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ANTHROPOMETRIC STATUS OF UNDER-5 CHILDREN FROM REMOTE RURAL AREAS IN FOREST BUFFER ZONE OF BOR TIGER SANCTUARY IN CENTRAL INDIA, DURING AUGUST-OCTOBER, 2016.

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ABSTRACT

This cross-sectional study was conducted in 46 villages which belong to Forest Buffer Zone of Bor Tiger Sanctuary in central India.[1] About 15 % population in this region is tribal. This cross-sectional survey was conducted during August to October 2016. All households with children in the age group of 6 months to 60 months were purposively selected and anthropometric assessments for weight, height and mid-upper arm circumference were done for all the children available on the day of visit. The main indicators assessed were weight for height, weight for age and height for age. The main anthropometric results (prevalence of global and severe acute malnutrition in terms of z-scores and/or oedema and 95% confidence intervals) are as follows- GAM: 21.7 % (19.4 - 24.3 95% C.I.) SAM : 5.8 % (4.6 - 7.4 95% C.I.) Prevalence of Severe Wasting as per WHZ scores was 5.8% whereas it was 0.9% as per MUAC cut-offs. Prevalence of severe stunting as per HAZ scores was 18.6% whereas prevalence of severe underweight as per WAZ scores was 13.6%. Special attention is needed regarding education and awareness of parents on nutrition of under 5 children with special focus on children aged 12-36 months showing highest percentage of wasting.

KEYWORDS: Global Acute Malnutrition (GAM), Severe Acute Malnutrition (SAM), Moderate Acute Malnutrition (MAM), Mid Upper Arm Circumference (MUAC), Wasting, Stunting.

INTRODUCTION

Globally, 52 million children under five years are moderately or severely wasted (low weight for height). A report by UNICEF published in 2006 states that around 146 million children in the developing countries are underweight - that is one out of every fourth child.[3] One in four children under age 5 (165 million or 26 per cent in 2011) is stunted. Sub-Saharan Africa and South Asia contribute to three quarters of the world's stunted children. In 2011, five countries that count the highest numbers of stunted children were: India (61.7 million), Nigeria (11 million), Pakistan (9.6 million), China (8 million) and Indonesia (7.5million). The highest prevalence is in South Asia, where approximately one in six children is severely or moderately wasted. The burden is highest in India, where more than 25 million children are wasted.[5,6] Despite global efforts for improving maternal and child health malnutrition among children remains a significant problem. In India, nearly 48%, 43%, and 20% of children under five years of age are stunted, underweight, and wasted, respectively. Out of these around one fourth are severely stunted.[7]

It is well documented that chronic under nutrition is associated with serious developmental and health impairment later in life which reduce the quality of life.[2, 13] Tragically, more than a third of child deaths and greater than 10% of the total global disease burden is attributed to maternal and child under nutrition, which includes underweight, stunting, wasting, and deficiencies of essential vitamins and minerals.[4]

This study was conducted with an aim to find out the prevalence of stunting and wasting among children under five years of age in forest buffer zone of Bor Tiger Sanctuary in Central India.

Bor is the smallest tiger reserve in India. The Bor buffer area is 66,116 hectares (661.11 sq km). It includes around 45,000 hectare (450 sq km) area from Wardha forest division and 20,000 (200 sq km) hectare private land. Remaining forest area belongs to Nagpur division. The selected 46 villages are in forest buffer zone of Bor Tiger Sanctuary which come in Seloo block of Wardha district and Hingana block of Nagpur district.[1] The rationale for selecting these villages was that these villages come in the forest buffer zone of Bor Tiger sanctuary in Central India and are covered under the Community Outreach Programme of DMIMS University. The villages are predominantly located in and around forest area covering a population of around 30841 and about 15% of this population is tribal. Majority of population is engaged in agriculture and forest based activities for earning their livelihood. Though many villages have good access by road, they have limited transportation facilities and Anganwadi centers are the only government facility available for under-5 children in these villages.

2. METHODOLOGY

Survey Objective: Estimate the prevalence of malnutrition- stunting, wasting and underweight among the under-5 children from remote rural areas in Forest Buffer Zone of Bor Tiger Sanctuary.

This was a cross-sectional survey conducted in remote rural areas of Seloo block of Wardha district and Hingana block of Nagpur district. As per census 2011, there are total 146 villages in Seloo block and 132 villages in Hingana block. For this survey, total 46 villages from both blocks were purposively selected which were covered by 50 Anganwadi Centers.

