ORIGINAL RESEARCH PAPER

Volume-8 | Issue-8 | August - 2019 | PRINT ISSN No. 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

RISK FACTORS FOR ACUTE MALNUTRITION IN INFANTS UNDER 6 MONTHS IN A PUBLIC HOSPITAL IN MAHARASHTRA- CROSS SECTIONAL OBSERVATIONAL STUDY

Paediatrics

Eesha Natarajan MBBS. B. J. Government Medical College, Pune

Chhaya Valvi* MD. Associate Professor, Pediatrics, B. J. Government Medical College, Pune
*Corresponding Author

ABSTRACT

Acute malnutrition is a major cause of mortality globally. Traditional definitions encompass children aged 6-59 months, and infants under 6 months are often overlooked by national health programs. This study highlights factors associated with risk of acute malnutrition in infants under 6 months, and analyzes differences between moderate and severe acute malnutrition patients. This is a hospital-based cross sectional study done in Sassoon General Hospital, Pune, India. Fifty newly admitted acutely malnourished infants between 1 and 6 months of age were enrolled. Percentages and Chi-square test were used, p value <0.05 was significant. The young age of the infant, low birth weight, first birth order, unemployed primary caregivers, malnutrition in sibling, and low frequency of breastfeeding were characteristics present in majority of the infants studied. Pre-lacteal feeds (p=0.02) and rural slum residence (p=0.02) was statistically significant in the SAM group when compared to MAM.

KEYWORDS

severe acute malnutrition, moderate acute malnutrition, 6 months, maternal, infant

INTRODUCTION

Acute malnutrition is a major cause of morbidity and mortality globally. As per United Nations International Children's Education Fund (UNICEF) estimates of 2018, 49 million children under 5 years were wasted globally, of which 17 million were severely wasted.[1] Of these, more than half lived in South Asia, and the prevalence of wasting in South Asia is the highest at 15.2%.[1] As per the National Family Health Surveys of 2015-16, 21% children under 5 years in India are wasted, and 7.5% are severely wasted.[1] The World Health Organization (WHO) defines Severe acute malnutrition (SAM) as very low weight-for-height (Z-score below -3 standard deviations of the median WHO growth charts), or a mid-upper arm circumference (MUAC) <115mm, or by the presence of nutritional edema.[2]Moderate acute malnutrition (MAM) is defined as weight-for-height Z-score between -2 and -3 SD or MUAC between 115 and <125mm.[2] Traditional definitions and criteria for malnutrition encompass children from 6-59 months, however, there is increasing recognition that malnutrition occurs before 6 months of age with associated mortality. Globally, there are an estimated 3.8 million cases of SAM in infants less than 6 months of age,[3] and 4.7 million of MAM, as per the analysis carried out by Kerac et al on demographic and health survey datasets in 2011.[3]The prevalence in India is yet to be established.

In terms of health policy, this group falls between guidelines for neonatal care and those for the management of malnutrition.[4] In recognition of this issue, in 2013, WHO updated guidelines for the management of SAM to include under 6 months infants. However, these guidelines are based on "very low quality" evidence.[5]SAM also has shown more adverse outcomes for young infants as compared to older children,[3] and treating infants under 6 months of age is more difficult.[4] In a hospital-based study on malnourished infants between 1-6 months age in North India, they found birth weight, prematurity, birth spacing, pre-lacteal feeds, non-exclusive breast feeding, maternal age at first conception, maternal literacy and incomplete immunization, all affected the recovery of infants during their hospital stay.[6] Early detection, treatment and prevention is of utmost importance as it would not only reduce malnutrition-associated mortality in the short term, but also influence the long-term health and development of these children.[4]

A study in Bangladesh found poor maternal education, non-exclusive breastfeeding and infant illnesses associated with malnutrition.[7] Risk factors associated with acute malnutrition in infants under 6 months need to be clearly delineated, as this is still a relatively grey zone and high-powered studies are lacking. Therefore the objective of this study is to analyze various factors associated with increased risk of malnutrition in infants under 6 months, and to compare the possible differences between moderate and severe acute malnutrition patients.

MATERIALS AND METHODS

This was a hospital-based cross sectional observational study done at Sassoon General Hospital, Pune, India; a tertiary care public teaching hospital. Infants between 1 and 6 months of age admitted to the nutritional rehabilitation center meeting the WHO criteria of moderate or severe acute malnutrition were enrolled. Infants with non-nutritional causes of pedal edema were excluded. The sample size was 50 and patients were enrolled with convenient sampling. Ethical permission was obtained from the Institutional Ethics Committee of Byramjee Jeejeebhoy Government Medical College and Sassoon General Hospital, Pune, India.

