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Prevalence, Pattern and Risk Factors of Severe Acute Malnutrition in Children below Six Months Old in Jos North Central Nigeria

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ABSTRACT

Severe Acute Malnutrition (SAM) in infants of less than 6 months of age (U6m) is a serious public health concern globally, especially with declined rates of exclusive breastfeeding. With challenges in the use of the standard anthropometric parameters and higher mortality in these infants than in older children, it is pertinent to document the burden, pattern and risk factors for SAM in U6m. This study aimed to determine the prevalence of SAM in U6m, the pattern and the determinants of malnutrition using weight-for-length (WFL) Z score and mid-upper arm circumference (MUAC), and also to determine the usability of MUAC and WFL in detection of SAM in U6m. Infants six weeks to <6months were recruited. Socio-demographic and nutritional data were collected using researcher administered questionnaire. WFL z scores <-3 and MUAC <11.5cm were used to define SAM. Of the 233 infants aged<6months, mean age was 90.0±38.3days. Females accounted for 52.8%. Nineteen, (8.5%), were born with low birth weight and 11.7% were preterm deliveries. Males had higher mean length for age and weight for age than females but MUAC showed no significant difference. The prevalence of SAM was 2.6% by MUAC and WFL parameters but MUAC identified more SAM subjects in those <3months while WFL identified more in older children. Concordance between MUAC and WFL was poor. Both MUAC and WFL showed more female children than males with MAM. Lower social economic status was significantly associated with SAM while birth weight, birth order, maternal nutritional status and time of first feed did not affect prevalence of SAM in any of the parameters. It is recommended that both WFL and MUAC be employed in the screening of acute malnutrition in this U6m.

***Keywords**: Acute malnutrition,Under 6months, MUAC and WFL.*

INTRODUCTION

Childhood wasting is a serious public health concern worldwide.[1] High rate of malnutrition pose significant public health and development challenges for the country. With declined and varying rates of exclusive breastfeeding among several population groups[2], severe acute malnutrition is increasingly becoming a recognized entity in infants less than 6 months of age (U6m). It is also said to be associated with higher mortality in these infants than in older infants and children.[3] Kerac *et al* reported that globally, some 4.7 million infants less than 6 months of age are moderately wasted and 3.8 million are severely wasted, and these set of persons have been overlooked by clinicians, nutritionists, and policy makers.[4] The diagnosis of SAM in U6m utilizes weight for length (WFL) <-3 standard deviation[5], this as seen in

children 6-59 months is not a good predictor of mortality.[6] The use of MUAC in U6m has not been validated but has shown some advantages such as its simplicity and better inter-observer reliability than WFL.[7] Both methods have been reported to identify different subsets of SAM patients with poor concordance.[8,9] Thus WFL does not give a clear picture of the burden of SAM in U6m hence the need to seek more reliable clinical and field parameters for identification of SAM in U6m as opined by many authors.[6,9,10]

Little is known about the burden of severe acute malnutrition in children less than 6months (U6m) in Nigeria using the defined parameters. There is also dearth of information on risk factors that determine the prevalence of malnutrition in this population group.

The paucity of data therefore hinders appropriate policy development and implementation. This study was therefore designed to determine the prevalence of SAM among children less than 6months of age, the pattern of malnutrition using various anthropometric indices and the risk factors of malnutrition in this population. It also intends to determine if MUAC can be used in the diagnosis of SAM in this subset of children.

MATERIALS & METHODS

Study design

This was a cross sectional study of children six weeks to <6months attended to at the Jos University Teaching Hospital paediatric outpatient department and immunization clinic. All infants age less than 6months seen at the clinic, whose mothers gave consent, were consecutively recruited until the sample size was met.

Ethical Approval

Ethical Approval for the study was received from the institutional review board of the Jos University teaching hospital. Consent was also obtained from mothers of babies recruited for the study.

Data collection

Infant feeding practices from birth till date was assessed using a semi-structured researcher administered questionnaire. Anthropometric data which included weight, length, head circumference and mid-upper arm circumference (MUAC) was measured using a digital weighing scale for weight, and infantometer for length, a non-stretchable tape for head circumference and MUAC tape for MUAC. Z scores of length, weight and Weight for Length were derived using WHO Z score charts. All measurements were done using standard methods by trained research assistants.

Sample size determination

The sample size for the study was computed using EPI info Statcalc at a confidence interval of 95% and a confidence limit of 5%. Using a prevalence of 13.3% by Thurstan S[11], the calculated minimum sample size was 177.