Complete enumeration of all the households in all 46 villages was done using the NFHS-4 Household Questionnaire Form by a team of 30 trained Data Collectors. All households with children aged 6-60 months were listed. Also the list of children enrolled in AWCs was obtained from corresponding AWWs and the both lists were cross-checked for the number of children. All children between one month to five years of age and residing in the study area were included in the assessment after getting the written informed consent from their mothers or caregivers. UID Number was assigned to all children and household members. All the listed children in the village available on the day of survey were assessed. The study protocol was approved by the Institutional Ethics Committee of DMIMS and permissions from district ICDS authorities were obtained. Respondents were assured about confidentiality of information and its intended use for research purpose only.

Inclusion Criteria

1] All children aged 6-60 months from the permanent resident families of the village and available on the day of survey.

Exclusion Criteria

1] Severely sick children, handicapped children, with disabilities like lame, archeiropody, and amputee.
2] Children from families not currently resident of the village eg. guests, migrants for short duration.

Data Collectors, Equipments and Materials

A team of 10 trained and certified Research Assistants from nursing background collected the anthropometric data of 1408 children which included Height, Weight, Mid-upper arm circumference and oedema feet. All data collectors were rigorously trained on anthropometric assessments using standardized protocols of WHO. All data collectors underwent Certification and Standardization tests (Inter-rater and Intra-rater exercises) after training and candidates with higher scores were mobilised to the field. Weight was recorded using Digital weighing scale pretested for accuracy (Dr. Trust) with minimal clothes. Length of children up to the age of two years was measured with the child on horizontal measuring scale (Infantometer). Height of children above 2 years of age was measured by using Stadiometer (Alive Stature-meter). Standing height was measured up to nearest of 0.1 cm. The child was made to stand against the scale without shoes, heels together and shoulder buttocks and heels touching the vertical surface. Height was recorded with a head piece touching the top of the head when child was looking straight and arms hanging by the sides in a natural manner.[20] MUAC was recorded using the Lbis MUAC Tapes.

Data Analysis

The data was directly entered to Tablet PC based app with inbuilt quality checks for data figures, UIDs and age calculator. The data file retrieved from ONA server for 1408 children was fed to the Emergency Nutrition assessment Software (ENA-2011).[21] The main outcome variables were stunting and wasting. WHO growth charts for the boys and girls were used for classifying stunting and wasting. Child having a Z score for, height for age less than –2SD was classified as “moderate stunting” and that with Z score, less than -3SD was classified as “severe stunting”. Similarly the child with Z score for weight for height less than -2SD was considered as having moderate wasting and those with the score of less that -3SD was considered as having severe wasting.[9]

Questionnaire, Survey Teams, Training and Supervision: Questionnaire was prepared in Marathi and back translated to English and Marathi. The Data Collection tools was prepared in xls forms on ODK app and was imported to Tablet PC. The collected data was entered to this app directly which had inbuilt auto-checks, error correctors and age calculator. Each data collectors were assigned a specific ID and each subject / child was given a 8-digit UID. The stickers with Child name and UIDs were pasted at the households in advance. The data collectors entered the data for each child by using these pre-assigned UIDs. The completed

forms were submitted by the data collectors when back in network.

Each team consisted of one Main Measurer and one Assistant Measurer who were constantly supervised by one Supervisor. The daily input data was retrieved from the server and was fed to statistical analysis programme. Team wise data was analysed for digit preference, outliers and any discrepancies from listed targets. The teams showing objectionable entries were given debriefing sessions every day and retrained in each weekly meeting.

Data collection was repeated for left out children in the clusters.

3. RESULTS

3.1 Anthropometric results (based on WHO standards 2006): This study included total 1408 children among which 733 (52.1%) were males and 675 (47.9%) were females with an overall male- female ratio of 1.1.

Table 3.1: Distribution of age and sex of sample.

	Boys		Girls		Total		Ratio
AGE (mo)	no.	%	no.	%	no.	%	Boy:girl
6-17	154	49.4	158	50.6	312	22.2	1.0
18-29	180	54.7	149	45.3	329	23.4	1.2
30-41	169	54.9	139	45.1	308	21.9	1.2
42-53	154	48.9	161	51.1	315	22.4	1.0
54-59	76	52.8	68	47.2	144	10.2	1.1
Total	733	52.1	675	47.9	1408	100.0	1.1

Table 3.2: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex

	All n = 1375	Boys n = 716	Girls n = 659
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(299) 21.7 % (19.4 - 24.3 95% C.I.)	(157) 21.9 % (18.9 - 25.3 95% C.I.)	(142) 21.5 % (18.1 - 25.4 95% C.I.)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(219) 15.9 % (14.2 - 17.8 95% C.I.)	(117) 16.3 % (13.8 - 19.3 95% C.I.)	(102) 15.5 % (12.9 - 18.5 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(80) 5.8 % (4.6 - 7.4 95% C.I.)	(40) 5.6 % (4.1 - 7.6 95% C.I.)	(40) 6.1 % (4.3 - 8.5 95% C.I.)

