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**Original Research Article**

# Nutrition status and associated factors among tribal preschool children of 2-5 years in five districts: a cross-sectional study from three states of India

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## ABSTRACT

**Background:** To report the nutrition status in preschool children by 2-5 years of age among tribal children from five districts of India.
**Methods:** Community based cross sectional study of 204 tribal households having a child aged 2-5 year from five Indian districts with a considerable proportion of the tribal population. Socio-demographic details, and nutrition status by anthropometric measurements of children were collected from mothers. The age, sex, height and weight data of children were analysed according to WHO child growth, 2006 criteria to estimate the nutritional status. Multiple logistic regression analyses were performed to identify the associated factors.
**Results**: Only 56% preschool children (2-5 years) were having normal nutrition among the tribal children; 44% preschool children were found to be malnutrition. Of them, 27.9% (29.2% boys and 26.8% girls) were severely underweight (<-3SD), and 15.7% (13.5% boys and 17.6% girls) were underweight (-3SD to -2SD). The age-appropriate nutrition was unsatisfactory due to delay in breast feeding, nuclear family, child birth at home, mother education and non-availability of milk giving animal were the main reasons for malnutrition. Extended family, higher education of mothers and head of the household, hospital birth and breastfeeding immediately were significantly associated with normal nutrition.
**Conclusions:** A relatively low proportion of children were normal nutrition among the tribal population. Socio-economic factors, mainly the parental education, extended family were significantly associated with a child being normal nutrition. Improving the socio-economic status is crucial, and there is a need to improve the nutrition coverage in tribal areas.

**Keywords:** India, Tribal children, Nutrition status, ICDS programme, Malnourished children

## INTRODUCTION

Malnutrition among children in India is a public health issue due to inadequate nutrition. It has one of the most common causes of morbidity and mortality among under five years of children. In 2019, the United Nations international children's emergency fund (UNICEF) estimated that, globally 1 in every 3 children under age 5 is suffering from malnutrition and in 2017.[1]

The 150.8 million children around the world are stunted (acute malnutrition) and 50.5 million children under the

age of 5 years are experiencing wasted growth.[2] Malnutrition is the major cause of premature death of children under 5 years of age in developing countries.[3] And malnutrition becomes fatal in developing countries as many socio-economic factors are closely associated with it. In case of India, national family health survey 4 (NFHS-4) report estimated that 38.4% under 5 years of children were stunted, underweight was observed among

Among 35.8% children, and 21.5% was wasted.[4] Recent report of NFHS-5, reported 32.1% of children under five years of age were found to be underweight, 19.3% were wasted, and 35.5% were stunted.[5] The trend of malnutrition showing minor reduction when comparing the reports of NFHS-4 and NFHS-5. Regarding the mortality of under five years of children were reported 41.9 by fifth NFHS- report.[5] Usually, the causes of childhood malnutrition are insufficient diet, protein in the diet, infections, poor breast-feeding practices, and delayed initiation of complementary foods, insufficient quantities of food and insufficient parental knowledge on nutrition. Therefore, the determination of nutritional status is well established measures to examine the health status of vulnerable communities, specially child and pregnant mothers.[4,6] The existence of socio-economic inequality and its effect on child malnutrition is the key factor in determining malnutrition.[7,8] The tribal population in India constituted 8.6% out of the total country population (Census 2011). Interestingly, tribal belt of Central India (Madhya Pradesh, Chhattisgarh and Rajasthan) is the home of the highest number of tribal populations including major particularly vulnerable tribal groups (PVTGs). The PVTGs are the most backward communities in the country, depending on agriculture, having low literacy and subsistence level of economy. Even after the enormous presence of natural resources, this tribal zone is mostly backward and demonstrates a high level of health threats.[5,9,10] Tribal population is also known as indigenous population as they are living in difficult geographical zones, dense forest areas and they are out of the mainstream of the country. Indigenous communities suffered from high rates of under nutrition and continuously affected with diseases like tuberculosis, malaria, sickle cell anaemia, child mortalities owing to socio- economic deprivation.[11] Consequently, the health eminence of tribes in Central India is mostawful since they are geographically isolated, solitude, poor education, poverty and minimum use of government schemes or lack of availability of those schemes in tribal areas has shown their vulnerability. It is a matter of concern that, despite the availability of several national and state level social welfare programme like integrated child development scheme (ICDS), national rural health mission (NRHM) and national nutrition mission (NNM), malnutrition is still prevail in most part of the country, particularly in tribal region.

