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Assessment of 24 hour dietary recall in under five children with moderate acute malnutrition

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Abstract:
Objective: To assess the nutritional status of children 6 to 59 months of age in nontribal and tribal areas of Raigad district
Methodology: A representative sample of children 6 to 59 months of age was randomly selected with a validated multistage clustered design. The sample was stratified according to place of residence (nontribal and tribal area) locality and size of locality (number of households). A cross-sectional survey of nutritional status was carried out. Data were collected by interviews with the primary caregivers of the children. Measurements were made of children's weight and height or length. Food-intake data were collected by the 24-hour food-recall method with the use of a booklet of photographs of foods commonly eaten in India.
Results: A total of 1008 children were assessed, of which 97 had severe acute malnutrition, 286 had moderate acute malnutrition. Out of 286 children studied, locality and maternal education were significantly associated with acute malnutrition whereas infants 6 to 23 months of age were significantly at risk. Calorie and protein intakes were generally lower than recommended dietary allowances.
Conclusion: Maternal education and provision of food education in selected areas is needed to make aware dietary impact.
Key words: Anthropometric, children, food security, recommended dietary allowance (RDA), z-score

Introduction:

The terrain of the Raigad district has a length of about 160kms from North to South and the Breath varies between 24kms to 28kms. The district covers total area of 7152 sq. kms which is 2.4 percent of the state's geographical area. It ranks 27 in geographical area in the State of Maharashtra. It consists of a combination of fertile plains along various rivers, terraced hills, and a marshy sea side region. Raigad district has 30500 populations of tribals, which is 11.54 percent of total tribal population of Maharashtra state.[1]

Moderate malnutrition (MM) is defined as a weight-for-age between -3 and -2 z-scores below the median of the WHO child growth standards. It can be due to a low weight-for-height (wasting) or a low height-for-age (stunting) or to a combination of both. Similarly, moderate wasting and stunting are defined as a weight-for-height and height-for-age, respectively, between -3 and -2 z-scores.

MM affects many children in poor countries. Children with moderate malnutrition have an increased risk of mortality and MM is associated with a high number of nutrition-related deaths. If some of these moderately malnourished children do not receive adequate support, they may progress towards severe acute malnutrition (severe wasting and/or oedema) or severe stunting (height-for-age

less than -3 z-scores), which are both life-threatening conditions.[2] Therefore, the management of MM should be a public health priority.

In contrast to severe malnutrition, programmes for the management of MM in children have remained virtually unchanged for the past 30 years, and it seems timely to review efforts to improve their efficacy and effectiveness.[3] Currently there are no evidence-informed recommendations on the composition of supplementary foods used to treat children with moderate acute malnutrition. WHO has published a technical note that summarizes existing knowledge and presents principles on the dietary management of children with moderate acute malnutrition? The technical note also proposes a nutrient composition profile for supplementary foods.[4] Socioeconomic assessment in India is done using Modified Kuppuswamy assessment scale.[5]

It has been asserted that national food security does not necessarily ensure household or individual food security, and that 20% to 30% of the population of countries where the per capita supply of food is at or above 100% of dietary energy needs may persistently subsist on inadequate diets and be unable to meet their requirements for normal physiological functioning[6], with particularly adverse implications for the nutrition of young children[7]. Food security has been defined as access to food adequate in quantity, quality, and safety to ensure healthy and active lives for all household members[8]. In addition, although insufficient food availability may be the direct cause of low food intake in food-insecure households, the nature of the diet, particularly its quality, may actually be the cause of low food intake. However, it has been pointed out that the complexity of the relationship been national conflict and child health is "poorly understood and rarely studied, largely because adequate data are often lacking"[9].

Objective: 1. To assess the nutritional status of children 6 to 59 months of age in nontribal and tribal areas of Raigad district. 2. to study association of socioeconomic factors in relation to moderate malnutrition.