The prevalence of oedema is 0.0 % (Definitions of acute malnutrition: Global acute malnutrition (GAM) is defined as <-2 z scores weight-for-height and/or oedema, severe acute malnutrition (SAM) is defined as <-3z scores weight-for-height and/or oedema. Exclusion of z-scores from Zero (reference mean) WHO flags: WHZ -5 to 5; HAZ -6 to 6; WAZ -6 to 5).

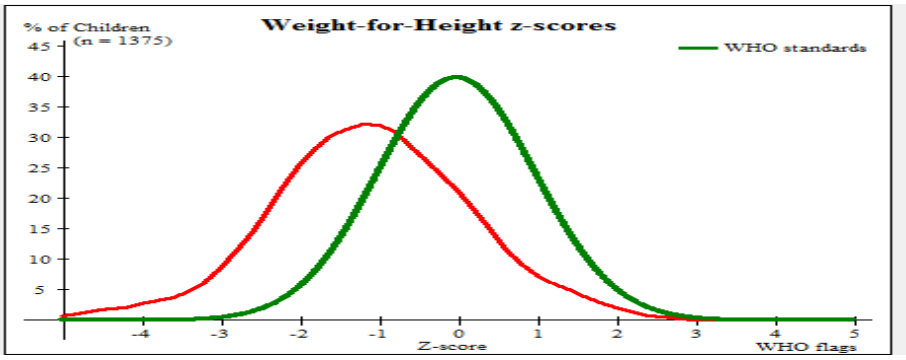

Fig. 1: Weight-for-Height Z-scores of study population compared to WHO standards.

Table. 3.3: Prevalence of acute malnutrition by age, based on weight-for-height z-scores and/or oedema.

		Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
Age (mo)	Total no.	No.	%	No.	%	No.	%	No.	%
6-17	298	32	10.7	62	20.8	204	68.5	0	0.0
18-29	323	22	6.8	49	15.2	252	78.0	0	0.0
30-41	301	11	3.7	35	11.6	255	84.7	0	0.0
42-53	310	9	2.9	49	15.8	252	81.3	0	0.0
54-59	143	6	4.2	24	16.8	113	79.0	0	0.0
Total	1375	80	5.8	219	15.9	1076	78.3	0	0.0

Table 3.4: Distribution of acute malnutrition and oedema based on weight-for-height z-scores

	<-3 z-score	>=-3 z-score
Oedema present	Marasmic kwashiorkor No. 0 (0.0 %)	Kwashiorkor No. 0 (0.0 %)
Oedema absent	Marasmic No. 80 (5.8%)	Not severely malnourished No. 1295 (94.2%)

Table 3.5: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex

	All n = 1408	Boys n = 733	Girls n = 675
Prevalence of global malnutrition (< 125 mm and/or oedema)	(74) 5.3 % (4.0 - 6.9 95% C.I.)	(28) 3.8 % (2.6 - 5.7 95% C.I.)	(46) 6.8 % (5.0 - 9.2 95% C.I.)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(61) 4.3 % (3.2 - 5.9 95% C.I.)	(22) 3.0 % (2.0 - 4.5 95% C.I.)	(39) 5.8 % (4.1 - 8.1 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(13) 0.9 % (0.5 - 1.7 95% C.I.)	(6) 0.8 % (0.3 - 2.2 95% C.I.)	(7) 1.0 % (0.5 - 2.4 95% C.I.)

Table 3.6: Prevalence of acute malnutrition by age, based on MUAC cut off's and/or oedema

		Severe wasting (< 115 mm)		Moderate wasting (>= 115 mm and < 125 mm)		Normal (> = 125 mm)		Oedema	
Age (mo)	Total no.	No.	%	No.	%	No.	%	No.	%
6-17	312	9	2.9	33	10.6	270	86.5	0	0.0
18-29	329	3	0.9	23	7.0	303	92.1	0	0.0
30-41	308	0	0.0	2	0.6	306	99.4	0	0.0
42-53	315	1	0.3	2	0.6	312	99.0	0	0.0
54-59	144	0	0.0	1	0.7	143	99.3	0	0.0
Total	1408	13	0.9	61	4.3	1334	94.7	0	0.0