Nevertheless, numerous studies were highlighted about the pitiable condition of child malnutrition among tribes of Central India. In this research, we have conducted a study on nutritional status among PVTGs of Central India in the tribes namely Baiga, Bharia, Saharia, Bhil and Hill Korwa from states Madhya Pradesh, Chhattisgarh and Rajasthan. We examined the quantitative aspect of socioeconomic situation of households and anthropometric measurement of children. The nutritional status of under 5 years of children including preschool children aged 2-5 years is one of the important indicators of the development of community, and thus country also. These tribes are located in hill and jungle terrain with difficult communication systems. As they are geographically isolated from mainstream society, their livelihood is mostly dependent on local ecological resources like forest. Apart from this, they are engaged in traditional agriculture, worked as landless labour and involved in indigenous craftsmanship like iron smith, basketry and rope making. Economically they are marginalized with a very low level of education and live mostly in mud-built houses. This paper deals with only the nutritional status of preschool children. In India, children of rural and tribal areas are at high risk of under-nutrition due to improper nutrition, sanitation coupled with low hygienic practices and other conditions.[12]

The WHO has prescribed three anthropometric indices which are widely used to assess child growth status. These are stunting meaning for low height-for- age, underweight is considered as low weight-for-age and wasting regarded as low weight-for- height.[13,14] As stunting is an indicator of chronic under-nutrition, it is the outcome of extended deprivation from food, disease and illness.[15] Whereas, underweight relates to low body mass in relation to chronological age, influenced by both, child's height and weight. On the other hand, wasting refers to acute malnutrition, resulting from latest food deficiency and disease or illness. In this study, we have concentrated on 'underweight' as it prevails among tribes of India. The present study attempts to understand the nutritional status of tribal preschool children by 2-5 year of age from five districts from three states situated in central India in the country. Such districts are having a considerable proportion of PVTGs population. It further identifies the responsible factors associated with the malnutrition of the preschool child by 2-5 years of age.

## METHODS

### *Study setting*

This cross-sectional study was carried out in five districts of Central India during the period of 2020-21. The study district is Dindori, Chhindwara and Sheopur (in Madhya Pradesh state) with 9.06% tribal population, share of state total population, Sarguja (in Chhattisgarh state) with 16.63% tribal population, share of state total population and Udaipur (In Rajasthan) with16.51% tribal population, share of state total population. The population of the district varies from state to state, and the population of these selected districts is 8.91 million. These districts represent all geographical zones of central India, and the

data expose the childhood nutritionalsituation of the tribal population of the country. The five tribes namely Baiga, Bharia, Saharia, Hill Korwa and Bhil of selected five districts were included in the study. We have selected those districts where the particular tribe is numerically higher in that particular State. The socio-economic, demographic and anthropometric data were collected by trained investigators through pretested administered questionnaires. This survey was conducted as apart of descriptive research in the context of understanding tribal culture and lifestyle. As a part of the research, the nutrition data were collected from mothers having a child aged 2-5 years. Data on household socio-economic, demographic details, ANC and place of childbirth were collected.

***Nutrition programmes in India***

The current consecutively ICDS (Integrated child development services) scheme offers a supplementary nutrition and non-formal education to improve the nutritional and health statusof the children by six years of age in India. The nutritional beneficiaries are preschool children, pregnant mother and lactating mother under the nutrition programmes. Aiming to provide supplementary nutrition for 300 days in a year for re-orientation of eating habits among children. Services of supplementary nutrition to children below 6 year by Anganwadi workers and helpers. And to provide the additional nutrients to target groups (preschool children) to fulfil the gap between food intake and requirements.[16] The ICDS scheme also functions for present study districts.