Data on the newly admitted infants were collected over a period of 8 months (August 2018-March 2019). Parents/Guardians of the infants were counselled, and written informed consent was taken. The socio-demographic details obtained from parents/guardians' interviews and patients' clinical examination findings were documented on a structured case report form, which was pre-tested and validated.

Open Epi Info version 5.0 was used for statistical analysis. Percentages were reported for socio-demographic variables, and Chi-square test and Fisher's exact test were performed as tests of significance. P values less than 0.05 were considered statistically significant.

RESULTS

1. Maternal characteristics correlation of acute malnutrition in the infants

Characteristic	Frequency (Percentage)
Age	
<20 years	13 (26%)
>20 years	37 (74%)
Residence	
Rural slum	34 (68%)
Urban slum	16 (32%)
Unemployed care giver	42 (84%)
*MKS Class	
3	26 (52%)
4	24 (48%)
#HIV positive and/or tuberculosis history	11 (22%)
Hematinics not taken during pregnancy	12 (24%)
Breastfeeding frequency <7 times/day	35 (70%)
Prelacteal feeds given	22 (44%)
Formula supplementation given	32 (64%)
Not counselled about breastfeeding	14 (28%)

*MKS= Modified Kuppuswamy Scale[8]
HIV= Human Immunodeficiency Virus

Table 1 depicts maternal characteristics that were possibly associated with malnutrition of their infants. Majority of the mothers resided in rural slums, were unemployed, and breast-fed their infants less than 7 times a day.

2. Characteristics of infants with acute malnutrition

Characteristics	Frequency (percentage)
Age (months)	
1 - <2	36 (72%)
2 - <3	8 (16%)
3 - <4	4 (8%)
5 - <6	2 (4%)
Gender	
Male	30 (60%)
Female	20 (40%)
Birth order	
1	24 (48%)
2	14 (28%)
3	10 (20%)
4	2 (4%)
Congenital malformation present	10 (20%)
Previous episode of gastroenteritis	15 (30%)
Malnutrition in the sibling	12 (60%)
Intrauterine growth restriction	8 (16%)
Months of gestation	
Preterm	14 (28%)
Term	36 (72%)
Birth weight (kg)	
<2.5 (Low)	28 (56%)
>2.5 (Normal)	22 (44%)
^NICU stay >5 days	15 (30%)
Primary caregiver	
Mother	48 (96%)
Orphanage caretaker	2 (4%)
Inadequate care (Orphan/Twin/Neglected)	8 (16%)
Degree of malnutrition	
Moderate acute malnutrition (MAM)	14 (28%)
Severe acute malnutrition (SAM)	36 (72%)

*NICU= Neonatal Intensive Care Unit
There were no infants between 4 and 5 months of age on admission in this study.

Table 2 highlights characteristics of the infants that could possibly be related to their malnutrition. Based on the WHO definitions, there were 36 infants (72%) suffering from SAM, and 14 infants (28%) suffering MAM.

3. Comparison of characteristics between *MAM and #SAM infants

Characteristics	*MAM n(%)	#SAM n(%)	@X^2 df 1	$p value
Age of infant (months)				
1 - <3	14 (100)	30 (83.33)	1.31	0.25
3 - <6	0	6 (16.67)		
Gender of infant				
Female	4 (28.57)	16 (44.44)	0.50	0.47
Male	10 (71.43)	20 (55.56)		
Birth order				
1	8 (57.14)	16 (44.44)		0.95
2	4 (28.57)	10 (27.78)		
3	2 (14.29)	8 (22.22)		
4	0	2 (5.56)		
Congenital malformation present	0	10 (27.77)	3.28	0.07
Previous episode of gastroenteritis	3 (21.43)	12 (33.33)	0.23	0.63
Malnutrition in the sibling	4 (50)	8 (66.66)	0.01	0.95
Intrauterine growth restriction	4 (28.57)	4 (11.11)	1.17	0.27
Months of gestation				
Preterm	4 (28.57)	10 (27.78)	1.43	1
Term	10 (71.43)	26 (72.22)		
Birth weight (kg)				
<2.5 (Low)	8 (57.14)	20 (55.56)	0.01	0.91
>2.5 (Normal)	6 (42.86)	16 (44.44)		
^NICU stay	4 (28.57)	11 (30.55)	0.04	0.83
Primary caregiver				
Mother	14 (100)	34 (94.44)	0.01	0.92
Orphanage caretaker	0	2 (5.56)		
Inadequate care (Orphan/Twin/Neglected)	4 (28.57)	4 (11.11)	1.17	0.27
Age of mother (years)				
<20	2 (14.29)	11 (30.56)	0.67	0.41
>20	12 (85.71)	25 (69.44)		
Residence				
Rural slum	3 (21.43)	23 (63.89)	5.67	0.02
Urban slum	11 (78.57)	13 (36.11)		
Unemployed caregiver	14 (100)	28 (77.77)	2.23	0.13
**MKS Class				
3	8 (57.14)	18 (50)	0.02	0.88
4	6 (42.86)	18 (50)		
##HIV positive and/or tuberculosis history	2 (14.29)	9 (33.33)	0.19	0.65
Hematinics not taken during pregnancy	4 (28.57)	8 (22.22)	0.01	0.91
Breastfeeding frequency <7times/day	7 (50)	28 (77.77)	2.49	0.11
Prelacteal feeds given	2 (14.29)	20 (55.56)	5.39	0.02
Formula supplementation given	6 (42.86)	26 (72.22)	2.6	0.1
Not counselled about breastfeeding	6 (42.86)	8 (22.22)	1.22	0.26

