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NUTRITIONAL ASSESSMENT BASED ON MID UPPER ARM CIRCUMFERENCE OF THE HILL KORWAS UNDER FIVE YEAR CHILDREN IN SARGUJA DISTRICT, CHHATTISGARH, INDIA

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ABSTRACT

Mid Upper Arm Circumference is used as an indicator for assessing acute undernutrition among children below five years of age. WHO child growth standards (2007) have given age related Z-Score for both boys and girls for MUAC for identification of undernutrition among children below five years. The objective of nutritional status based on mid upper arm circumference (MUAC) among under five-year Hill Korwa children. Therefore, a study was carried out from December-2015 to 2016 in three Lundra, Batauli and Sitapur blocks of Sarguja district Chhattisgarh. A total of 1000 children for MUAC have been made on 580 boys and 420 girls' children below 6 years of age living in Sarguja district of Chhattisgarh in this cross-linked study. MUAC was measured using fibreglass tape sensitive to the nearest mm using standard technique. MUAC z-scores (MUAC-Z) were computed using WHO child growth standards and nutritional status was assessed. It was observed that 45.20% of the children (age-combined) were malnourished. The WHO (2007) recommended age and sex independent cut-off points for MUAC (mm) under estimated the prevalence of undernutrition was 47.6% among children in the study. This clearly indicated that MUAC-for-age using WHO Child Growth Standards would help in identifying the burden of acute undernutrition among Hill Korwa children.

KEY WORDS

Hill Korwa Tribe, Nutritional status, Mid Upper Arm Circumference, WHO child growth standards.

INTRODUCTION

Malnutrition is a nutritional disorder or condition resulting from faulty or inadequate nutrition. It is generally resulting from an imbalance between the body's needs and the intake of nutrients, which can lead to syndromes of deficiency or obesity. It includes under-nutrition, in which nutrients are undersupplied, and over-nutrition, in which nutrients are oversupplied. Because of the high demand for energy and essential nutrients, infants and children are at particular risk of undernutrition. Malnutrition has serious, long-term consequences specially in early childhood because it impedes motor, sensory, cognitive, social and emotional development (Krishnan, 2004).

In case of tribal children due to insufficient food intake, infection, lack of accessibility to health services, illiteracy, unhygienic personal habits, and adverse cultural practices etc malnourishment is higher. Specially among children nutrition has an important role in determining health status. (Rao, *et al.,* 2005).

UNICEF report in 2012 suggested that the estimated numbers (in million) of underweight, stunted and wasted preschool children in 2015 in Asia is around 60, 84 and 39 million respectively (UNICEF, 2012).

According to UNSCN report, in India alone there are approximately 60 million children who are underweight (UNSCN, 2012) and the prevalence is higher in rural areas compared wto urban areas (Smith *et al.,* 2005). However, as per National Family Health Survey (NFHS, 2005-06) III data, under-five mortality rate in the slum area was higher (72.7%) than urban average (51.9%).

According to NFHS-3 report, among the under-five children, about 43.1% males and 43.9% females are underweight, about 47.9% males and 48% females are stunted, about 20.7% males and 19.3% females are wasted (NFHS, 2005-06).

Among the anthropometric indices Mid-upper arm circumference (MUAC) was recommended by the consensus statement to assess nutrition status (Becker et al., 2015). MUAC is a very effective tool for screening nutrition status because of the ease of use when weight and height are difficult to obtain, measurement involves simple inexpensive equipment, and with minimal training users make fewer errors when compared with measurements of weight and height (Velzeboer *et al.,* 1983). Many studies have shown that MUAC value of <115 mm as an age-independent and gender-independent, outperforms all other anthropometric indices in identifying severely malnourished children at high risk of death (Deonis *et al.,* 1997; WHO, 1995; 2009).