***Study design and sampling***

A multi-stage cluster random sampling method was followed. From each of the selected states, a district with a considerable PVTGs population was selected. At the next level, talukas/blocks were selected where PVTGs dominated for each district. Then, villages were selected as per strength of block population using probability proportion to size sampling (PPS) method. Hence total 13 blocks were selected for the study. Thus, 31village areas were included in the present study throughout 13 blocks. In the next stage, one health facility village (whose village is situated in the radius of 5 km from PHC) and a minimum of four villages with no health facility were selected from each district. From each village, households were selected randomly from all four directions from the centre point of the village. In multi-ethnic villages, data collection was limited to the PVTGs population only. This study is descriptive research, conducted with a cross-section method. By considering the study design, sample size was calculated by using the standard formula (Lwanga and Lemeshow,1991).[17]

$$n = z^{1}_{1-\alpha/2}\mathrm{p}(1-\mathrm{p})\in^{2}$$

By considering the prevalence of the utilization of public health service by tribal population (p) of 27.5% (India human development survey-2) with 5% relative precision and 90% confidence interval, the sample to be 306.[18] By considering the design effect of 1.5, as cluster sampling is adopted, and considering 10% of non-response rate the sample size would be 459. We had considered a sample size of 500 households, distributed equally 100 households for each district. Finally, 512 households were included in the study from all block's areas from the selected five districts. Among these 512 households, 227 had a mother with a preschool child of 2-5 years. Seven mothers refused to participate due to time constraint for searching the occupation, one mothers lost the child before 5 year, and 15 were not considered for analysis due to incomplete information, finally 204 samples were considered for analysis.

***Data***

We didn't collect anthropometric measurements of children below 2 year's children, only covered those children who were enrolled in 'Anganwadi centre' and aged between 2-5 years. Another reason was the situation of COVID-19 outbreak during fieldwork, hence lactating mothers and their children were kept aside from measurement and interview. The exact age of the children was collected from their mothers and it was cross verified with the children immunization certificate and Anganwadi register. Among the 204 preschool children, 96 were boys and 108 were girls. Anthropometric measurements were taken from all sampled children, whereas socio-demographic information was collected from their mothers. Various socioeconomic data like education, occupation, house type, family type, source of drinking water which are relevant for nutritional status were collected by field investigators using pretested structured questionnaires.

***Measures***

Two anthropometric measurements including height (cm) and weight (kg) of each child were collected by employing standard techniques.[19] Trained single researcher was responsible for collecting anthropometric measurements of all children in order to keep the consistency and accuracy and avoid interfering with observation error. All the children are above two years of age and able to make a stand. Accordingly, we measure their height in a standing upright position with bare feet. As height is defined as the vertical distance from floor to vertex (topmost point). Height was measured by using an anthropometric rod and a weighing machine was used to measure the weight of children. Both instruments were examined continuously before taking measurements so that it functioned properly. For the nutritional status of children; anthropometric data were analysed according to WHO child growth status, 2006 (Z score) to assess the nutritional status of tribal children. The Z scores were calculated using standard technique. And, interpreted as per WHO norm, children whose weight for Age (WAZ) is below<-2 standard deviation from reference median

population are considered as 'moderately underweight'. Below-3 SD are considered as 'severely underweight'. All the data was initially entered in MS-excel 2012 software, for the analysis purpose data were imported in the SPSS-26 version.

### *Statistical analysis*

Nutrition status was the proportion of children who are normal nutrition (according to age, height and height) and under-nutrition or malnutrition who are not appropriate according to age. To identify the determinants of malnutrition status, children of 2-5 years were considered for analysis. The dependent variable was the malnutrition children of 2-5 years of age. Initially, each independent variable was regressed against each dependent variable. Those variables with a minimum p=0.25 were considered for multiple logistic regression analyses. Hosmer and Lemeshow recommended a $p<0.25$ as a screening criterion for variable selection. Analyses were carried out using SPSS version. 26 (IBM Corp., Armonk, NY, USA). The multiple regression analysis was done by using backward likelihood ratio method. The fit of these models was tested by Hosmer and Lemeshow to goodness of fit tests.

### *Ethical clearance*

Ethical clearance was obtained from the institute ethics committee (IEC) of national institute of research in tribal health, Jabalpur, Madhya Pradesh, India (No. NIRTH/IEC/01/814/2019). IEC approved the study protocol for the selected district. All participants gave informed consent. In the case of illiterate, consent was taken in the presence of a witness.

## RESULTS

Out of the 512 households, 204 children were 2-5 year of age. Therefore, the data from 204 households were considered for the analysis.