*MAM= Moderate acute malnutrition
SAM= Severe acute malnutrition
@ X^2 df 1= Chi square statistic with one degree of freedom
$ p value <0.05 was considered statistically significant
^ NICU= Neonatal Intensive Care Unit
** MKS= Modified Kuppuswamy Scale[8]
HIV= Human Immunodeficiency Virus

Table 3 depicts the possible risk factors for malnutrition, analyzed separately for SAM and MAM groups. Rural slum residence and pre-lacteal feeds were associated with SAM as compared to MAM, and this difference was statistically significant (p<0.05).

DISCUSSION

In our study, majority of the infants were between 1-2 months age, lived in rural slum areas, were first-born children, had unemployed primary care-givers, were of low birth weight, were breastfed less than 7 times a day, and were given pre-lacteal feeds. These could be risk factors for malnutrition in this age group. When SAM and MAM groups were compared, pre-lacteal feeds and rural residence were significantly associated with SAM.

Marco Kerac et al[9] analyzed the data from Demographic and Health Surveys (DHS) conducted in the past 10 years in 20 countries, for risk factors of wasting under 6 months age. They found that low birth weight (OR 1.32, p value <0.01, 95% CI 1.10-1.58), pre-lacteal feeds (OR 1.34, p value <0.001, 95% CI 1.18-1.53) and recent diarrhea (OR 1.37, p value <0.01, 95% CI 1.12-1.67) were significantly associated with wasting. When these factors were analyzed for SAM and MAM separately, SAM had a statistically significant association with pre-lacteal feeds (OR 1.52, p value <0.001, 95% CI 1.27-1.82) but MAM did not (OR 1.13, p value 0.14, 95% CI 0.96-1.34). Similarly, previous diarrheal episodes were significantly associated with SAM (OR 1.35, p value 0.03, 95% CI 1.03-1.77) but not MAM (OR 1.27, p value 0.06, 95% CI 0.99-1.62). This is similar to our study, with pre-lacteal feeds being a significant risk factor for SAM as compared to MAM (p value 0.02). But in our study, repeated gastroenteritis was not a significant risk factor for SAM over MAM. Kerac et al[9] did not find any association of malnutrition with the age of the infants, their sex, or even their birth order, which was expected considering maternal inexperience and therefore possible increased risk of malnutrition in the first born. In our study, there were 20 male infants with SAM, as compared to the 10 with MAM. Similarly, 16 female infants had SAM (44.44% of SAM group) and 4 had MAM (28.57% of MAM group). This may reflect poor health-seeking behavior of the families as more

patients are severely malnourished, and possibly that medical care was sought out more for the male infants than females. No significant difference was found between the groups based on gender in our study. The study by Kerac et al[9] found that maternal age was not significantly associated with malnutrition in infants under 6 months, similar to our study. However, working mothers had a significantly lesser risk of their infants being malnourished as compared to not working mothers (OR 0.84, p value 0.01, 95% CI 0.74-0.96), and similarly uneducated mothers had increased risk. When analyzing SAM and MAM separately, they found MAM to be significantly associated with these two factors, but not SAM. Most of the primary care-givers in our study were unemployed, but no difference was found between MAM and SAM.

The study by Kerac et al[9] also depicted an increased risk of malnutrition in families from low socioeconomic status, and this pattern held true for both SAM and MAM. Our study found no difference between SAM and MAM groups based on MKS classes, however most of our patients were of low socioeconomic status, so accurate comparison was not possible. Kerac et al[9] found no association with rural versus urban residence for wasting (OR 1.09, p value 0.21, 95% CI 0.95-1.26), or for SAM (OR 0.97, p value 0.74, 95% CI 0.81-1.17) and MAM (OR 1.18, p value 0.08, 95% CI 0.98-1.43). Our study found that infants from rural slum areas were significantly associated with SAM as compared to MAM (p value 0.02). This however could be related to the geographical area where our study was conducted.

The prospective cohort study by Islam MM et al[7] in Bangladesh found non-exclusive breastfeeding (p=0.01), poor maternal education (p<0.02) and infant illnesses (p<0.001) to be associated with SAM in less than 6 months age. They did not have a separate MAM group studied. In our study, pre-lacteal feeds was the only feeding practice associated with SAM as compared to MAM, but there was no control group of healthy infants with which feeding practices could be compared.