RESULTS

In all, 233 infants aged 6weeks to less than 6months were recruited over a six months period from November 2018 to April 2019. The mean age was 90.2 days ±38.8days (3.01±1.3months). Females were 110 (47.2%) while males were 123 (52.8%), Female: Male ratio was 0.9:1. Among the subjects, 19 (8.5%) were born with birth weight less than 2.5kg and 3.2% were born with birth weight 4.0kg and above. This is shown in Table 1.

Nutritional status

Males were significantly taller (HAZ) and heavier (WAZ) than the females but there were no significant difference in

Table 1: General and Perinatal characteristics

	N	%
Birthweight categories		
LBW (<2.5kg)	19	8.5
Normal (2.5kg-3.9kg)	197	88.3
Large (>=4.0kg)	7	3.2
Total	**223**	**100.0**
Gestational age		
Preterm	27	11.7
Term	181	78.7
Post-term	22	9.6
Total	**230**	**100.0**
Socio-economic status		
Lower	22	9.4
Middle	119	51.1
Upper	92	39.5
Total	**233**	**100.0**

Table 2: Mean Anthropometric characteristics by gender

Variable	Mean	Group SD	Female	Male	Conf Int	P
HAZ	-0.62	1.89	-1.11	-0.17	-0.86 to -0.37	0.0001*
WAZ	-0.64	1.33	-1.21	-0.14	-0.81 to -0.47	<0.0001*
WFL	0.22	6.7	-0.39	0.77	-0.6 to 1.1	0.19
MUAC	14.0	3.0	13.7	14.3	13.6 to 14.4	0.09

Statistically Significant

WFL and mean MUAC measurements between the genders. This is as shown in Table 2. MUAC showed no significant gender difference although mean MUAC was more in males than females. The prevalence of SAM by WFL was 2.6%, females had a higher prevalence of SAM, MAM and consequently GAM but not significantly different from males (p=0.4). When MUAC was used, prevalence of SAM was also 2.6%, but a higher prevalence of MAM- 10.3% than WFL(6.9%) identified, while SAM was higher in males (3.3% vs 1.8%) with MUAC than with WFL. Generally more female infants were stunted and undernourished than male using HAZ and WAZ (Table 3).

Risk Factors

By age group, infants more than three months had more SAM patients identified by WFL while MUAC identified more SAM cases in children less than 3months. No child above three months was identified as MAM using MUAC. This is shown in table 4.

Birth order, birth-weight, time of first feed, and maternal nutrition had no significant impact on prevalence of SAM either by WFL or MUAC. WFL demonstrated significant difference in prevalence of acute malnutrition among the different socio-economic strata. MUAC showed no significant difference

Table 3: Nutritional status by Gender

Variable	Group	Female	Male	P
WFL	n(%)	n (%)	n (%)	
SAM (<-3)	6 (2.6)	3 (2.7)	3 (2.4)	0.4
MAM (<-2)	16 (6.9)	10 (9.1)	6 (4.9)	
Normal (>=-2)	211 (90.6)	97 (88.2)	114 (92.7)	
MUAC				
SAM <11.5cm	6 (2.6)	2 (1.8)	4 (3.3)	0.43
MAM 11.5-12.4	24 (10.3)	14 (12.7)	10 (8.1)	
Normal 12.5+	203 (87.1)	94 (85.5)	109 (88.6)	
HAZ				
Severe <-3	15 (6.4)	10 (9.1)	5 (4.1)	0.013*
Stunting <-2	21 (9.0)	15 (13.6)	6 (4.9)	
Normal >=-2	197 (84.6)	85 (77.3)	112 (91.0)	
WAZ				
Severe <-3	13 (5.6)	9 (8.2)	4 (3.3)	0.000*
Moderate <-2	18(7.7)	16 (14.5)	2 (1.6)	
Normal >=-2	202 (86.7)	85 (77.3)	117 (95.1)	

*statistically significant differences between the genders

Table 4: Nutritional status by Age groups

Variable	0-3months	>3months	P value
WFL	n (%)	n(%)	
SAM	1(0.9)	5(4.3)	0.1(Fisher's)
MAM	11(9.4)	5(4.3)	
Normal	105(89.7)	106 (91.4)	
MUAC			
SAM	5(4.3)	1(0.9)	<0.001* (Fisher's)
MAM	24(20.5)	0(0.0)	
Normal	88 (75.2)	115(99.1)	