### *Socio-economic characteristics and participants*

The socio-demographic and economic characteristics of the selected households, mothers schooling, father schooling, father occupation, etc., is presented in Table 1. Nearly one-third of households lived in pucca houses; 77.2% used unclean fuel (cow-dung's cake, kerosene, straw, firewood) for cooking which led to pollution. As all of the households belonging to PVTGs were following a different religion than their other tribal religion. Regarding the keeping of pet/milk animal; cows, buffalo and goats were the main source of milk intake, and 68% had a milk giving animal. It may be mentioned here that they like to sell the available milk to earn money. Most (87%) of the household were male-headed, and only 53% head of the households were formal schooling. Radio, TV and mobile are the exposures to mass media and communication, and 67.7% households had either Radio or TV or mobile. Regarding their own travel convenience items like a cycle or bike or bullock card, about 40% of households reported have a convenience. More than fifty percent (55.7%) were family lives in nuclear households. More than forty percent (42.1%) households were still taking drinking water from streams/rivers/springs, which may be responsible for waterborne disease.

Pertaining to reference children, 2-5 year of age, boys-47% and girls-53% are having in the study. About 32% of reference children were of first birth order while 37% were in second birth order and 31% were of the third or above birth order. Majority (77.4%) of the mothers were aged 20-29 years, 5.4% of mothers were in adolescents. Nearly 43% percent of the mothers of the household had no formal schooling (illiterate). Only 47% mothers had taken 4 ANC check-ups during the pregnancy. For safe delivery, only 53.4% mothers gave childbirth in hospital. As postnatal/child care only 36.8% mothers breastfed immediately to the new born baby after birth.

### *Nutritional status*

The children aged 2-5 years, the age classified in the three age groups 24-35-month, 36-47 month and 48-60 month. The mean age was estimated 43.7 month with standard deviation 7.8 month and the majority of children were 48-60 month. The weight is measured in kilograms, and classified in three groups 10-12 kg, 11-13 kg, 14-16 kg. The majority of children were to be found at 14-16 kg and the mean weight was 13.05 kg with standard deviation 2.1 kg and height measured in cm, and classified in four groups less than and equal to 80 cm, 81-90 cm, 91-100 cm and greater than and equal to 101 cm. The majority of children (65%) were 90 cm and above. The mean height was 94.07 cm with standard deviation 71 cm. The measurement and nutrition status were presented in Table 2. About 28% of the children were severely underweight; of them the severe underweight was higher (29.2%) among boys than to the girls (26.8%). But, underweight girls (17.6%) were higher to the underweight boys (13.5%). Overall, almost 44% children were malnourished, and 56% children were normal.

### *Determinants of nutritional status*

Table 3 presents malnutrition and normal nutrition children by various independent/categorical variables and the results of multiple logistic regression. For logistic regression, the nutritional status has been classified as normal nutrition children (healthy) and malnutrition children (unhealthy). The socio-demographic factors details; type of house, type of family, source of drinking water, milk giving animal, education of the head of household, mother's educational attainment and occupation, ANC check-up, birth characteristic (hospital birth and birth at home), breastfeeding practices were considered as independent variables. The associations between malnutrition and selected exposure variables are presented as adjusted odds ratios (AOR) with 95% confidence interval (CI). The head of the household's

educational attainment and mother education, nuclear family, mothers breastfeeding immediately after birth were significantly associated with children being malnourished. The family who did not have a milkgiving animal (AOR 2.568, CI 0.349-1.238) was also associated with the malnutrition of the child. A child born in a home was 3 times more likely to be malnourished than those born in hospital (AOR 3.431, CI 2.133-7.922).