Inclusion criteria: 1. Children from 6 completed months to 5 year 364 day

2. Children enrolled through Anganwadi or camps organized

Exclusion criteria: 1. Children with known immunodeficiency

2. Child without any record of birth date

Methodology: A cross-sectional study was carried out on a nationally representative sample of children who were randomly selected with a validated multistage clustered design, with the NFHS 4[10] used as the sampling frame. Sample size was calculated on the basis of an expected estimated prevalence of wasting among the Indian population of 5%, with a 95% confidence interval and 5% error. The sample was stratified according to place of residence (area) nontribal and tribal, locality, and size of locality (number of households). A random sample yielded 546 households and 1026 children 6 to 59 months of age. Of these, six households (0.2%) refused to participate and the mothers of 12 children (0.7%) refused to allow their children to be measured, resulting in a sample of 492 households with 997 preschool-age children. Of these, 286 children had moderate acute malnutrition and were evaluated in details for dietary assessment and related key factors. Consent was obtained from the mother or the head of the household. The protocol for the study was approved by the Research Ethical Committee

Data collection: Each of the 3 data collection teams consisted of two women with graduate-level public health knowledge and previous experience in performing anthropometric measurements. Each team received training on administering the assessment questionnaire. The data collection period was July and August 2018. An interviewer-administered questionnaire was used to collect information from the primary caregivers (mothers, fathers, or others) of children under 5 years of age on basic demographic characteristics (age or date of birth and sex), feeding patterns, food security, and

dietary intake. The investigators performed anthropometric measurements of the surveyed children. The Baby Digital Scale, graduated to 0.01 kg for infants (capacity 30 kg) and 0.1 kg for children, was used for weight measurements. The children were weighed barefoot wearing only underwear. Height was measured to the nearest 0.5 cm on children who were able to stand against a wall with their feet flat on the floor and with the heels, buttocks, shoulders, and back of the head touching the wall and the head positioned with the child looking straight ahead; a rigid headpiece marked the height on the wall, and a tape measure was used to measure the distance from the floor to the wall mark. For infants and toddlers unable to stand, length was measured with the infantometer. The infantometer was placed on a hard, flat surface, and length was measured to the nearest 0.1 cm with the infant lying on its back with the head touching the base, facing straight ahead, with the back and legs straight against the floor and the feet positioned flat against the foot brace at a 90 degree angle Food-intake data were collected by a 24-hour food recall method. The multiple-pass 24-hour diet-recall interview was structured into three steps to maximize the respondent's recall of foods eaten. On the first pass, the "quick list," the respondent supplied a broad description of all food and beverage items consumed on the previous day (the 24 hours from 4:00 in the morning to 4:00 in the next morning). At the next step, a detailed description of each food or beverage item on the quick list was obtained through a series of questions and prompts specific to each item. The questions for each item included the manner and frequency of consumption (i.e., eaten in combination with other foods, for example, hummus and olive oil), the cooking method, fats used in preparation, and the recipe, when appropriate. If the respondent did not know the recipe for a mixed item, probe questions about ingredients likely to influence the fat content of the food (for example, the type of fat, milk, yogurt, or cheese used) were asked. The third and final pass was a review of the recall. The interviewer read aloud the foods eaten in chronological order and verified the descriptions and amounts consumed with the respondent. A final question checked whether anything had been omitted from the recall. Any information that was forgotten or incorrectly entered was added or edited at this step. The interviewers used cards, a food-intake booklet, and measuring aids such as a measuring cup, teaspoon, and tablespoon to facilitate quantification of the foods consumed. Participation in the survey was voluntary.[6]

Data analysis: Data processing and analysis were performed with Epi Info 6.0 and SPSS for Windows, version 8.0. Weight for-age, weight-for-height, and height-for-age were calculated for children and the cutoff point for stunting, wasting, and underweight was a z-score below –2 SD of the reference value, according to World Health Organization (WHO) guidelines[15]. The food recalls were analyzed for nutrient data with Diet Cal Software, a program specially adapted to meet the needs of the nutrition survey in India. Food and beverages from the 24-hour diet recall were matched with food-composition data to calculate nutrient intake.

Maternal education categories were defined as follows: Illiterate mothers were those who reported they were unable to read or write. Primary, secondary, and high-school education was defined as completion of grades 4, 10, and 12, respectively. Those with a diploma had finished a 2-year program beyond high school; those with a bachelor's degree or above had completed at least a 3- year degree program beyond high school or had received an advanced university degree.