In our study, when SAM was compared with MAM for significance of congenital malformations in the infant, a p-value of 0.07 was obtained, approaching significance. The study by Okoromah C et al[10] found a statistically significant association of congenital heart disease with malnutrition (p=0.001) in children between 3-192 months. This association persisted for SAM patients in this group (p=0.0001), but not MAM (p=0.16). However, that study was not limited to infants less than 6 months.

As per WHO recommendations, causative factors for severe acute malnutrition in infants under 6 months include low birth weight, persistent diarrhea, chronic underlying diseases and disabilities, and suboptimal feeding practices, especially breastfeeding practices.[9] This is reflected in the studies mentioned above, and some factors which are possibly related to these WHO factors are found to be statistically significant when SAM was compared to MAM in our study. For example, rural residence (p=0.02) in our study was significantly associated with SAM, and rural residence can be associated with poor income, maternal unemployment and poor maternal education, leading to poor feeding practices like pre-lacteal feeding (p=0.02 in our study).

Based on the findings depicted in our study, it is evident that multiple health care interventions can reduce the prevalence of malnutrition in this young age group. These could include comprehensive prenatal care including nutritional supplementation, detection and treatment of gestational diseases and timely prenatal ultrasounds; breastfeeding support and counseling; involvement of mothers in community activities and promotion of self-sufficiency; focused education about sanitation and hygiene; infectious disease management; and overall maternal and child health. Thus a collaboration between different health programs may be beneficial. It is important to target first-time mothers, especially those who are unemployed, uneducated or live in rural areas.

This cross-sectional observational study contributed more about malnutrition under 6 months age, where further research is warranted. Factors poorly addressed in other studies, such as NICU stay after birth, intrauterine growth restriction on prenatal ultrasound, hematinics taken by the mother during her pregnancy, and malnutrition existing in a sibling of the enrolled infant, have been highlighted in our study. However, most factors did not show associations with SAM when compared to MAM, which could be in part due to the small sample size. Lack of a matched control group is the major limitation of this study, as comparisons with controls would probably have brought out statistically significant results and helped make concrete conclusions.

CONCLUSIONS

The young age of the infant, low birth weight, first birth order, unemployed primary caregivers, malnutrition in sibling, and low frequency of breastfeeding were characteristics present in majority of the infants studied, and thus could be associated with acute malnutrition in infants less than 6 months of age. Our study also found pre-lacteal feeds and rural slum residence to be statistically significant in the SAM group when compared to MAM, which is in accordance to previous studies. Since the result of this study and others reveals that malnutrition in under 6 months is multifactorial, future preventive interventions by national programs must be a package of complete care.

REFERENCES

1. UNICEF Global Database on Childhood Malnutrition, April 2019. UNICEF Data: Monitoring the situation of children and women
2. WHO (World Health Organization). Supplementary Foods for the Management of Moderate Acute Malnutrition in Infants and Children 6–59 Months of Age. Technical Note, WHO, Geneva 2012
3. Ali HF, Arabi A, Bilal JA. Feeding Pattern of Malnourished Infants <6 months of age and their response to treatment using diluted F-100 formula. Nursing and Health 2016;4:9-13
4. Kerac M, Mwangome M, McGrath M, Haider R, Berkley JA. Management of acute malnutrition in infants aged under 6 months (MAMI): Current issues and future directions in policy and research. Food and Nutrition Bulletin 2015;19:30-34
5. WHO. Guideline: Updates on the management of severe acute malnutrition in infants and children. WHO, 2013
6. Kumar L, Das G, Gaur A. Prognostic factors affecting outcome of hospitalized infants 1-6 months with severe acute malnutrition in North India. Int J Contemp Pediatr 2018;5(4):1315-21
7. Islam MM et al. Risk factors for severe acute malnutrition in infants <6 months old in semi-urban Bangladesh: a prospective cohort study to inform future assessment/treatment tools. Research for nutrition conference 2016;62-63
8. Shaikh Z, Pathak R. Revised Kuppuswamy and B G Prasad socioeconomic scales for 2016. Int J Community Med Public Health 2017;4:997-99
9. Kerac M, Frison S, Connell N, Page B, McGrath M. Informing the management of acute malnutrition in infants aged under 6 months (MAMI): risk factor analysis using nationally-representative demographic & health survey secondary data. PeerJ 2019;6:e5848
10. Okoromah CAN, Ekure EN, Lesi FEA, Okunowo WO, Tijani BO, Okeiyi JC. Prevalence, profile and predictors of malnutrition in children with congenital heart defects: a case-control observational study. Arch Dis Child 2011;96:354-360