**Table 1: Background characteristics of the sample (n=204).**

| Variables | N (%) |
|---|---|
| **The study state-district** | |
| Madhya Pradesh- | |
| Dindori | 40 (19.6) |
| Chhindwara | 41 (20.1) |
| Sheopur | 42 (20.6) |
| Chhattisgarh-Sarguja | 41 (20.1) |
| Rajasthan-Udaipur | 40 (19.6) |
| **Type of village** | |
| Health facility village | 33 (16.2) |
| No health facility village | 171 (83.8) |
| **Type of house** | |
| Katcha | 109 (53.4) |
| Semi-pucca | 35 (17.1) |
| Pacca | 60 (29.4) |
| **Type of family** | |
| Nuclear | 114 (55.9) |
| Extended | 90 (44.1) |
| **Type of cooking fuel** | |
| Unclean | 182 (77.2) |
| Clean | 22 (10.8) |
| **Gender of the head of household** | |
| Male | 178 (87.3) |
| Female | 26 (12.7) |
| **Educational status of head of the household** | |
| No formal schooling | 95 (46.6) |
| 1-5 years of schooling | 50 (24.5) |
| 6-10 years of schooling | 46 (22.5) |
| 11 or more years of schooling | 13 (6.4) |
| **Educational status of the mother** | |
| No formal schooling | 87 (42.4) |
| 1-5 years of schooling | 56 (27.4) |
| 6-10 years of schooling | 52 (25.5) |
| 11 or more years of schooling | 9 (4.4) |
| **Occupation of the head of household** | |
| Former | 98 (57.8) |
| Labour (Agriculture) | 88 (43.1) |
| Govt./private service | 18 (8.8) |
| **Mothers age group** | |
| Less than 20 years | 11 (5.4) |
| 20-24 years | 71 (34.8) |
| 25-29 years | 87 (42.6) |
| 30 years and above | 35 (17.1) |
| **Milk animal (Cow or buffalo or goat)** | |
| Did not have animal | 65 (31.9) |
| Have animal | 139 (68.1) |
| **Travel item (Cycle or bike or bullock card)** | |
| Did not have travel item | 121 (59.3) |
| Have travel item | 83 (40.7) |
| **Entertainment items (Radio or TV or mobile)** | |
| Did not have entertainment item | 166 (32.4) |
| Have entertainment item | 138 (67.6) |

Continued.

| Variables | N (%) |
|---|---|
| **Available home items (Cot, clock, chair, table)** | |
| Did not have home item | 86 (42.2) |
| Have home item | 118 (57.8) |
| **Toilet facility** | |
| Did not have facility | 84 (41.2) |
| Have facility | 120 (58.8) |
| **Electricity connection** | |
| Did not have connection | 19 (9.3) |
| Have connection | 185 (90.7) |
| **Drainage/sanitation facility** | |
| Yes | 45 (22.0) |
| No | 159 (78) |
| **Sources of drinking water** | |
| Well | 31 (15.2) |
| Hand pump | 87 (42.6) |
| Stream/ river/ spring | 86 (42.1) |
| **Number of rooms in houses** | |
| 1 Room | 87 (42.6) |
| 2 Room | 67 (32.8) |
| 3 and more room | 50 (24.5) |
| **ANC check-up** | |
| 4 ANC check-up | 96 (47.1) |
| Less than 4 ANC check-up | 108 (52.9) |
| **Place of child birth** | |
| Home | 95 (46.5) |
| Hospital | 109 (53.4) |
| **Putting breastfeeding** | |
| Hours | 129 (63.2) |
| Immediately | 75 (36.8) |
| **Mother's occupation** | |
| Working to earn | 125 (63.1) |
| Homemaker | 79 (38.7) |

**Table 2: Nutritional status of children 2-5 years by gender.**

| Variables | N | | Percentages (%) | |
|---|---|---|---|---|
| **Age (in month)** | | | | |
| 24-35 | 39 | | 19.1 | |
| 36-47 | 56 | | 27.5 | |
| 48-60 | 109 | | 53.4 | |
| Mean ± SD | 43.7±7.8 | | | |
| **Weight (in kg)** | | | | |
| 8-10 | 27 | | 13.2 | |
| 11-13 | 78 | | 38.2 | |
| 14-16 | 99 | | 48.6 | |
| Mean ± SD | 13.05±2.1 | | | |
| **Height (in cm)** | | | | |
| ≤80 | 11 | | 5.4 | |
| 81-90 | 60 | | 29.4 | |
| 91-100 | 67 | | 32.8 | |
| ≥101 | 66 | | 32.4 | |
| Mean ± SD | 94.7±71 | | | |
| **SD classification** | **Male, (n=96) (%)** | **Female, (n=108) (%)** | **Both, (n=204) (%)** | **Nutritional status** |
| Severe underweight (<-3SD) | 28 (29.2) | 29 (26.8) | 57 (27.94) | Malnourished/ undernutrition 89 (43.6) |
| Under weight (-3SD to -2SD) | 13 (13.5) | 19 (17.6) | 32 (15.7) | |
| Normal (>Median) | 55 (57.3) | 60 (55.5) | 115 (56.37) | Normal 115 (56.4) |