MUAC is being used as an age independent criterion for assessing acute undernutrition among children for many years. This is because; it's simplicity in measurement and is easy to interpret. MUAC is important diagnostic criterion to identify acute undernutrition among preschool children during emergencies or where the precise age is not known. For screening of severe acute malnutrition among children aged between 6 months and five years MUAC <11.5 cm is used as a criterion in both facilities based and community-based management programme (GOI, 2011). Some studies conducted in urban slums of Delhi have raised concerns regarding use of single cut-off based MUAC as a screening tool for identification of SAM children (Dasgupta *et al.,* 2013; Chand and Shah, 2015).

The aim of the present study was to evaluate the nutritional status of less than five-year Hill Korwa children of Sarguja district, Chhattisgarh using the World Health Organization (2006) age and sex specific MUAC cut off points. Few studies have been done to assess the nutritional status among the children of Hill Korwa communities in Sarguja district, Chhattisgarh. So, this study was designed to assess the nutritional status of a sample of 6-59 months children using the most commonly used indices as compared to the WHO reference standards in order to identify underweight malnutrition problems if exist.

METHODOLOGY:

Area and People:

Hill Korwa a sub group of Korwa tribe was identified as particular vulnerable tribal group (PVTGs) during the fifth five-year plan (Ota, *et al.,* 2015). The history of this tribe reveals that they moved westward into the Khudia Jamindari (Present Sanna and Bagicha revenue circles) of Jashpur district from Chhotanagpur region. They are distributed in Sarguja, Jashpur, Balraampur, Shankargarh and Korba district and their total population is 34,122 (Tribal Research Training Institute, Raipur, Chhattisgarh, 2006). According to anthropological description of family, they belong to Austro-Asiatic family (Shrivashtav, 2007). Generally, most of the Hill Korwas were having nuclear families. Hill Korwa are divided into Five totemistic endogamous clan, viz; *Hansadwar*, *Samar*, *Edigwar*, *Ginnur* & *Renla* (Daltan, 1969). The religion of the Hill-Korwa is confined to ancestral worship and to the worship of few Gods and deities. Their important Gods are *Sigri Dev*, *Gauria Dev*, *Mahadev*, and *Parvati*; and main deity is *Khudia Rani* (Vashnav, 2008). The present study was conducted among the randomly selected Hill Korwa tribe of Sarguja district of Chhattisgarh.

The present study carried out mainly in three blocks namely Lundra, Batauli and Sitapur of Sarguja district of Chhattisgarh. In this study, 16-gram panchayat comprising 26 villages were covered where Hill Korwas are predominately residing.

Sampling:

A cross sectional survey was conducted in 2015- 2016 on Hill Korwa tribe. A total of 1000 (580 boys and 420 girls) children (6-59 months) of three blocks of Sarguja district of Chhattisgarh were included in this study; purposive sampling was done for the selection of research participants. Those who were not willing to participate in the study were excluded. Apart from the above said the sample of Anganwadi Centre, Primary Schools and Primary Health Care Centres were also being taken for study.

Data Collection:

During the time of collecting information, basic data pertaining to general information of the people and area was gathered. Schedules were prepared for collecting the data from the research participants, which contains basic information like age, sex and outcomes of Mid- upper circumference of the children for qualitative data in-depth interviews and observation were carried out in the field. Mid upper arm circumference (MUAC) was measured using a non-stretchable tape. The circumference was measured at the midpoint of the left arm. After measuring the distance between lateral tip of the acromion and the tip olecranon process of ulna, midpoint was located by dividing the distance by two. Circumference was measured without compressing soft tissues and recorded to the nearest 0.1 cm.

Mid upper arm circumference cut-offs are somewhat arbitrary due to its lack of precision as a measure of malnutrition. A cut-off of is 115-135 mm used for mild & moderate malnourished children. Those children below <115 mm are classified as severe malnourished.