Table 3.7: Prevalence of underweight based on weight-for-age z-scores by sex

	All n = 1402	Boys n = 733	Girls n = 669
Prevalence of underweight (<-2 z-score)	(646) 46.1 % (43.6 - 48.6 95% C.I.)	(336) 45.8 % (42.4 - 49.3 95% C.I.)	(310) 46.3 % (42.4 - 50.4 95% C.I.)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(455) 32.5 % (30.4 - 34.6 95% C.I.)	(232) 31.7 % (28.7 - 34.8 95% C.I.)	(223) 33.3 % (29.6 - 37.3 95% C.I.)
Prevalence of severe underweight (<-3 z-score)	(191) 13.6 % (12.0 - 15.5 95% C.I.)	(104) 14.2 % (11.9 - 16.8 95% C.I.)	(87) 13.0 % (10.5 - 16.0 95% C.I.)

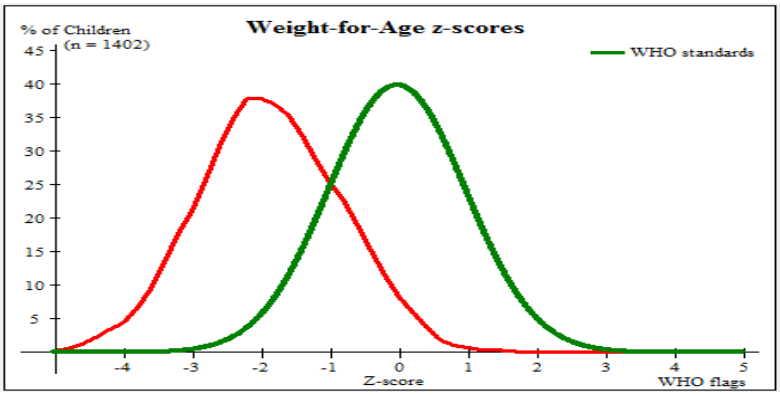

Fig-2: Weight-for-age Z-scores of study population compared to WHO standards.

Table 3.8: Prevalence of underweight by age, based on weight-for-age z-scores

		Severe underweight (<-3 z-score)		Moderate underweight (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
Age (mo)	Total no.	No.	%	No.	%	No.	%	No.	%
6-17	309	40	12.9	98	31.7	171	55.3	0	0.0
18-29	329	55	16.7	114	34.7	160	48.6	0	0.0
30-41	307	42	13.7	96	31.3	169	55.0	0	0.0
42-53	314	42	13.4	97	30.9	175	55.7	0	0.0
54-59	143	12	8.4	50	35.0	81	56.6	0	0.0
Total	1402	191	13.6	455	32.5	756	53.9	0	0.0

Table 3.9: Prevalence of stunting based on height-for-age z-scores and by sex

	All n = 1385	Boys n = 720	Girls n = 665
Prevalence of stunting (<-2 z-score)	(690) 49.8 % (46.6 - 53.1 95% C.I.)	(368) 51.1 % (46.6 - 55.6 95% C.I.)	(322) 48.4 % (44.2 - 52.7 95% C.I.)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(432) 31.2 % (28.5 - 34.0 95% C.I.)	(226) 31.4 % (27.3 - 35.8 95% C.I.)	(206) 31.0 % (27.7 - 34.4 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(258) 18.6 % (16.0 - 21.6 95% C.I.)	(142) 19.7 % (16.4 - 23.5 95% C.I.)	(116) 17.4 % (14.1 - 21.4 95% C.I.)

Fig-3: Height-for-age Z-scores of study population compared to WHO standards

Table 3.10: Prevalence of stunting by age based on height-for-age z-scores

		Severe stunting (<-3 z-score)		Moderate stunting (>= -3 and <-2 z-score)		Normal (> = -2 z score)	
Age (mo)	Total no.	No.	%	No.	%	No.	%
6-17	304	51	16.8	65	21.4	188	61.8
18-29	324	96	29.6	101	31.2	127	39.2
30-41	303	58	19.1	107	35.3	138	45.5
42-53	310	41	13.2	115	37.1	154	49.7
54-59	144	12	8.3	44	30.6	88	61.1
Total	1385	258	18.6	432	31.2	695	50.2

Table 3.11: Prevalence of overweight based on weight for height cut off's and by sex (no oedema)

	All n = 1375	Boys n = 716	Girls n = 659
Prevalence of overweight (WHZ > 2)	(11) 0.8 % (0.4 - 1.5 95% C.I.)	(3) 0.4 % (0.1 - 1.3 95% C.I.)	(8) 1.2 % (0.6 - 2.6 95% C.I.)
Prevalence of severe overweight (WHZ > 3)	(2) 0.1 % (0.0 - 0.6 95% C.I.)	(0) 0.0 % (0.0 - 0.0 95% C.I.)	(2) 0.3 % (0.1 - 1.3 95% C.I.)