**Table 3: Proportion of nutritional status of children of 2-5 years of age, various variables and results of multiple logistic regression.**

| Variables | Malnourished, n (%) | Normal, n (%) | AOR (95% CI) |
|---|---|---|---|
| **Number of children** | 89 (43.6) | 115 (56.4) | |
| **Type of house** | | | |
| Katcha | 44 (53.0) | 39 (46.9) | Reference |
| Semi-pucca | 27 (33.7) | 53 (66.2) | 1.492 (0.766-2.593)$^{NS}$ |
| Pacca | 18 (43.9) | 23 (56.1) | 0.382(0.448-1.034)$^{NS}$ |
| **Type of family** | | | |
| Nuclear | 47 (45.2) | 57 (54.8) | Reference |
| Extended | 42 (42.0) | 58 (58.0) | 3.643 (1.973-3.814)* |
| **Sources of drinking water** | | | |
| Stream/River/spring | 36 (44.4) | 45 (55.5) | Reference |
| Well | 32 (35.9) | 57 (64.1) | 4.372 (1.059-3.465)$^{NS}$ |
| Hand pump | 21 (61.8) | 13 (38.2) | 2.865(0.931-1.681)** |
| **Milk giving animal** | | | |
| Did not have animal | 58 (51.8) | 54 (48.2) | Reference |
| Have animal | 31 (33.7) | 61 (66.3) | 2.568 (0.349-1.238)** |
| **Educational of the mother** | | | |
| No formal schooling | 51 (46.4) | 59 (53.6) | Reference |
| 1-5 years of schooling | 21 (45.6) | 25 (54.3) | 0.527 (.486-1.568)$^{NS}$ |
| 6-10 years of schooling | 14 (35.0) | 26 (65.0) | 0.926 (0.591-1.258)* |
| 11 or more years of schooling | 3 (37.5) | 5 (62.5) | 2.146 (1.482-5.497)* |
| **Educational of the head of household** | | | |
| No formal schooling | 59 (46.4) | 68 (53.5) | Reference |
| 1-5 years of schooling | 16 (42.1) | 22 (57.9) | 1.025 (.826-3.158)$^{NS}$ |
| 6-10 years of schooling | 9 (30.0) | 21 (70.0) | 0.788 (0.355-1.211)$^{NS}$ |
| 11 or more years of schooling | 5 (55.5) | 4 (44.4) | 0.546 (0.622-1.744)** |
| **ANC check-up** | | | |
| 4 ANC check-up | 34 (46.6) | 39 (53.4) | Reference |
| Less than 4 ANC check-up | 55 (42.0) | 76 (58.0) | 0.581 (0.391-1.005)$^{NS}$ |
| **Place of child birth** | | | |
| Home | 41 (44.1) | 52 (55.9) | Reference |
| Hospital | 48 (43.2) | 63 (56.8) | 3.431 (2.133-7.922)** |
| **Putting breastfeeding** | | | |
| Hours | 60 (45.8) | 71 (54.2) | Reference |
| Immediately | 29 (39.7) | 44 (60.3) | 4.372 (1.059-3.465)* |
| **Mother's occupation** | | | |
| Working to earn | 14 (13.1) | 93 (86.9) | Reference |
| Homemakers | 75 (77.3) | 22 (22.7) | 0.381 (0.544-1.385)$^{NS}$ |

Hosmer and Lemeshow test: $X^2$ (p)=11.342 (0.201); Nagelkerke $R^2$= 0.267; *p<0.05, **p<0.01, NS-not significant

## DISCUSSION

The present study reports nutritional status among the children of vulnerable tribes from five Indian districts. This cross-sectional study attempted to holistically examine the nature of nutritional status of the preschool tribal children in the background of socioeconomic factors and MCH services. It is one of the very few studies which comparatively assessed the scenario of underweight and responsible socioeconomic factors among tribes across the three States. Only 56% of children were normal nutrition by the age of 2-5 years among the tribal population; 44% children were malnutrition. The age-appropriate nutrition was unsatisfactory as 27.9% of the children were severely underweight, and 15.7% children were underweighted. The 29.2% boys and 26.8% girls were found to be severely underweight. Overall prevalence of malnutrition is 44% among preschool children. High prevalence of malnutrition was also reported from studies conducted in eastern and central Indian States.[20-22] The results showed that tribal children are susceptible to the problem of malnutrition since birth. Other studies on the same age group have confirmed these trends.[23] Studies confirmed that boys significantly stood better compared to girls in malnutrition.[24-26] In our study it was found to be about similar among boys' and girls' children. On an opposite note, by Mitra et al based on their study on Kamar tribe of Chhattisgarh and Pradhan and Sharma, 2012 studies on

