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MORPHOLOGICAL PATTERNS OF SEVERE ACUTE MALNUTRITION IN CHILDREN ON THE BASIS OF CLINICAL OR ANTHROPOMETRIC ASSESSMENT

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ABSTRACT

BACKGROUND Malnutrition is a widespread problem, affecting the global population at some life stage. Malnutrition includes both undernutrition (wasting, stunting, underweight, and mineral- and vitamin-related malnutrition) and overnutrition (overweight, obesity, and diet-related noncommunicable diseases. The best-targeted age for addressing malnutrition is the first 1000 days of life as this window period is ideal for intervention implementation and tracking for the improvement of child growth and development. Therefore, it was a genuine necessity to find out the burden of all three categories of malnutrition such as Kwashiorkor, Marasmus, Marasmic kwashiorkor and also to find out age wise distribution of the PEM, so that these findings could help to design Nutritional Rehabilitation Policies by considering the category and age groups.

METHODS All the patients in the age group 6 months to 59 months of either gender were screened for malnutrition by anthropometry using standard techniques, and SAM was diagnosed as per WHO guidelines, all were clinically classified into marasmus, kwashiorkar and mixed type.

RESULTS During this study 60 children were enrolled, 31 cases and 29 controls with maximum no of cases between 12- 24 months of age with male predominance & M: F::1.3:1, mostly belonged to urban habituation. Most common type of clinical diagnosis was mixed type as marasmic-kwashiorkar followed by marasmus & kwashiorkar. Stunting, was seen in 30.70% cases, wasting in 29.03% and 33.27% were underweight.

CONCLUSION Our data on age distribution underlies the importance of early intervention to ward off short- and long-term morbidity caused by malnutrition. Our findings show that the, demonstrating that patterns of malnutrition can differ according to nutritional assessment method. They suggest the importance of applying a mix of clinical and anthropometric methods for assessing malnutrition instead of just one method. Functional validity of characterization of aspects of individual nutritional status by single anthropometric scores or by simple clinical classification remain issues for further investigation

KEYWORDS : Severe acute Malnutrition, Morphological Patterns, Stunting, Wasting, Marasmic-kwashiorkar.

INTRODUCTION

Malnutrition, which encompasses both undernutrition and overweight, is a global problem with important consequences for child survival, incidence of acute and chronic diseases, healthy development, and the economic productivity of individuals and societies. It underlies almost half of all childhood deaths in developing counutries.[1]. Malnutrition is classified into two classical syndromes, marasmus (wasting syndrome) and kwashiorkor, or a mixture of both (marasmic-kwashiorkor). Severe acute malnutrition (SAM) is defined by a weight-for-height Z-score (WHZ) below -3 z scores of the median World Health Organization (WHO) growth standards or presence of bilateral edema or mid upper arm circumference (MUAC) < 115mm for a child ≤ 6months of age .[2] It is a leading cause of death among children younger than five years of age. Management of severe acute malnutrition according to WHO guidelines can reduce the case-fatality rate by about 55% in hospital settings.[3]Globally, the case fatality rate of SAM has been decreased from 16 to 8% following the implementation of WHO protocols. However, it still remains a public health problem in India .[4]

Studies defining malnutrition clinically {moderate clinical malnutrition (McM) marasmus, kwashiorkor} rather than anthropometrically (stunting, wasting and underweight) are rare. Our aim was to see the burden, morphological/clinical patterns and course of malnutrition among children <5 years and to compare patterns and course of clinically and anthropometrically defined malnutrition

METHODS

The present study is an observational study, conducted in the Department of Pediatrics in a tertiary care hospital in Jammu on children of either gender from 6–59 months of age attending OPD in hospital from June 2021 to 31 December 2021 were screened for malnutrition by anthropometry i.e., weight, height/length and Mid Upper arm Circumference (MUAC). For the present analysis, anthropometric scoring was done using the WHO-MGRS 2006 Child Growth Standards [8] Nutritional status of children was assessed by clinical assessment as well as by anthropometrical assessment. Z-scores were calculated for weight for length/height (WHZ) and for length/height for age (HAZ). Children with a WHZ <-2 to >-3 were classified as moderately wasted, those with WHZ <-3 as severely wasted. Similarly, those with a HAZ <-2 to >-3 were categorized moderately stunted and those with HAZ<-3 as severely stunted. Children with a WHZ and HAZ higher than -2 SD were classified as normal, that is no wasting and no stunting

