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ASSESSMENT OF NUTRITIONAL STATUS BY MID UPPER ARM CIRCUMFERENCE (MUAC) AMONG RURAL CHILDREN OF KATIHAR DISTRICT IN KOSI REGION OF BIHAR

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ABSTRACT: An observational study of 500 children (267 boys and 233 girls) was undertaken during 2008-2010 at primary health centres under the aegis of Katihar Medical College in Kosi region of Bihar to assess their nutritional status using mid upper arm circumference (MUAC) in Katihar district of Bihar. Children from remote villages in rural areas located approximately 30 km from Katihar district headquarters were observed. Information on age of the children were collected from their parents. Measurement was recorded in centimetres and was procured using the standard technique. Nutritional status was determined following the World Health Organization age and sex specific cut off points. Results revealed that mean MUAC among boys was higher than girls at all ages. Significant sex differences were observed at ages 3 ($p < 0.05$), 4 ($p < 0.05$) and 5 ($p < 0.05$) years. Overall under nutrition were similar in both sexes. This result implied that both the sexes were equally malnourished. An increasing trend in the rates of overall malnutrition from 3 to 5 years in both sexes was observed. Our study clearly indicated that the nutritional status of children of both sexes in this age group is a serious issue. It seems appropriate to expect much improvement in the form of enhanced supplementary nutrition than what is currently being offered by the ICDS scheme in Katihar district of Bihar.

KEYWORDS: Mid upper arm circumference, malnutrition, supplementary nutrition.

INTRODUCTION: India still succumbs to the colossal problem of child malnutrition. Malnutrition is a burden on a considerable proportion of population the most vulnerable being the youngest of the country.⁽¹⁾ Under nutrition in childhood was and is one of the reasons behind the high child mortality rates observed in developing countries including India. It is highly detrimental for the future of those children who survive.⁽²⁾ Chronic under nutrition in childhood is linked to slower cognitive development and serious health impairments later in life that reduce the quality of life of individuals.⁽³⁾ Nutritional status is an important index of this quality.⁽⁴⁾ Improved child health and survival are considered universal humanitarian goals. In this respect, understanding the nutritional status of children has far reaching implications for the better development of future generations.⁽⁵⁾ Child growth is universally used to assess adequate nutrition, health and development of individual children, and to estimate overall nutritional status and health of populations. Compared to other health assessment tools, measuring child growth is a relatively inexpensive, easy to perform and non-invasive process.^(6, 7, 8) During preschool age period, children have special nutritional needs because of their extensive growth and development.^(6, 7, 9) Under nutrition among pre-school children is a colossal public health problem even today in rural India^(10, 11, 12, 13, 14) including Bihar. There is scanty information of the prevalence of under nutrition among preschool children in India^(9, 15) and Bihar.^(16, 17) Anthropometric examination is an almost mandatory tool in any research on health and

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nutritional condition in childhood and the study of nutritional status is of great importance for the understanding of the social wellbeing in a population.^(18, 19) The mid upper arm circumference (MUAC) is an important measurement which is often used for the assessment among pre-school children. In community based studies, MUAC appears to be a superior predictor of childhood based anthropometric indicators.⁽⁶⁾ MUAC is a relatively simple index, but with a fixed cut off, it ignores age-related changes. Compared with weight for height, MUAC has a sensitivity of 24.6% and a specificity of 94.8%⁽²⁰⁾ appears to be a better predictor of childhood mortality than is weight for height.⁽²¹⁾ Currently available evidences indicate that MUAC is the best in terms of age independence, precision, accuracy, sensitivity and specificity, case-detection method for severe malnutrition and that it is also simple, cheap and acceptable.⁽²²⁾ As measurement of MUAC can be taken by minimally trained health workers and is a reliable indicator of nutrition the aim of the present study was to evaluate the nutritional status of rural children of Bihar from Katihar district using the World Health Organization⁽⁶⁾ age and sex specific MUAC cut off points.

MATERIALS & METHODS: This observational study was undertaken during the period from November 2008 to October 2010 at three primary health centres of Katihar Medical College in Katihar district headquarters of Kosi region of Bihar. Children under observation were residents of remote villages in rural areas located approximately 30 km from proper Katihar town. MUAC of children with ages ranging from 2-5 years was recorded using standard technique after obtaining official approval from Institutional Ethics Committee. A total of 500 children (Boys = 267; Girls = 233) aged between 2-5 years were included in the present study. Information on age of the children was collected from their parents. Measurement in centimetres was taken using measuring tape.

OBSERVATIONS: Differences were observed in MUAC among children of both sexes which were recorded and statistically analyzed.

