

Protein Energy Malnutrition among Preschool Tribe's Children of Chhattisgarh, India

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Abstract

Introduction

The aim of this study was to find out the prevalence of Protein Energy Malnutrition (PEM) by anthropometric measurements among preschool children of tribal community of Chhattisgarh, the Central of India.

Materials and Methods

A total of 449 children (237 boys and 212 girls) from 286 families were selected randomly. Anthropometric measurements were done as per standard protocol. The level of underweight, stunting and wasting was assessed using Standard Deviation (SD) classification as against National Center for Health Statistics (NCHS) reference standards.

Results

369 (82.1%) children belonged to one or the other grade of PEM. 189 (42%) belonged to grade II, 92 (20.4%) belonged to grade III and 84 (18.7%) belonged to grade IV while only 80 (17.8%) were healthy. We found that only 99 children (22%) were normal, 206 children (45.8%) were stunted, 30 (6.68%) were wasted, 114 (25.3%) were wasted and stunted.

Conclusion

This study found very high rates of malnutrition in the form of underweight, stunting and wasting in preschool children of tribal community, indicating a critical situation. There is urgent need for an integrated approach towards improving the child health as well as nutritional status in this area.

Key Words: Preschool children, Protein energy malnutrition, Shunting, Tribes, Wasted.

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Introduction

Future of nation depends upon the children and prospective of any country is very much influenced by the living condition provided to the children for their growth and development. This is more true for a vast country like India. This is an accepted fact that children are normal assets and any expenditure on them must be considered an investment rather than expenditure. To improve the health status of children constructive planning of health services for children is the basic need. This is based on the knowledge of the health status of children for whom it's being planned. The more extensive the knowledge is, more likely our services will fulfill the various purposes for which they are designed.

The children in the age group of 0-6 years are considered most neglected in whole population. They are vulnerable or special risk group in any population, deserving special healthcare. Today more than ever before, the preschool age children have become focus for organised medical and social welfare activities.

The mortality rate among infants and preschool children said to be more sensitive indicator of social levels of community. Data from national surveys have shown that in India nearly half the preschool children are under-weight or stunted and less than a fifth are wasted (1-4). Preschool child mortality rate was 59 per 1000 live births in India (5) which is much higher than global child mortality rate of 46 per 1000 live birth (6).

This high mortality is largely due to infection and malnutrition which is characteristic of this age group in underprivileged areas. Condition is more severe in tribal communities as they are found in rural and inaccessible areas of the country. Tribal communities in India are considered to be socially and economically vulnerable community (7). Other causes of poor health and disease burden in tribal

population are poor environment, sanitation, poor hygiene and lack of safe drinking water, lack of access to healthcare facilities resulting in increased duration of illness and social barriers preventing utilization of available healthcare services. The National Family Health Survey (NFHS-3) of India has reported that about 60% of tribal children under five- year are underweight and 59% are stunted and 21% children are wasted (3). Many studies across the Chhattisgarh, the Central of India, have been conducted to know the nutritional status of under five children among rural areas however the studies involving only tribal children are lacking. Therefore this study was planned to see the occurrence of protein energy malnutrition by anthropological measurements in preschool tribes of Chhattisgarh.

Material and Methods

Subjects: This study was carried out during 2011 to 2012 in tribal area of Chhattisgarh. 30 villages were randomly selected. Most of the villagers are widely scattered from primary health centers and they become non approachable during rainy seasons. Because of the poor communication facilities in the area operational feasibility remained the primary purpose of selection. About half of them could only be approached by two-wheeler and for many of them walking about 1 km was necessary. On reaching the village, anganwadi workers or some local person were used to guide. A door to door survey was done.

As per proforma general information of every child regarding age, sex, address, caste, date of birth was noted. Age was confirmed either by calendar of local events or from registers of anganwadi worker. Family size, birth order and total number of children were also noted. Age, literacy status, occupation, monthly incomes were recorded. Socioeconomic

status was classified according to modified Kuppuswamy scale. Place of delivery of child whether at home or hospital was asked. If at home whether it was conducted by trained or untrained day was also noted along with any special event at birth e.g. delayed cry. Time and type of first feeding after birth was recorded. Time of weaning and duration of breast feeding was asked from the mother.

Anthropometric measurement: In the presence of parents, measurements of the children were taken. Weight, height, head circumference, mid arm circumference and chest circumference were measured according to standard techniques.

Weight: UNICEF Detecto weighing scale with lever scale pan balance was used for infants and older children were weighed in UNICEF platform balance scale. Detecto scale has minimum increment of 10 gms. On reaching the village weighing machine was kept on an even surface and standardization and correction of error done with a previously known weight, weight was measured after removing foot wear and with minimum clothes on. The weight was recorded to nearest 0.1 kg.