The clinical assessment of nutritional status is described by Van den Broeck et al [5]. With this method marasmus was assessed by inspection of abnormal visibility of skeletal structures and by absence or near-absence of palpable gluteus muscle. Kwashiorkor was assessed using the presence of pitting oedema of the ankles and/or feet as a criterion. Moderate clinical malnutrition (McM) was identified as the presence of wasting of the gluteus muscle, wasting at inspection and/or palpation without signs of marasmus or kwashiorkor.

Weight was measured using digital weighing scale weighing to a precision of 0.01 kg. In children ≥ 24 months, height was measured using Wall Mounted Stadiometer to the last completed 0.1 cm, and in children ≤ 24 months of age, length was measured using infantometer up to 0.1 cm. MUAC tape was used for measurement of MUAC (>6 months of age) up to 0.1 cm.

Among 120 children (63 males and 53 females) admitted 57 children had weight for weight/height above -2 SD/Z score of WHO growth standards. These were taken as controls. Rest 63 children with inclusive criteria were selected. Case definition of severe acute malnutrition as outlined by WHO was used (any one of the following): weight for height/length or weight/length <-3 SD/Z, and/or visible severe wasting (of nutritional origin), and/or presence of bipedal edema, and /or mid upper arm circumference <11.5 cm

INCLUSION CRITERIA Children age 6 months to 59 months both male and female with WHO case definition on admission were included in the study.

EXCLUSION CRITERIA children with acute secondary problems like cerebral palsy, meningitis, infiltrative disorders, congenital malformations, chronic systemic disease were excluded.

METHODS

The age and oedema of each subject was specially noted at the time of enrollment. The weight of each subject was measured as per WHO guidelines and weight for age %, was determined as per welcome classification system, by using standard formula. Oedema of all subjects was carefully observed and recorded. Finally, all enrolled

malnourished subjects were classified into kwashiorkor, marasmus, and marasmic kwashiorkor by using welcome classification system[6]. Weight was measured by infant and regular weighing scales. All were then categorized as Stunting, wasting, and underweight. **Stunting** is defined as the children with height-for-age Z-score (HAZ) <−2SD and **severe stunting** is defined as the children with HAZ <−3SD. **Wasting** is defined as the children with weight-for-height Z-score (WHZ) <−2SD and/or MUAC <125mm and/or presence of bilateral pitting oedema. Similarly, SAM or **severe wasting** is defined as the children with WHZ<-3SD and/or MUAC<115mm and/or presence of bilateral pitting oedema. **Underweight** is defined as the children with weight-for-age Z-score (WAZ) <−3SD.The Observed weight was plotted on WHO growth standard charts for weight against the subject's age. Their age and gender's 50th centile were taken as a normal expected weight and data of these anthropometric measurements were recorded.

ETHICALASPECTS

Ethical approval for the study was granted from the university.

STATISTICALANALYSIS

The data was analyzed with the help of statistical program SPSS VERSION 17.0. CHI SQUARE test was applied to compare the proportions and p value <0.05 was considered as statistically significant. The odd's ratio (OR) > 1 is positively correlated with malnutrition and or <1 negatively correlated. Qualitative variables were represented as percentages.

RESULTS

A total of 60 children were taken up for study. Out of these 29 children had weight for height/length above -2 SD/Z score of WHO growth standards. These were taken as controls. Rest 31 children with any one of the inclusive criteria like weight for height/length <-3 SD/Z, visible severe wasting, presence of bipedal edema and /or mid upper arm circumference <11.5 cm was categorized under severe acute malnutrition cases. Following observations were made:

Out of the total 31 who were diagnosed as SAM, 25(80.64%) of them were diagnosed on the basis of presence of visible severe wasting, 12 (38.70%) had B/L pedal oedema and 14(45.16%) had MUAC <115mm.Also more than one criterion was present in one child for diagnosis and 8 patients had both WHZ and MUAC criteria accounting for 25.8%.

Age characteristics (Table 1)
Most common age group of presentation was 12-18 months (10; 32.25%), followed by 18-24 months (5; 16.12%). Among controls it was seen in the age group of 18-24 months (10; 34.48%), followed by 12-18 months (17.54%).