Nutritional status of the children was assessed using the following scheme:

Nutritional Status	Z-Score Cut-off point
Normal	≥ 2 SD
Undernutrition	< - 2 SD
Moderate undernutrition	< - 2 SD to - 3SD
Severe undernutrition	< - 3 SD

Where, SD refers to the age- and sex-specific WHO (2007) standard deviations of MUAC. The-2SD and -3SD of age- and sex-specific cut-off points are given in table- (a).

Age	Boys		Girls	
(Years)	Moderate (-2SD)	Severe (-3SD)	Moderate (-2SD)	Severe (-3SD)
1	12.5	11.6	12.4	11.1
2	13.0	12.0	12.7	11.7
3	13.5	12.5	13.3	12.2
4	13.7	12.7	13.6	12.5
5	14.0	12.9	14.0	12.8

Table- (a): The WHO (2007) recommended age and sex specific cut-off points for MUAC (mm).

Nutritional Classification	MUAC Cut-off points
Severely undernourished	<115 mm
Mild & Moderate undernutrition	115 - 135 mm
Normal	>135 mm

The WHO (2007) recommended age and sex independent cut-off points for MUAC (mm).

Statistical Analysis:

Z-Score was calculated as per WHO child growth standard (2007). The statistical analysis of complete data was carried out by using Microsoft Excel, SPSS, and Emergency Nutrition Assessment (ENA) software's.

ANALYSIS AND RESULTS

Table-1: Statistical Analysis of Anthropometric Measurements MUAC among the Hill Korwa boys and girls

Age group (months)	Mid upper arm circumference (MUAC)				't' Value
	Boys		Girls		
	Mean	SD	Mean	SD	
0 – 5	11.70	±0.99	11.66	±0.78	-0.029
6 – 17	12.64	±1.05	12.36	±1.42	2.184*
18 – 29	12.45	±1.44	12.30	±1.62	2.851*
30 – 41	13.52	±1.47	13.08	±1.69	2.756*
42 – 53	13.30	±1.66	13.52	±1.71	2.821*
54 – 59	14.90	±2.08	14.40	±1.77	-0.035

*unpaired t-test between boys and girls, t-values significant at p<0.05

Age group wise mean MUAC among Hill-Korwa boys and girls and a comparison has been shown in the present table-1. It was found that in the age group 6 -17, 18-29, 30-41, 42-53 months, a significant difference is present between boys and girls, here the t-value is statistically significant ($p<0.05$).

Table-2: Nutritional status of Hill Korwa children using MUAC-for-age as an index with WHO child growth Standards (2007).

Age (Months)	Total	Boys (N=580)				Girls (N=420)				
		N	Under Nutrition %	N	Normal	Total	N	Under Nutrition (%)	N	Normal
6-17	80	35	43.75	45	56.25	52	23	44.24	29	55.76
18-29	105	46	43.81	59	56.19	72	34	47.22	38	52.78
30-41	130	72	55.38	58	44.62	95	42	44.21	53	55.79
42-53	131	63	48.09	68	51.91	121	56	46.28	65	53.72
54-59	134	40	29.85	94	70.15	80	41	51.25	39	48.75
Total	**580**	**256**	**44.14**	**324**	**55.86**	**420**	**196**	**46.67**	**224**	**53.33**

Table-2 represents nutritional status of Hill Korwa children's MUAC-for-age using WHO standards. Here in the present study it was observed that in age group 6-17 months among the boys 43.75% are undernourished and 56.25% are normal, where as among girls in this age group undernourished are 44.24% and normal are 55.76%. In age group 18-29 months among the boys 43.81% are undernourished and 56.19% are normal, where as among girls in this age group undernourished are relatively of higher percentage than boys, that is 47.22% and normal are 52.78%. In age group 30-41 months among the boys 55.38% are undernourished and where as among girls in this age group is 44.21% that is very low relative to boys. In age group 42-53 months 51.91% boys are normal and among girls again in this age group normal are relatively of higher percentage that is 53.72 %. In age group 54-59 months, only 29.85% boys are undernourished and 70.15% are normal, but among girls of this age group, 51.25% are undernourished and 48.25% fall under normal category here also higher percentage of boys are fall under normal category than girls.