Results: A total of 286 children aged 6 to 59 months from the Raigad district were included in the study. Table 1 outlines the demographic characteristics of the study population. Complete data were collected for all demographic variables. The average sample household size was 4.2in nontribal and 4.5 in tribal. The median age of the children was 33.6 months. The children were evenly

Table 1: Demographic characteristics of the study population

Characteristic	No	%
Sex		
male	144	50.34
female	142	49.66
Age		
6–11	31	10.84
12–17	36	12.59
18–23	31	10.84
24–35	68	23.77
36–47	73	25.52
48–59	47	16.44
Locality		
Tribal	153	53.5
Non-Tribal	133	46.5
Maternal education (SU/A)		
Illiterate	06/16	2/5.6
Primary school	48/93	16.8/32.5
Secondary school	61/22	21.3/7.7
12 th std pass	36/01	12.6/0.3
Beyond 12 th Std	02/00	0.6/0

distributed according to sex, with 51.4% boys and 48.6% girls. There were 153 nontribals, 133 tribal children. The overall prevalence of wasting (percentage of subjects–2 SD below the NCHS/ WHO weight-for-height reference) was 3.4% (Table 2). The prevalence of wasting peaked at 12.0 to 23.9 months and then decreased with age and was lowest at ed 48 months of age. The overall prevalence of stunting (the percentage below –2 SD of the NCHS/WHO height-for-age reference) was 10.7%. The prevalence of stunting was higher among boys (11.2%) than among girls (10.2%); p = .217. The overall prevalence of underweight (percentage below –2 SD of the NCHS/WHO weight-for-age reference) was 5.1%. The prevalence of underweight increased with age and then decreased at 48 months of age or older.

Table 3 shows the prevalence of moderate acute malnutrition with respect to each of the variables that were studied. The only variable that significantly differed with respect to the prevalence of moderate acute malnutrition was age: children younger than 24 months were significantly more likely to be acutely malnourished. When the analysis was performed only for the tribal population , illiterate women had a 2.08 higher chance of having an acutely malnourished child, although this result was not statistically significant, with a p value of .232. The overall prevalence of moderate acute malnutrition was 10.7%; the prevalence was significantly lower in the tribal than nontribal (9.2% vs. 12.7%; p = .02). Table 4 shows effects of various factors on the malnutrition. Effect on moderate malnutrition with each of the variables taken individually and also when all of the other variables were controlled for in a multiple logistic regression. Of all the variables, maternal education was clearly the most significant factor in the simple logistic regression and the multiple logistic regression, with a much greater prevalence of chronic malnutrition in children of illiterate mothers. Table 5 shows percentage of preschool children with energy and protein deficit according to age and region .It reveals that percentage of energy intake is much more less than protein intake overall. Age wise comparison shows that smaller ages are more affected overall. We have found that there is no significant difference in nontribal and tribal area as far as total energy and protein intake is concerned.

Discussion: Several Indian studies were conducted to assess the prevalence of anemia and its determinants in tribal[11]. Our study describes the findings of the assessment of nutritional status and related factors carried out by the MGM Medical College under government health insurance scheme. It is a representative survey among children 6 to 59 months of age residing in the Raigad .

This nutrition survey yielded a number of important findings. The prevalence of wasting among children under five was 28.6%, 3.78

Table 2: Comparison of stunting, wasting and underweight in initial population

Children under 5 years who are stunted (height-for-age)	Maharashtra study	29.3 28.6	38.4 40.4	34.4 35.3
Children under 5 years who are wasted (weight-for-height)	Maharashtra study	24.9 24.1	26.1 30.2	25.6 26.3
Children under 5 years who are underweight (weight-for-age)	Maharashtra study	30.7 28.9	40.0 42.4	36.0 38.5

Table 3: Analysis of stunting, wasting and underweight in study population

Group	Wasting	Stunting	Underweight
Sex			
male	53	57	45
female	45	44	47
Age			
<12	32	13	16
12–23.9	34	22	25
24–35.9	30	28	27
36–47.9	31	24	21
>48	21	21	29