Parameter	Boys	Boys	Girls	Girls
Age in years	- 2 SD	- 3 SD	- 2 SD	- 3 SD
2	13. 6	12. 2	13. 4	12. 0
3	13. 8	12. 2	13. 6	12. 2
4	14. 1	12. 6	13. 9	12. 4
5	14. 2	12. 6	14. 1	12. 5

Table 1: The WHO (1995) recommended cut-off points for MUAC (cm) by age and sex

Age in years	Boys	Girls
2	13. 1	12. 7
3	13. 3	12. 9
4	13. 5	13. 1
5	13. 7	13. 3

Table 2: Sex differences in MUAC by age

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Age in years	Undernutrition in boys	Undernutrition in girls
2	58 (21.72%)	48 (20.60%)
3	63 (23.60%)	55 (23.60%)
4	69 (25.82%)	61 (26.18%)
5	77 (28.84%)	69 (29.61%)
	n = 267 (24.995%)	n = 233 (24.997%)

Table 3: Assessment of nutritional status of the children studied upon

States	Prevalence	References
Punjab	38.52 %	Kaur & Singh (2005)
Odisha	58.00%	Mishra & Mishra (2007)
West Bengal	28.60%	Chatterjee & Saha (2008)
Bihar*	24.99%	Singh & Mukherjee (2015)

Table 4: State wise comparison of overall prevalence of undernutrition among pre-school children based on MUAC

Present study*

DISCUSSION: The sex differences in mean MUAC by age are presented in Table 2. Results revealed that mean MUAC among boys was higher than girls at all ages. Significant sex differences were observed at ages 3 years and 4 years. Significant sexual dimorphism in mean MUAC at ages 3 and 4 years could be a result of differential rate of fat deposition at this site between the sexes. No such significant sexual dimorphism was observed at age 3. Sexual dimorphism in adiposity deposition and distribution has been well documented by earlier studies worldwide^(5, 6, 23) in different populations. The prevalence of under nutrition among the children in our study is presented in Table 3 which shows overall under nutrition were similar in both sexes (Boys = 24.995%; Girls = 24.997%). This result implied that both the sexes were experiencing similar nutritional stress. In general, there was an increasing trend in the rates of overall under nutrition from 3 to 5 years in both sexes. Prevalence of under nutrition of the present study clearly show higher rates than the pre-school children of Jaffna, Sri Lanka in post Exodus period.⁽²⁴⁾ That study revealed that the percentages of the preschool children within the age groups 1-2, 3-4 and 5-6 years affected by severe and moderate acute malnutrition were 44.85%, 18.07% and 2.29%, respectively. Whereas, in an earlier study⁽²⁵⁾ it was found that the prevalence of acute malnutrition in Jaffna district, Sri Lanka in 1993 (prior to exodus in 1995) was 18.5%. Considering the Indian context (Table – 4), the prevalence of under nutrition among the preschool children of the present study was higher than those reported among preschool children from Punjab⁽²⁶⁾ and Kolkata.⁽¹⁾ The rates were 38.5% and 28.6%, respectively. The rate of under nutrition among the pre-school children from Central Orissa (by using MUAC) was comparatively higher at 58.0%.⁽²⁷⁾ Our study clearly indicated that the nutritional status of these children was serious with very high but similar rates of under nutrition in both sexes. Nevertheless, it must be mentioned here that detailed relationships between morbidity, mortality and various socio-economic factors with childhood undernutrition, based on MUAC, are not being reported in this

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study. Along with this the lack of information on detailed dietary history of the subjects is the limitation of our study. Due to this lack of information it is not possible to draw any conclusion regarding the quantity and quality of food given to the subjects at their homes. Nevertheless our results clearly indicated that there existed distinct nutritional deprivation among the subjects regardless of their food intake. MUAC may be useful in clinical settings.⁽²⁸⁾ Younger children tended to become upset and agitated during both height and weight measurements and that no such behaviour was observed during the measurement of MUAC.⁽²⁹⁾ Considering the rates of stunting, underweight and wasting among the same population, very high prevalence of undernutrition was also noticed.⁽³⁰⁾

CONCLUSION: In conclusion, our study clearly indicated that the nutritional status, based on MUAC, of these children was serious with high rates of undernutrition in both sexes. We suggest that more studies dealing with undernutrition based on MUAC should be undertaken among children from different districts of Bihar. It has been recommended that MUAC be used to determine nutritional status among children of different ethnic groups worldwide, particularly in developing countries. Such investigations will allow us to not only to compare the rates of three conventional measures of undernutrition with MUAC, but also help to demonstrate the enhanced utility and effectiveness of the latter measure. Since the vast majority of the Indian population reside in rural areas where the rates of childhood undernutrition are very high, such studies should concentrate on rural children. 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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