Bhil tribe of Madhya Pradesh, argued that boys are suffered more by malnutrition compared to girls in their initial age.[23,27] Our study is of different opinion as we illustrated that there is no substantial difference in underweight between boys and girls among PVTGs tribes. Numerous socio-cultural factors are responsible for severe under nutrition.[4,28-320] Present study showed that important socioeconomic indicators like education, occupation, house type, source of drinking water, living conditions are in poor condition among the studied tribes. Parental education is a key indicator as their knowledge would help to maintain the nutritional requirement of the child. We observed that parents are not aware of the nutritional status due to lack of education and awareness as they are socio-economically poor. Association of parental education and nutritional status is thus closely correlated as argued by other studies also.[12,31] Moreover, economic hardship also prevailed among study tribes. This is one of the strong barriers to access sufficient and quality food.[32] This inequality prevailed among tribes and non-tribes, affecting the nutritional status.[11] Our study reveals that most of the tribes depend on agriculture and local forest products. Due to lack of education they were unable to find suitable employment, often locally exploited. Poverty prevents them from buying nutritious food and lack of good quality and quantity food further increases the chance of being affected by malnutrition.[33] Nowadays tribes live more in the nuclear family as indicated by our study. Both parents were going to earn a livelihood earning; they frequently didn't have much time to look upon the nutritional necessity of the child. Absence of grandparents in nuclear families is the negative factor for maintaining nutritional care of the children as without parents and grandparents, children are susceptible to low quality food. Talapalliwar et al in their study also accepted family type as one of the factors in determining nutritional status of the children.[34] Present study also found type of family is responsible for determining nutritional status among preschool children.

Tribes' health outlines are inadequate as lack of access to healthcare facilities, community beliefs, cultural traditions, etc. For instance, conducted studies of the Baiga tribe in Madhya Pradesh (2009-10) showed that the tribe have underutilized and low awareness of maternal and child health (MCH), care services.[35] Furthermore, a shape of children's health status exposed that traditional cultural norms are an intensifying factor of Baiga infant morbidity.[36] Since, the place of child birth and its integrated aspects are based on women's background characteristics are highly influenced by the family and community. The socio-demographic characteristics of tribes regulate health care decisions and influence the attitudes of women utilizing modern health care practices. And the use of traditional-knowledge, attitude and practice (T-KAP) has been practiced majorly by tribal communities.[37] Low level of education, strong cultural beliefs and traditional culture norms are the strongest community barriers reflecting their self-decision-making for not accessing the modern health care facility.[38] Low birth weight babies as a result of early marriage and stillbirth were major concerns among adolescent tribal girls.[39] In tribal regions major gaps such as lack of human resources, infrastructure, out of pocket expenditure, etc., exist, so there is a need to develop individuals and community level plans to overcome the barriers of rural health services.[40]

The major strength of the study is large scale coverage of tribal children from different states of the country to analyse the factors answerable for nutritional status. We could not cover the food supplement and pattern from Anganwadi centre. And, its limitation is only available to children at the time of survey covered, due to the cross-sectional nature of the study. The findings of study would help address issue of malnutrition in tribal children.

## CONCLUSION

Only 56% of preschool children were found to be normal nutrition, and 44% preschool children were found to be malnourished by 2-5 years of age. Of them, the age-appropriate nutrition was unsatisfactory as 27.9% of the children were severely underweight, and 15.7% children were underweighted. The study revealed that socioeconomic factors were responsible for poor nutritional status. To prevent undernutrition; immediate intervention is needed, including creating awareness at community level, income generation for tribes through government schemes, improving health care access, and providing supplementary nutrition are urgent measures to stop under nutrition in tribal regions particularly to PVTGs tribes in country. Integrated child development scheme (ICDS) factor, mainly the distribution of food in Anganwadi centres and advice by Anganwadi workers could also be positively correlated with a child being normal nutrition. Improving distribution of the quality of food services is crucial to improve nutrition coverage in tribal areas and there is also a need to address nutritional awareness, supply of complementary food.

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