Table 3.12: Prevalence of overweight by age, based on weight for height (no oedema)

		Overweight (WHZ > 2)		Severe Overweight (WHZ > 3)	
Age (mo)	Total no.	No.	%	No.	%
6-17	298	2	0.7	1	0.3
18-29	323	3	0.9	0	0.0
30-41	301	4	1.3	0	0.0
42-53	310	2	0.6	1	0.3
54-59	143	0	0.0	0	0.0
Total	1375	11	0.8	2	0.1

Table 3.13: Mean z-scores, Design Effects and excluded subjects

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	1375	-1.10±1.27	1.20	17	16
Weight-for-Age	1402	-1.85±1.06	1.00	1	5
Height-for-Age	1385	-1.94±1.30	1.47	8	15

* contains for WHZ and WAZ the children with oedema.

4. DISCUSSION

Prevalence of stunting and wasting

In present study, prevalence of stunting was 49.8% and wasting was 21.7%. According to DLHS 4 in Maharashtra the prevalence of stunting (42%) was less than stunting found in this study? Also prevalence of wasting in this area was 21.7% which was much higher than the prevalence of wasting (6%) in Maharashtra.[10] The reason for difference in prevalence in the present study and the study conducted by DLHS 4 in Maharashtra was seen because the prevalence by latter was a complete figure of the whole state whereas our study represents prevalence of few villages in Maharashtra state.

Almost similar findings were reported from studies by Nandy S et al, (2005).[1]; Mittal A et al, (2007)[14]; Sengupta P et al, (2010)[15]; Islam S et al, (2014)[7]; Dhani V et al, (2014).[18]

Very few surveys focus on severe acute Malnutrition diagnosed by measuring Mid-upper arm circumference. Overall prevalence of Wasting as per Mid-upper arm circumference (MUAC) in this population was 5.3% (GAM) with 4.3% having MAM and fortunately 0.9% having SAM. No case of bilateral pitting oedema was found in this population.

Association of Stunting and wasting with Gender

In the present study stunting in females was somewhat higher than males; 51.1% males & 48.4% females were stunted. Gender was not significantly associated with stunting. Studies of other investigators that revealed similar findings are Mandal GC et al, (2008)[14] ; Bhavsar S et al (2012)[16]; Mamulwar M S et al (2014)[17]; Agrawal N et al (2014).[19]

Biswas S et al, (2008)[8] found that the rate of stunting was significantly higher in male children.

In the present study 21.9% male & 21.5% female children had wasting. Gender was not found to be significantly associated with wasting.

Mandal GC et al,[14] and Agrawal N et al[19] found that wasting was higher in boys than girls.

Association of age with stunting and wasting

No significant association was found between age of the child and stunting. Also No significant association was found between age of the child and wasting.

Similar findings were reported by Sengupta P et al (2010)[15] and Saxena N et al (1997)[11] who found that 48-59 months old children had highest stunting. Sengupta P et al,[15] found that the 48-59 months (62.0 %) old children had the highest wasting.

But findings differ in the studies of Mittal A et al (2007)[13]; Biswas S et al, (2008) [8]

5. CONCLUSIONS

Aim of the present study was to assess the prevalence of stunting & wasting among children below five years in the rural area of Wardha district.

To conclude, the overall study shows that stunting and wasting was comparatively higher in this area than Maharashtra. Overall the present study revealed more stunting and wasting cases from the forest buffer area of Bor sanctuary.

In the present study prevalence of stunting and wasting was highest in 12-36 months old children. So these children should be focused with special emphasis on awareness of parents by Anganwadi workers and other health workers regarding complementary feeding of children with care of hygiene practices like washing hands with soap and water before cooking and feeding.

Health workers need to continue awareness regarding initiation of breastfeeding within first hour of birth and exclusive Breastfeeding. Motivate other family members to support women for appropriate Infant and Young Child Feeding practices (IYCF).

Also extensive work needs to be done to inhibit use of feeding bottles and commercial infant food substitutes available in market. Strict regulatory approaches need to be taken by government machinery to control distracting advertisements of these products. There is a need of a Community based programme for targeted intervention to severely malnourished children and Parenting programme for improving caregiver capabilities in this area.

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