**statistically significant*

Table 5: Nutritional status by SES

Variable	Lower	Middle	Upper	P value
WFL	n (%)	n (%)	n (%)	
SAM	1 (4.5)	3 (2.5)	2 (2.2)	0.042*
MAM	4 (18.2)	10 (8.4)	2 (2.2)	
Normal	17 (77.3)	106 (89.1)	88 (95.6)	
Total	**22 (9.4)**	**119 (51.1)**	**92 (39.5)**	
MUAC				
SAM	2 (33.3)	4 (66.7)	0 (0.0)	0.112
MAM	1 (4.2)	14 (58.3)	9 (37.5)	
Normal	19 (9.4)	101 (49.7)	83 (40.9)	
Total	**22 (9.4)**	**119 (51.1)**	**92 (39.5)**	

* Statistically significant

Table 6: Comparison of Nutritional status by MUAC and WFL

MUAC	WFL<-3	WFL<-2	N	Total
	n (%)	n (%)	n (%)	n (%)
SAM	1 (16.7)	2 (12.5)	3 (1.4)	6 (2.6)
MAM	0 (0.00)	4 (25.0)	20 (9.5)	24 (10.3)
Normal	5 (83.3)	10 (62.5)	188 (89.1)	203 (87.1)
Total	**6 (100.0)**	**16 (100.0)**	**211 (100.0)**	**233 (100.0)**

P=0.005, statistically significant

DISCUSSION

This study demonstrates the prevalence and pattern of acute malnutrition in children below six months (U6m). The prevalence of wasting (WFL<-2) among the population was found to be 9.5% while global acute malnutrition (GAM) using MUAC was 12.9%.

The prevalence of severe acute malnutrition in the study was 2.6% using WFL. This falls within the global range

of SAM as reported by Kerac M *et al.*[10] and also similar to finding by Prost *et al.*[12]among Malawian children 1-4months of age but is less than 6.3% reported in Kenya from a retrospective study[13] as well as the 14.8% reported by Choudhary *et al.*[14] in the Indian National Family Health Survey Four. Murphy *et al.*[15] reported a 7.5% prevalence utilizing MUAC of <11.0cm in assessment of wasting in infants under 6 months among a refugee population in South Sudan. This parameter, although assessed in this study, has not been validated for use in U6m but we found a lower prevalence of 2.6% using a MUAC cut-off point of <11.5cm.

Although not validated in U6m, Mwangome *et al.*[6] in a retrospective study showed that infants aged 6 to 14 weeks with MUAC < 11.5 cm had a fourfold greater risk of dying than those with MUAC ≥ 13.0cm, but the 11.5cm cut-off identified about one fourth of the infants in the sample and hence lacks specificity. In our study, prevalence of SAM using MUAC was same as the prevalence using WFL but no significant correlation between the two parameters. This is similar to our earlier reports[8] and those of Laillou *et al.*[9] that MUAC and WFL identifies different subset of children with malnutrition. It will thus be beneficial to apply both parameters in identification of U6m with acute malnutrition. This is especially important as reports[16,17] indicate, that MUAC is a better predictor of mortality in SAM than WHZ among younger children and . In this study, we found that the number of children with SAM and MAM using MUAC was significantly more in infants less than 3months of age. Thus the application of both parameters is of special importance in U6m.

The burden of MAM in this study using WFL was high at 6.9%. There is to the best of the author's knowledge, there is no report on the burden of MAM or SAM in Nigeria among infants less than six months. MAM can proceed to SAM if unidentified and properly managed especially in U6m who maybe receiving inappropriate feeds at this age. This study demonstrates mean differences in MUAC, length for age and weight for age among the sexes but not a significant difference in prevalence of severe acute malnutrition among the sexes. However, prevalence of moderate acute malnutrition using both MUAC and WFL parameters showed more females with moderate malnutrition than the males. MUAC identified more of the MAM than WHZ among the female sex. This is similar to findings by Wieringa *et al.*[18] that MUAC identifies more younger female children with malnutrition although in our study WFL did not show more male predominance as in the aforementioned study.[18]

We demonstrate the impact of socio-economic status (SES) on the burden of malnutrition. The lower the SES, the higher the burden of acute malnutrition using WFL parameters, but not with MUAC. The effect of SES on malnutrition is in keeping with findings from Ghana by Novignon J *et al*[19] that there exists a pro-poor inequality in child malnutrition measured by stunting and wasting.

CONCLUSION

In all, the prevalence of SAM in children less than six months is low in our setting but WFL and MUAC identifies different subset with little concordance. Pattern of malnutrition shows higher burden in children less than three months, those from lower SES and higher burden of MAM in females using MUAC.

Consent for publication

All authors in this study have given their consent for publication

Availability of data and material

All data for this work is available on request

Competing interests

None

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None

Authors' contributions

All authors made significant contribution to design, data collection, manuscript writing, review and editing.

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