Height or length: Length was recorded for babies under two years of age. Children were placed supine on an infantometer. The head was held firmly in position against the fixed upright head board and legs were straightened, keeping feet at right angles to legs. A free foot board was brought into contact with the child's feet and length was measured on infantometer scale.

For children above two years, children were asked to stand upright against a vertical wall, heels kept slightly separated and with heels, buttocks, and back brought in contact with the vertical surface. The head was so positioned that child looks directly forward with the frankfurt plane being horizontal. The head piece plate was kept firmly over vertex to compress the

hair. The measurement of height was then recorded.

Head Circumference: It was measured with a non-stretchable tape. The occipitofrontal head circumference was measured keeping the tape on supraorbital frontal area in front and over the most prominent part of the occiput. The tape was firmly kept during measurements.

Chest circumference: It was measured with non-stretchable tape. Tape was kept at level of nipples midway between inspiration and expiration in recumbent position.

Mid-upper Arm Circumference (MUAC): This measurement was also taken with non-stretchable tape. Tape was placed at the mid pointing between olecranon process of ulna and tip of acromion process of scapula in left upper arm hanging by the side.

All measurements were compared with NCHS standards (8). These children were classified in to different grades of malnutrition, weight for age used as anthropometric index of PEM.

Classification of Protein energy malnutrition:

According to Indian academy of Pediatrics (9) malnourished children were classified in to four grades of malnutrition:

- 1st grade: Weight between 71-80% of NCHS standards;
- 2nd grade: Weight between 61-70%;
- 3rd grade: Weight between 51-60%;
- 4th grade: Weight below 50%.

Every child was thoroughly examined for skin and hair changes, edema and other signs of malnutrition.

Results

A total of 449 children (237 boys and 212 girls) from 286 families were studied. Most of the families (33.9%) had 3 children, followed by 2 children in 30.7% of families, 48 families (16.7%) had 4

children, 24 families (8.3%) had one child, 3.1% families had more than 5 children. Out of 286 families, 247 (86.3%) families were nuclear families while only 39(13.6%) families were joint. Large proportion (91.9%) of children belonged to illiterate mothers, while only 26 (5.7%) mothers were educated up to primary school & only 10(2.2%) mothers were educated up to middle school and more. Table.1, shows that mean weight of boys

in all age group were heavier than girls in all age groups, except 0-3 months and 25-36 months, by 0.5 Kg. When compared with NCHS standards mean weight two gender in all age groups was between 60-70% of the 50th percentile of NCHS standard except in age group of 0-3 months and 25-36 months, where mean weight was between 80-90% of 50th percentile of NCHS Standards.

Table 1: Mean weight of children as compared to NCHS standard

Age (month)	Gender	Total	Mean \pm SD	NCHS standards	% of expected
0-3	M	7	3.86 \pm 0.38	4.51	85.5
	F	6	4.00 \pm 0.55	4.2	95.2
4-6	M	14	5.54 \pm 1.01	6.91	80.1
	F	9	5.54 \pm 1.01	6.91	80.1
7-9	M	15	6.10 \pm 0.85	8.51	71.6
	F	10	5.7 \pm 0.48	7.88	72.3
10-12	M	14	7.36 \pm 1.06	9.66	76.1
	F	15	6.43 \pm 1.94	9.04	71.1
13-18	M	12	7.29 \pm 1.27	10.81	67.4
	F	12	6.46 \pm 1.34	10.17	63.5
19-24	M	16	7.94 \pm 1.09	12.03	66
	F	23	7.91 \pm 1.01	11.36	69.6
25-36	M	32	8.86 \pm 1.65	13.49	65.6
	F	37	9.12 \pm 1.08	12.97	70.3
37-48	M	32	11.56 \pm 1.69	15.66	73.8
	F	28	10.33 \pm 1.30	15.04	68.6
49-60	M	31	13.06 \pm 1.83	17.68	73.8
	F	37	11.74 \pm 1.61	16.81	69.8
61-72	M	64	13.95 \pm 1.98	19.67	70.9
	F	35	13.53 \pm 1.76	18.58	72.8

M: male; F: female.

Table 2, shows that mean height of boys was more than girls in all age groups except 0-3 months and 19-24 months age group where girls were taller than boys by 0.5 cm-1 cm. When compared with NCHS standards it is found to be between 90-95% of 50th percentile of NCHS standard in all age groups and both sexes except Girls in the age group of 13-18 months and 49-60 months were between 85-90% of the 50th percentile of NCHS standard. Table 3, shows that mean head circumference lies

between 91-99% of expected. Mean head circumference of boys is higher than the girls in all age groups except in 0-3 months. Table 4, shows that boys had higher mean chest circumference at all ages except at 0-3 month of age and overtaking of chest overhead occurs at around 2 years in males and after that in females. Table 6, shows that Mid arm circumference in two gender is less than 12.5 at 1 year but gradually increasing with age and maximum at 5 year of age.