Table 4: Effects Of Various Factors On The Malnutrition

Factor	Simple logistic regression Odds of acute malnutrition			Multiple logistic regression Odds of acute malnutrition		
	95%	CI	p	95%	CI	p
Sex Male vs. female	1.113	0.648–1.43	.623	1.213	0.786–1.687	.654
Age (mo) 6–23 vs. 24–29	2.044	1.305–3.087	< .001	1.964	1.341–2.912	.001
Location Urban or rural vs. refugee camp	0.861	0.649–1.037	.071	0.891	0.623–1.069	.171
Maternal education Illiterate vs. any schooling	0.743	0.231–2.344	.612	0.731	0.232–2.381	.534

Table 5: Percentage of preschool children with energy and protein deficit according to age and region

Age in years	Energy intake % with < 80 % RDA		Protein intake% with < 80% RDA	
	NONTRIBAL	TRIBAL	NONTRIBAL	TRIBAL
1-3	56.6	65.2	23.5	28.7
4-5	78.4	81.5	20.1	26.2

percentage points higher than the state prevalence. We believe that the food aid helped to alleviate the problem, but the higher prevalence relative to the national figure indicates the effect of short-term nutritional deprivation on children under five. That said, moderate acute malnutrition continues to plague the thinly populated, remote villages and poverty-ridden tribal parts to a greater degree than the more developed nonurban areas. The greater utility of this study is in the analysis of the variables affecting nutrition, since this information is useful for health programmers and policy makers. This study also documented a high prevalence of stunting among the children in comparison with that seen at the national level. This observation documents that the nutritional status of this population may be a longstanding problem. The higher prevalence of moderate acute malnutrition in the 6- to 23-month age group than in the 24- to 59-month age group suggests that households have little food reserves, since the 6- to 23-month age group would be the most vulnerable, and a short-term indicator such as acute malnutrition would appear in this group first. We found that the prevalence of breastfeeding was consistent across the population, with nearly universal levels in the first year of life then dropping off dramatically after 12 months. Thus, breastfeeding status is less likely to affect acute malnutrition in children 6 to 12 months of age. Certainly the infant population should be a target for intervention, education, and aggressive monitoring in mother–child clinics[11]. Effects of various factors on the prevalence of chronic malnutrition Factor Simple logistic regression Multiple logistic regression Odds of chronic malnutrition 95% CI p Odds of moderate acute malnutrition 95% CI p Sex Male vs. female 1.112 0.885–1.398 .362 1.131 0.898–1.425 .653 Age (mo) 6–23 vs. 24–29 0.793 0.613–1.027 .079 0.781 0.601–1.013 .062 Location nontribal vs. tribal 0.871 0.756–1.004 .057 0.916 0.789–1.064 .252

Maternal education Illiterate vs. any schooling 2.649 1.694–4.143 < .001 2.578 1.642–4.046 < .001 Decrease in income in past 6 mo Decrease vs. no decrease 1.107 0.805–1.286 .886 1.057 0.830–1.345 .653. That moderate acute malnutrition is more likely to occur in the older age group is not surprising, considering that nearly all have lived their lives under the stress of the Intifada and thus would have experienced the limitations it has generated on economic status and freedom of movement. Children 24 to 59 months of age will have lived under substandard nutritional conditions their entire lives. Although lack of maternal education was not significantly associated with moderate acute malnutrition in our study, it was highly significant as a risk factor for chronic malnutrition. The fact that sex was not significantly associated with malnutrition reassures us that, in this culture at least, sex-based preference in feeding children is not an issue of concern.

Similar results are found in other countries like Palestine, who had done 24 hour assessment of preschool children in 2012 and compared two different populations. (12)

Conclusion: Malnutrition is a public health problem among children under five living in undeveloped areas. It is important to translate these findings into targeted interventions through all sectors with effective coordination among all agencies to prevent the further deterioration of nutritional status. Efforts to alleviate malnutrition through improved programs for food security should also be aimed particularly at ensuring diet quality in conjunction with promoting appropriate dietary behavior, and social services departments and international donor agencies should be advised to provide nutritionally complete food rations for children.

What this study adds: The greater utility of this study is in the analysis of the variables affecting nutrition, since this information is useful for health programmers and policy makers. This study also documented a high prevalence of stunting among the children in comparison with that seen at the national level.

Declarations:

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Conflicts of interest: Nil

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