.4 (1-5)	2.1 (1-5)	0.001*
Pakoda (pc)	3.7 (1-4)	2.6 (1-3)	3.8 (1-4)	0.032*
Biryani (gm)	194.1 (100-200)	208.6 (100-250)	175.9 (100-200)	0.008*
Other vada (pc)	2 (1-6)	2.3 (1-6)	1.8 (1-4)	0.052*

(\* shows significant correlation)

### 3.2.10 Frequency of consumption of foods

The study depicted that the tribals have a cereal based diet and so have a high folate intake. Boys consumed more moong and chana than girls ( $p=0.003$ ). Consumption of milk was low and not significantly correlated and depicts the low calcium intake. Groundnuts are the poor man's nuts. They were easily available and cheaper than other nuts. A child consumed approximately ½ cup of groundnuts daily. Consumption of egg was significantly more in boys than in girls ( $p=0.01$ ). Consumption of vegetables was found to be very low amongst the tribal children.

Similar results were seen amongst the Oraon tribal children where consumption of cereals was the most especially rice and wheat <sup>[12]</sup>.

Talasari taluka is known for production of fruits like Chickoo and guava. They are locally grown and easily available and cheaper. Children along with their peers, climb trees and pluck fresh fruits. Hence boys were found to have higher consumption of Chickoo ( $p=0.01$ ).

Consumption of outside foods has increased the intake of fats (49.3gm-boys, 54gm-girls). The subjects reported that they received approximately Rs.20 from their parents and used this money to buy outside food like vada pav (41.7% daily consumption). Girls consumed significantly more of Pakoda ( $p=0.032$ ) while boys consumed vada ( $p=0.052$ ) and biryani in their daily routine ( $p=0.08$ ).

### 4. Conclusion

It can be concluded that nutritional status of boys was found to be poor than girls. High intake of fats was observed because of increased consumption of outside food. This was significantly involved in increased weight of the children especially girls. Calcium and iron were found to be very low. Haemoglobin reports of the children would have given a more idea about the anemia prevalence in the children. A larger

sample size could have been included.

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