Table-3: Assessment of nutritional status of the Hill Korwa children based on MUAC (WHO, 2007)

Age (Months)	Total Number of Boys and Girls (N=1000)			
	N	Undernutrition %	N	Normal %
6-17	58	12.83	74	13.50
18-29	80	17.70	97	17.70
30-41	114	25.22	111	20.26
42-53	119	26.33	133	24.27
54-59	81	17.92	133	24.27
Total	**452**	**45.20**	**548**	**54.80**

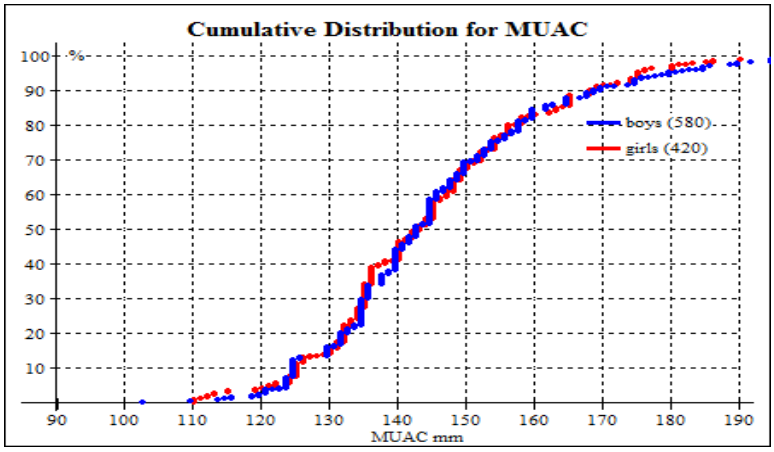
In table-3 assessment of nutritional status of Hill Korwa children both male and female based on MUAC has been shown. Total number of children is 1000 children, 45.20% are fall under under-nutrition category and 54.80% are fall under normal category. According age-wise distribution it was observed that in the age group 6-17, normal children are more (13.50%) than undernourished children (12.83%), where as in the age group 18-29 same percentages (17.70%) was found in case of normal as well as undernourished children. Again, in the age group 30-41 months, undernourished children (25.22%) are more than normal children (20.26%). In the age group 42-53 months, undernourished children are more (26.33%) than normal children (24.27%) and in age group 54-59 months normal children are higher (24.27%) than undernourished children (17.92%).

Table-4: Distribution according to MUAC of Hill Korwa children aged 6-60 months

MUAC Cut-off points of Nutritional status	Boys (N=580)		Girls (N=420)		Total (N=1000)	
	N	%	N	%	N	%
Severely undernourished (<115 mm)	47	8.10	52	12.38	99	9.9
Mild & Moderate undernutrition (115 – 135 mm)	208	35.86	169	40.23	377	37.7
Normal (>135 mm)	325	56.03	199	47.38	524	52.4
Total	**580**	**100.00**	**420**	**100.00**	**1000**	**100.00**

In the present table-4 the nutritional status with the help of MUAC index has been shown among the total 1000 children. According to MUAC cut-off points of nutritional status it was observed that 8.10% boys are fall under severely undernourished category where as 12.38% girls are severely undernourished. Among the boys, 35.86% are fall under mild and moderate undernutrition among the girls 40.23% are fall under this category. Among the boys 56.03% are normal in case of girls that are 47.38% which is relatively lower than boys. From this table-4 it also can be understood that girls are facing undernourishment problems in comparison to the boys.

Figure-1: Comparison of median MUAC of boys and girls with WHO 2006 standards



In the present figure-1 comparative study within boys, girls and the WHO standard has been shown for MUAC measurement. Here in this figure it has shown that both the boys' and girl' curve has overlapped on each other and they are almost same and facing undernourishment problem.

