Assessing the prevalence of malnutrition in tribal children using MUAC as a screening tool

RESEARCH NOTE

Assessing the prevalence of malnutrition in tribal children using MUAC as a screening tool [v1; ref status: approved 1, approved with reservations 1, http://f1000r.es/4ix]

Mohtashim Qureshi[1], Ihtesham Qureshi[2], Asghar Syed[3], Suresh Babu Kokku[4]

[1]Mamata Medical College, Khammam, 507002, India
[2]Medecins Sans Frontieres, AP-CG Project, Bhadrachalam, 507111, India
[3]Kamineni Institute of Medical Sciences, Narketpalli, 508254, India
[4]National Nutrition Monitoring Bureau (NNMB), National Institute of Nutrition Hyderabad, Hyderabad, 500007, India

Abstract

Children malnutrition is a major public health problem in India. Malnutrition has the maximum impact on children living in rural and tribal areas. Various anthropometric indices such as weight–for-age, height-for-age, weight-for-height and Body Mass Index (BMI) are used to assess the nutritional status of the children. Mid-upper-arm circumference (MUAC) is being used as an alternative to traditional measurements like height and weight, particularly in emergency settings. The World Health Organization (WHO) has recommended MUAC to be used as an independent diagnostic criterion for assessing severe acute malnutrition among children. A total of 4502 children between 6-59 months of age were screened over a period of 12 months, in seven Medicins Sans Frontieres (MSF) Project mobile clinic sites located in states of Andhra Pradesh and Chhattisgarh border areas in India. MUAC was measured with MSF-designed fiber optic measuring tapes. In general, the overall prevalence of malnutrition among 6-59 months children was 15.2%. However the prevalence of malnutrition was higher among children of 6-23 months age group (25.8%) as compared to children of 24-59 months (5.4%). Despite various national nutritional intervention programs have been in operation for about four decades, the malnutrition remains very high particularly among the children living in hilly and remote tribal villages.

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Referee Status: ❓✅

	Invited Referees	
	1	**2**
version 1 published 24 Oct 2014	❓ report	✅ report

1   **Samiran Bisai**, Regional Medical Research Centre for Tribals India

2   **Kaushik Bose**, Vidyasagar University India

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Comments (0)

Competing interests: No competing interests were disclosed.

Introduction

Periodic growth monitoring of children is an important indicator of the health and nutritional well being of the population. Child under-nutrition remains a major public health problem in many countries, and continues to hamper children's physical growth and mental development[1]. India registered an impressive growth in term of GDP during last few years, but the malnutrition rates among the Indian children remains high. As reported by UNICEF, in India, about 46% of children below three years have stunting (height-for-age <Median-2SD), while 47% have underweight and 16% are wasted[2].

Traditionally, nutritional status was evaluated using anthropometric measures like height, weight and indices like body mass index (BMI)[3]. However mid-upper-arm circumference (MUAC) is being used as an alternative index of nutritional status for children during famines or refugee crises and as an additional screening tool in non-emergencies, and is based on a single cut-off value for all the children less than five years of age[4]. Studies showed that under conditions of reduced food intake, lower levels of subcutaneous fat and muscle mass in human arms tend to correspond to a decrease in the MUAC[5]. In 2005, the World Health Organization (WHO) recommended a MUAC cut-off of 110 mm as an independent diagnostic criterion for severe acute malnutrition. However a higher cut off point of 115 mm was recommended later by WHO as it allows to identify a more accurate number of infants and children with severe acute malnutrition and has a high specificity of more than 99% over the age range 6–60 months[6]. There is large body of evidence strongly suggesting that MUAC is a better indicator of acute malnutrition than weight/height particularly for use in emergency feeding programs[7].

About MSF, India

Since October 2006, MSF (Médecins Sans Frontièrs, Doctors without Borders) is committed to providing health services to the people in the Naxal-affected regions of Dantewada (Chhattisgarh state) and Khammam (Andhra Pradesh state) in India. MSF India provides impartial medical assistance to the populations with little or no access to health care in these regions. The agency provides primary and secondary healthcare including reproductive health, immunization, health education and treatment of tuberculosis (TB), malaria and diarrhoea among other diseases in conflict-affected areas. MSF runs a Mother and Child Health Centre (MCHC) in Bijapur, Chhattisgarh, also in addition to other mobile clinics that provide health care directly to people in both states[8].

Materials and methods

MSF teams carried out MUAC screenings at the Maita, Mallampeta, DharmanaPeta, Pusuguppa, Tippapuram, Yampuram and Puttapalli mobile clinics. MUAC was measured using MSF-designed fiber optic color-coded measuring tapes divided into 2 mm additions[12]. A girth of the child's arm within the green part of the tape indicates a normal nutritional status. The yellow part of the tape indicates that the child is at risk of malnutrition, the orange color indicates that the child is moderately malnourished and the red color indicates a severe malnutrition and threat of death [MSF Refugee Handbook] (Table 1).

From January 2012 to December 2012, in the above mentioned clinics (Table 2), 2162 children between 6 and 23 months of age

Table 1. Interpretation of MUAC measurements and colour codes.

Colour	Corresponding measurements	Interpretation
Green	>135 mm	Normal
Yellow	125–134 mm	Risk of malnutrition
Orange	110–124 mm	Moderate malnutrition
Red	<110 mm	Severe malnutrition and threat of death

Table 2. Number of children screened for MUAC at the mobile clinics.