Table 2: Mean height of children according to NCHS standard

Age (month)	Gender	Mean \pm SD	NCHS standards	% of expected
0-3	M	52.31 \pm 2.28	55.4	94.4
	F	53.83 \pm 4.26	54.3	99.1
4-6	M	61.22 \pm 2.87	64.45	94.9
	F	57.61 \pm 1.79	62.7	91.8
7-9	M	64.25 \pm 3.07	70.05	91.7
	F	63.11 \pm 2.58	68.15	92.6
10-12	M	68.31 \pm 2.11	74.2	92
	F	66.65 \pm 1.57	72.35	92.1
13-18	M	72.54 \pm 3.52	79.25	91.5
	F	67.18 \pm 7.97	77.6	86.5
19-24	M	76.76 \pm 1.84	85	90.3
	F	76.93 \pm 3.79	83.7	91.9
25-36	M	83.06 \pm 3.07	90.7	91.5
	F	82.29 \pm 3.23	90.3	91.1
37-48	M	90.16 \pm 2.50	98.9	91.1
	F	89.23 \pm 1.78	97.8	91.2
49-60	M	97.57 \pm 3.12	106.4	91.7
	F	94.34 \pm 2.34	105	89.8
61-72	M	102.43 \pm 2.29	113	90.6
	F	100.67 \pm 3.07	111.5	90.2

Table 3: Mean head circumference in comparison to NCHS standard

Age (month)	Gender	Mean \pm SD	NCHS standards	% of expected
0-3	M	36 \pm 1.92	37.5	98
	F	36.40 \pm 1.94	36.7	99.1
4-6	M	40.09 \pm 1.69	42.4	94.5
	F	39.89 \pm 0.59	41.3	96.5
7-9	M	41.93 \pm 0.46	44.8	93.5
	F	40.86 \pm 1.01	43.5	93.9
10-12	M	43.63 \pm 0.65	45.1	94.5
	F	42.63 \pm 0.65	45.1	94.5
13-24	M	44.24 \pm 1.19	47.6	92.9
	F	44.24 \pm 1.19	47.6	92.9
25-36	M	45.93 \pm 1.24	50.2	91.4
	F	45.10 \pm 1.45	49	92

Table 4: Mean chest circumference and head chest ratio

Age (month)	Gender	Mean chest circumference	Head/chest
0-3	M	34.27	1.05
	F	34.90	1.04
4-6	M	38.11	1.05
	F	37.28	1.07
7-9	M	40.03	1.04
	F	38.65	1.05
10-12	M	41.19	1.04
	F	40.71	1.04
13-24	M	44.58	1.00
	F	43	1.01
25-36	M	47.48	0.96
	F	46.42	0.97

Table 5: Mid are circumference in different age groups

Age (year)	Gender	Mean + SD	NCHS standard	% of expected
1-2	M	11.16 + 0.96	15.9	73.3
	F	11.97 + 1.00	15.95	75
2-3	M	12.70 + 1.12	16.35	77.6
	F	12.85 + 0.68	16.15	74.6
3-4	M	12.92 + 0.94	16.30	79.2
	F	12.90 + 0.91	16.15	78.6
4-5	M	13.17 + 0.76	16.55	79.5
	F	12.97 + 0.69	16.30	79.3

PEM was more common in girls among all age groups. Of 212 girls, 191 (83.9%) and of 237 boys, 178 (81.4%) were affected by PEM. Table 6, shows that of 449 children studied, 80 (17.8%) were healthy, 369 (82.1%) were having PEM. Maximum i.e. 189 children (42%) belonged to Grade II

followed by 92 children in Grade III (20.4%) and 84 children in Grade I (18.7%). Only 4 children belonged to Grade IV (0.89%) PEM. Prevalence of PEM was highest (95.6%) in the group of 25-36 months and lowest 0-3 months (38.4%).

Table 6: Nutritional status of children according to IAP classification

Age (month)	No.	Healthy [%]	Prevalence of malnutrition				Total PEM [%]
			G I	G II	G III	G IV	
0-3	13	8	2	3	0	0	5(38.4%)
4-6	23	7	6	7	3	0	16(69.5%)
7-9	25	4	3	14	4	0	21(84%)
10-12	29	6	8	13	4	0	23(79.3%)
13-18	24	3	4	9	8	0	21(87.5%)
19-24	39	4	5	19	11	0	35(89.7%)
25-36	69	3	13	28	24	1	66(95.6%)
37-48	60	13	7	24	16	0	47(78.3%)
49-60	68	16	10	32	9	1	52(76.4%)
61-72	99	16	26	40	15	2	83(76.4%)
Total	449	80(17.8%)	84(18.7%)	189(42%)	92 (20.4%)	4(0.89%)	369(82.1%)

Table 7, shows prevalence of PEM in relation to birth order. 90.7% of children belonging to birth order 3 were PEM while 93(74.4%) of 125 children of birth order 1 were PEM. Table 8, shows of 144 children with lower middle class, 77% children were PEM while of 305 children with

lower class, 258 children (84.3%) were PEM. Table 9, shows most common morbidity is Respiratory Infection, 90 children (20%), Diarrhea in 37 children (8.2%), Skin infection in 29 children (6.4%), Dental caries in 28 children (6.2%).