Table 1: Age distribution of children

Age group (months)	Cases		Controls	
	No.	%	No.	%
6 – 12	2	6.4	3	10.34
12 – 18	10	**32.25**	5	17.24
18 – 24	5	**16.12**	10	**34.48**
24 – 30	4	12.90	4	13.79
30 – 36	3	9.6	2	6.89
36 – 42	2	6.41	2	6.89
42 – 48	4	12.9	1	3.4
>48	1	3.2	2	6.89
Total	31	100.00	29	100.00

Gender (Table 2)
Among controls there were more male 19 (65.51%) as compared to female 10 (34.48%) with a male predominance (M:F ratio 1.9:1). However, among cases, there were 18 (58.06%) male and 13 (41.9%) female children (M: F 1.9:1)
Place of residence (Table2)

Table 2 Demographic profile of children

	Cases (%)	*Controls (%)*
Male	*18(58)*	*19(65.51)*
Female	*13(42)*	*10(34.48)*
Rural	*8(25.80)*	*16(65.5)*
urban	*23(74.19)*	*13(44.82)*

Most of the controls belonged to urban area 16 (65.5%) as compared to urban area 13(44.82%). Among cases also, cases from urban habituation were more in number 23 (74.19%) as compared to rural 8 (25.80%).

Table 3 Anthropometry assessment of cases

Score	*> -2SD*	*-2 to -3 SD*	*%*	*<-3SD*	*%*
HAZ	*20*	*5(stunting)*	*16.12*	*6 (severe stunting)*	*19.35*
WAZ	*21*	*2(underweight)*	*66.66*	*8 (severe underweight)*	*25.80*
WHZ	*19*	*5(wasting)*	*16.12*	*5 (severe wasting)*	*16.12*
MUAC	*10(>125mm)*	*7(115 TO 125mm)*		*14(<115mm)*	*45.16*

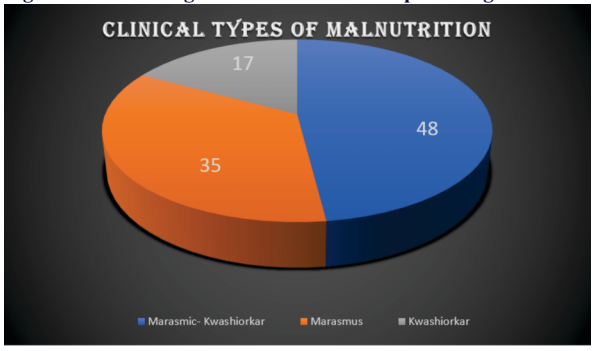
More than criteria were present in one child

Table 4 Distribution of cases on the basis of anthropometry

Anthropometrical diagnosis	*Number*	*Percentage (%)*
Stunting (HAZ<-2)	*11*	*30.70*
Wasting (WHZ<-2)	*10*	*29.03*
Underweight (WAZ<-2)	*10*	*33.27*

Clinical / morphological characteristics
On detailed anthropometric assessment it was seen that stunting (Table 4) was seen in 11(30.50%) cases, wasting in 10(32.25%) and underweight children were 10(32.25%) Also MUAC was <115mm in quite large number 14(45.16%) (Table 3). Among 31 admitted children with SAM, maximum cases were marasmic- kwashiorkor 15(48.40%) type, followed by marasmus 11(35.48%) and kwashiorkar 5 (16.812%) (Figure 1)

Figure 1 Clinical diagnosis of malnutrition in percentage



Immunization status (Table 5)
Fully vaccinated children represented only 12.90%, while25.81 % were not vaccinated at all and most of them were partially vaccinated accounting to 19(61.29%).