Mobile Clinic	Age: 6–23 months	Age: 24–59 months
Maita	137	133
Mallampeta	449	368
Dharmannapeta	358	347
Pusuguppa	297	319
Yampuram	388	502
Puttapalli	319	351
Tippapuram	214	320
All clinics	2162	2340

and 2340 children between 24 and 59 months of age were screened, making a total of 4502 children. The data were collected over a period of 12 months from seven MSF project clinics in the states of Andhra Pradesh and Chattisgarh namely Maita, Mallampeta, DharmanaPeta, Pusuguppa, Tippapuram, Yampuram and Puttapalli. These mobile clinics are in hard to reach remote hilly tribal villages with poor infrastructure facilities. In addition to MUAC screening, all children attending the mobile clinics with or without health problems were also screened for estimated age which was determined by noting the birth date recorded on the child's vaccination card. We have limitation on the availability of data for yellow and green colour measurements.

Results

Among the children between 6 and 23 months of age the severe malnutrition (indicated by the red colour) was 3.8%, whereas in children between 24 and 59 months of age was relatively much lower (0.59%). Similarly, moderate malnutrition among the 6–23 months aged children was almost 22%, significantly higher compared to 24–59 months aged children, which was only 4.8%. The cumulative malnutrition rate among the 6–23 months aged children was 25.8% and among the children between 24 and 59 months of age was 5.4%. However, the overall malnutrition among all screened 6–59 months aged children (4502) was 15.2% (Table 3).

Discussion

The severe malnutrition rates reported in this study are relatively lower compared to figures reported by National Family Health

Table 3. Age group wise distribution of malnutrition.

All 7 clinics	6–23 months	24–59 months	Total
Total children screened	2162	2340	4502
Red colour	83 (3.8%)	14 (0.59%)	97 (2.1%)
Orange colour	475 (21.9%)	113 (4.8%)	588 (13.1%)

Survey-3 (NFHS 3) (6.8%), which was carried out across the country among the same age group of children. However, the under nutrition rates reported in this study is still high which may have significant negative impact on health, education and productivity of the children. Persistent undernutrition is a major obstacle to human development and economic growth in India, especially among the rural poor and vulnerable areas, where the prevalence of malnutrition is the highest[9]. Illiteracy, poor health seeking behaviour, unavailability of health care services and poor infrastructure might be other contributing factors of malnutrition among these tribal populations.

The advantage of using the MUAC measurement compared to other nutritional indices is that it is simple to use and it is good to identify the high risk children who need urgent treatment, facilitating the better coverage at the screening and/or diagnostic stage, which is a key component of program success[11]. The revision of the MUAC cut off by WHO to identify severe malnutrition is useful in early diagnosis in less severe state of malnutrition whereby it reduces the duration of treatment in therapeutic feeding centres[6].

The government of India is implementing various nutritional interventions including ICDS (Integrated Child Development Services) to address the malnutrition problem among children[9]. The ICDS program is a well designed and well placed program to address the child undernutrition in the country. However there was more emphasis on coverage rather than on the quality of the program which resulted in limited impact in addressing the malnutrition problem[9]. Hence, it is necessary that the current ICDS program focuses on improving the quality of tools used to fight the persistent malnutrition among the under-five years old children.

Faulty feeding practices negatively affect the children's nutritional status, and the current nutrition programs have been unable to make much progress in dealing with these serious issues[11]. We believe that public health interventions for severe malnutrition must simultaneously focus on preventive and promotive aspects, and therapeutic interventions in the community. There is a paucity of local evidence especially in tribal areas which lack clarity about the possible therapeutic protocols to implement community-based management of severe malnutrition. Evidence from other countries may not be relevant to a very diverse and vast country like India. Research organizations and funding agencies need to prioritize the research further and build a valid evidence base to implement community based malnutrition programs.

Data availability

MSF obtained data pertaining only to orange and red colour measurements, as the purpose of MUAC screening at mobile clinics was to detect only those children who were malnourished enough to be included in ATFP [Ambulatory Therapeutic Feeding Programme]. For children to qualify for this programme their MUAC measurements should be <118 mm. Hence, only orange and red color measurements data were collected. MSF did not record green and yellow colour measurements for the above mentioned reason.

Ethical considerations

Data were obtained from MSF mobile clinic databases and as a retrospective study, ethical clearance was not necessary. We thank MSF for providing such data.

Author contributions

SBK and IQ conceived and designed the study. MQ, IQ, SA, SBK analysed the data. SBK and IQ interpreted the data. SBK and MQ drafted the article. All authors revised the article and gave the final approval for publication.

Competing interests

No competing interests were disclosed.

Grant information

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Open Peer Review

Current Referee Status:

Kaushik Bose

Department of Anthropology, Vidyasagar University, Midnapore, India

The present research work is very useful in highlighting the major public health problem of undernutrition among tribal children of India.

Modification required:
1. Re-analyse and compare the prevalence data separately for each state, since there may exist inter-state variation.

I have read this submission. I believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Competing Interests: No competing interests were disclosed.

Samiran Bisai

Regional Medical Research Centre for Tribals, Jabalpur, India

The present research work is very important in an Indian context, highlighting the major public health issue where large numbers of malnourished children reside here and the majority of the malnourished children are found among socially and economically underprivileged communities. Tribal population in India is considered as socio-economically underprivileged. However, I have a few minor suggestions as under:

1. The present study is clinic based data collected from two states. Re-analysed data separately for each state. There is large interstate variation of malnutrition and culture as well as food variation. Therefore individual tribal specific data is more important.

2. If available include morbidity history in relation to malnutrition. There are a large number of studies highlighting the application of MUAC as screening tool of undernutrition. More importantly it is a low cost technology as compared to measurement of height and weight. It is to be highlighted in the present manuscript.

3. Compare the prevalence with other studies conducted among tribal population in India.

I have read this submission. I believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Competing Interests: No competing interests were disclosed.