Table 7: Birth order of children and nutritional status

Birth Order	Healthy	Prevalence of malnutrition				Total PEM [%]
		G I	G II	G III	G IV	
1	32	28	36	26	3	93(74.4%)
2	26	28	73	25	1	127 (83%)
3	9	18	48	22	0	88 (90.7%)
4	9	5	20	10	0	35 (79.5%)
5 or more	4	5	12	9	0	26 (86.6%)

Table 8: PEM in relation to socioeconomic status

Grade of malnutrition	Lower Middle (n=144)	lower (n=305)
I	32	52
II	56	133
III	22	70
IV	1	3
Total	111 (77%)	258 (84.5%)

Table 9: Morbidity Pattern among Children

Morbidity	No. of Children	Percent
Skin Infections	29	6.4%
Respiratory Infections.	90	20%
Diarrhea	37	8.2%
Ear Discharge	5	1.1%
Eye Problem	13	2.8%
Worm Infestation	20	4.4%
Dental Caries	28	6.2%

Discussion

A home to home survey was conducted in the population comprising of birth to 6 years of age and two gender. The study was conducted in 30 villages mainly inhabited by tribal populations. Majority of them lived in Kaccha houses without proper facilities such as electricity, drinking water and sanitation. A total of 449 children among preschool age group were studied.

In present study, mean weight of both boys and girls was between 60-75% of 50th percentile of NCHS standard at all age groups except between 0-3 months and 4-6 months males where it was more than 80% of 50th percentile of NCHS standard. This could be because of practice of exclusive breast feeding in first six months of life. Maximum weight deficit is seen in the age

group of 18-36 months. This decreasing trend points towards improper weaning habits, deposing of child from breast feeding and birth of next sibling. The results were matching with those of other studies (9-13) showing mean weight between 60-80% of NCHS.

Mean height of both gender fell between 90-95% of 50th percentile of NCHS standard except girls of age group of 0-3 months when it was more than 95% and girls of 13-18 months and 49-60 months when it was between 85-90% of 50th percentile of NCHS standard. Similar results were observed by Behra et al. (10) from Orissa, Rao et al. (11), Gadre et al. (12) and Rao et al. (14) from Madhya Pradesh.

In this study it was observed that mean head circumference was higher in boys

than in girls except in the age group of 0-3 months when compared with NCHS. Mean head circumference lies between 91-99% of expected. These results were comparable to those observed by Shrivastava et al. (13), Gradre et al. (12). They also observed that mean head circumference was higher for boys than girls at all ages. The observation in present study were lower that observed by Behra et al. (10).

Overtaking of chest overhead occurred in present study at around 2 years. Similar results were observed by Behra et al. (10) and Gadre et al. (12), but Rao et al. (15) from Hyderabad observed it to occur at 30-36 month of age.

In the present study of 449 children, 369 (82.1%) children belonged to one or the other grade of PEM. The prevalence of PEM was much higher in present study than other previously reported studies. Banarjee et al. (16) reported 50.67% prevalence of PEM in his study conducted in tribal area. The prevalence of malnutrition observed by Garg et al. (17) was 58.2%. The prevalence of stunting among tribal preschool children in India varies from 35.1% to 67.8% (18). The prevalence of stunting in the present study (45.8%) was similar to that of the national tribal population (19). The rate was higher in the present study than in tribal preschool children of West Bangal (18, 20). The prevalence of stunting was lower in the present study than in the Kamar tribal children (21) and Saharia (22). Percentage of wasted was also higher than other tribal studies (18-22).

Under nutrition is a well-known contributory factor to high mortality in children due to infectious diseases. High infant mortality and under five mortality rates among scheduled tribes of Chhattisgarh have been observed (19). High prevalence of respiratory tract infections and micronutrient deficiency

disorders such as anemia might be playing an important role. A study among preschool children of this tribe also revealed high prevalence of intestinal parasitic infections (48%) among them (23). In present study we also observed a high rate of respiratory tract infection and diarrhea.

Conclusion

Protein energy malnutrition in preschool children of tribal community is still a major problem in our country. Attempts should be made to combat this problem through multi-pronged approach like growth monitoring, nutritional supplementation and nutrition education.

Conflict of interest: None.

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