Table 5- Vaccination status among children admitted with malnutrition

Vaccination status	Frequency	Percent
Fully	4	12.90
Partially	19	61.29
Not	8	25.81

DISCUSSION

Child undernutrition contributes to more than one third of the deaths. Undernourished children who survive may get trapped in a vicious cycle of recurring illness and faltering growth, with irreversible damage to their development and cognitive abilities. Owing to high prevalence of malnutrition and high population, India contributes largely to global malnutrition. According to NFHS-3, the prevalence of underweight, stunting and wasting in India is 42.5%, 48% and 19.8% [7] In developing countries over 220 million children less than 5 years of age have significantly impaired growth according to UNICEF.[7] Malnutrition is frequently observed between 3 to 24 months of age. A study done in Kenya showed that most of the malnourished children were between 18-23 months of age, 44% were stunted and 34% were under weight[8]. Present study data have shown similar findings with increasing percentage of malnutrition occurring between 12 to 24 months of age. These results are in accordance with the previous studies [9]. Nutritional status of children was assessed by clinical

assessment as well as by anthropometrical assessment It is apparent that children under 2 years of age are the most affected age group. This could be due to a number of factors including low rate of exclusive breast feeding as well as poor weaning and feeding practices

In present study it was seen that malnutrition was seen more in males as compared to females with a M:F ratio of 1.38:1, which was in concordance to study by Sinha et al [10]

Studies by Gernaat et al [12] reported marasmus to be the most common type. Another study by Carmell et al [13] reported kwashiorkar and marasmus as the most common types but present study has shown highest number of Marasmic kwashiorkor type children 49.21%, followed by children with Marasmus 34.92% and kwashiorkor 15.87%(Fig1). Failure to the adoptive mechanism could be the main reason attributed for the high prevalence rate of Marasmic kwashiorkor. In the present study on admitted under-five children, 33.27% of the patients were underweight, 30.70% were stunted of which 19.35% were severely stunted and 29.03% were wasted of which 16.12% were severely wasted (Table 3). In a study of East India the prevalence of underweight, stunting and wasting was 19.7%, 35.5% and 8.5%, respectively [14] which was similar to our study.

According to the latest update on management of SAM by WHO mentions only about 40% of the children are classified as having SAM using both WHZ score and MUAC [15]. In the present study, only 25.80% children had both the criteria. Singh et al. in their experience of management of children with SAM at NRCs in Uttar Pradesh found that 70.7% had both the criteria [16]

Also, there is a strong association between vaccination and malnutrition, as the role of vaccination in preventing contagious diseases cannot be over-emphasized. Lack of vaccination, fully or partially may be a predisposing factor for malnutrition as shown by a study in Uganda[17]. In this study also only 12.90% were fully vaccinated, 25.81% of children were not vaccinated, 61.29% were partially vaccinated. Lack of vaccination is linked to low socio-economic class, less education, and major family and social problems like divorce, unemployment or death of a parent etc.

Though malnutrition is rampant in India, we need to identify patients with SAM at the time of admission in a facility because they need to be triaged and managed differently and hospitals need to be equipped in all ways to deal with these cases. At present, every hospital in India does not have Nutritional Rehabilitation Centre (NRC) and facilities for management of SAM patients with complications. The GOI has developed technical and operational guidelines for establishment of NRCs. The efforts are in progress for establishment of these facilities in various states. As per NFHS-3, prevalence of SAM is 6.4% in India[7]. There are not many studies from India to show prevalence of SAM in hospital-admitted under-five children. In a study on prevalence of undernutrition among under-five children attending paediatric Out Patient Department (OPD) in a tertiary care hospital

CONCLUSION

Depending on the results revealed by the present study we conclude that the maximum number of cases belonged to Marasmic kwashiorkor 49.21%, followed by marasmus34.92% and kwashiorkar 15.87%. Most common age of presentation is 12-24 months with a male predominance. Our data on age distribution of malnutrition underlies the importance of strengthening interventions before the age of 2 to ward off morbidity due to SAM.

ONLY A few population-based studies that have addressed the occurrence dynamics of clinically and anthropometrically defined malnutrition. Our findings show the occurrence dynamics of general malnutrition in our institute, demonstrating that patterns can differ according to nutritional assessment method. None of the assessment methods can be described as superior as they partly measure different aspects of malnutrition. Our findings suggest the importance of applying a mix of clinical and anthropometric methods for assessing malnutrition instead of just one method. Functional validity of aspects of characterization of individual nutritional status by single anthropometric scores or simple clinical classifications remain issues for further investigation. The problem of SAM is a complex study and this study presented a descriptive picture of morphological patterns of malnutrition in an inpatient setting in children with different types of SAM.

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Competing interests

The authors declare no competing interests.

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