Table-5: Comparison of the overall prevalence (%) of Undernutrition among the preschool children based on MUAC.

References	Years	Research area	Sample size	Prevalence (%)
Kaur *et al.*	2005	Preschool children, Punjab	6531	38.5
Chakraborty *et al.*	2006	Shabar tribe, Kurda and Cuttack district, Odisha	101	35.6
Mishra & Mishra	2007	Preschool children, Cuttack, Odisha	292	29.1
Chatterjee & Saha	2008	Preschool children, Kolkata, West Bengal	21	28.6
Mandal and Bose	2009	Preschool children, Arambag Hooghly, West Bengal	894	64.5
Biswas et al.	2010	Bengalee children, Chapra, West Bengal	2016	35.1
Bisai	2010	Urban Poor Preschool children, North 24 Parganas, West Bengal	500	69.8
Singh& Mukherjee	2015	Rural Children, Katihar district, Bihar	899	25.0
Present Study *(Khan & Nayak)*	2017	Hill Korwa, Sarguja, Chhattisgarh	1000	45.20

In table 7, many studies have done by different researcher at different time, which stated the prevalence of undernutrition by using MUAC classification. In 2005, Kaur *et al.,* studied among preschool children in Punjub and found that 38.5% were undernourished. Chakraborty *et al*. in 2006 studied among Shabar tribal children in Odisha and found that 35.6% were undernourished. Mishra & Mitra in 2007, studied among preschool children of Cuttack, Odisha, and observed that 29.1% are undernourished children. In 2008, Chatterjee and Saha studied among preschool children at Kolkata in West Bengal, found that only 28.6% were fall undernourished category. Mandal and Bose in 2009 worked at Arambag Hoogly, in West Bengal and stated that there is present higher frequency of undernourished children that is 64.5% were malnourished. In 2010, Biswas *et al.* studied Bengalee children at Chapra in West Bengal and found that 35.1% are undernourished. Bisai in 2010, studied urban poor preschool children of North 24 parganas district in West Bengal and found that higher frequency of children are undernourshied that is 69.8%. Singh & Mukherjee in 2015 studied among rural children of Kathiar district in Bihar and noticed that 25.0% children are undernourished. The present study was carried out among Hill Korwa children, shows that half of the children that is 45.20% fall undernourished category and rest 54.80% are normal children.

CONCLUSION:

In conclusion, our study clearly indicated that the nutritional status, based on MUAC, of these children was serious with high rates of under nutrition in both sexes. In the studied population, about 45.20% of the total children are suffering from under nutritional problems. According to MUAC classification among the boys 56.03% are normal in case of girls 52.4% are normal, which is relatively lower than boys. It was also found from the present study that in the sex-wise difference is statistically significant among the age group 6 -17, 18-29, 30-41, 42-53 months.

Though this present study shows that among the total children 1000, 54.08 % are normal children and 45.20% fall under normal category and 49.7% were malnourished. Therefore, it was found from this study that as compared to previous studies the percentage of malnourished children is decreasing over time and almost half of the studied population is fall under normal category. It was possible due to their comparatively better lifestyle pattern and changes in their dietary food habit pattern.

We suggest that more studies dealing with undernutrition based on MUAC should be undertaken among children from different districts of Chhattisgarh specially among the Hill Korwa children. Worldwide, it has been recommended that MUAC be used to determine nutritional status among children of different ethnic groups particularly in developing countries. Such investigations will help us to demonstrate the enhanced utility and effectiveness of this measurement and also allow us to compare the rates of three conventional measures of undernutrition with MUAC. Studies should concentrate on rural children. As a vast number of the Indian population reside in rural areas where the rates of childhood undernutrition are very high so that effective health and nutritional promotion programmes can be formulated based on the findings of these researches with the ultimate objective of reducing childhood nutrition in these areas.

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