Short Communication

Sociodemographic Factors and Antenatal Service Utilization among Severe Acute Malnutrition Children under 2 Years of Age, Western India (Rajkot, Gujarat) – A Hospital-based Case-Control Study

Rujal D. Bhitora, Vibha V. Gosalia, Harsha M. Solanki
Community Medicine Department, P D U Government Medical College, Rajkot, Gujarat, India

Abstract

Severe Acute Malnutrition (SAM) is multifactorial including poor maternal health, sociodemographic factors, and poor quality of diet of both the mother and child. Present study was carried out to determine sociodemographic factors and antenatal service utilization for SAM occurrence. This hospital-based case-control study was carried out from April 2021 to April 2022. Cases (77) and controls (77) were matched for age and sex with 1:1 ratio. Cases were selected from Nutritional Rehabilitation Centre and controls from an immunization clinic using WHO's Multicentric Growth Reference Study Criteria 2006. Mothers of study participants were interviewed by using semistructured questionnaires. The weight and height of study participants were measured. The odds of children having SAM increased significantly with illiterate parents, working mothers, and labor work of fathers. The absence of toilet facility at home and poor hygienic practices of mothers were significant risk factors. Mother's <4 antenatal visits, home deliveries, and participants with low birth weight were associated with SAM. Logistic regression stated laborer fathers, poor hand washing practices of mothers, absence of toilet facility at home, and low birth weight of study participants were found independent determinants for SAM. Risk factors identified in the present study are modifiable and can be addressed through health system interventions.

Keywords: Case-control study, severe acute malnutrition, sociodemographic factors

Introduction

Severe Acute Malnutrition (SAM) is as a result of significant imbalance between nutritional intake and individual's need.[1] Globally, SAM contributes to 1 million children deaths every year.[2] Half of all under-5 deaths in 2019 due to SAM occurred in just five countries: Nigeria, India, Pakistan, the Democratic Republic of the Congo, and Ethiopia. Nigeria and India alone account for almost a third of all deaths.[3] According to NFHS-5, SAM prevalence is 7.7% and 10.6% in India and Gujarat, respectively.[4,5]

UNICEF framework[6] and global literature[7] had described that causes of malnutrition are multisectoral. India also reported age, sex, parental illiteracy, income, occupation, and large family size as factors for malnutrition.[8]

Despite the marked improvement in health and living conditions, India is still way behind to control burden of malnutrition. So, more attention should be given to find out causes and risk factors of child malnutrition. So, the present study was planned to carry out to determine sociodemographic factors for SAM among children from birth to 2 years of age.

Access this article online

Quick Response Code:

Website: www.ijcm.org.in

DOI: 10.4103/ijcm.ijcm_147_23

Address for correspondence: Dr. Vibha V. Gosalia, Department of Community Medicine, PDU Government Medical College, Rajkot - 360 001, Gujarat, India.
E-mail: vibhadvyas@gmail.com

How to cite this article: Bhitora RD, Gosalia VV, Solanki HM. Sociodemographic factors and antenatal service utilization among severe acute malnutrition children under 2 years of age, western India (Rajkot, Gujarat) – A hospital-based case-control study. Indian J Community Med 2025;50:246-50.

Received: 09-03-23, **Accepted:** 09-04-24, **Published:** 08-10-24

Methodology

A hospital-based case control study was conducted at Nutritional Rehabilitation Centre (NRC), Civil Hospital, Rajkot, Gujarat, from April 2021 to April 2022. The study participants were children from birth to 2 years of age. 77 children were included as cases who were admitted in Nutrition Rehabilitation Centre (NRC) with SAM, and an equal number of 77 healthy children were selected as controls from an immunization clinic. The study was approved by the institutional ethics committee.

Selection of cases and controls

As per the WHO's Multicentric Growth Reference Study (MGRS) Criteria 2006,[9]

- Case definition of children >6 months:
  - Weight for height z-score (WHZ) < -3SD or
  - Mid-upper arm circumference (MUAC) <11.5 cm or
  - With or without nutritional edema
    - Case definition of children <6 months: WHZ less than -3SD or with or without nutritional edema
- Controls: Children attending the immunization clinic with WHZ between -2 SD to +1 SD or MUAC ≥ 13.5 cm.
- Those having any chronic illness and congenital anomalies were excluded from the study.

Data collection

Mothers of study participants were interviewed by using semistructured questionnaires. For each case, one control was selected. The written consent of the mother was obtained before interview and anthropometrical measurements of their children.

Data regarding sociodemographic details, antenatal service utilization, birth details of children, and immunization history were collected. The recall bias**,** particularly in controls, was minimized by cross-checking the Mamta card. The weight and length of children were measured using an Infantometer; from these, WHZ score was calculated for each child by using WHO Anthro software (version 3.2.2, 2011). MUAC was measured by using Shakir's strip. Modified B.G. Prasad's socioeconomic classification was used considering All India Consumer Price Index of April 2021 of Rajkot.

Sample size

The sample size was calculated through STATCAL application of Epi-Info[10] assuming a two-sided confidence level at 95%, a power of the study was 80%, and a case-control ratio of 1:1. Lack of exclusive breastfeeding was taken as an exposure factor. The proportion of cases (SAM-diagnosed children) not exclusively breastfed (exposure factor) is 44.4% with an odds ratio (OR) of 2.8 from a case-control study done at Vellore, Southern India.[11] The calculated sample size was 154 (77 cases and 77 controls), including a 10% nonresponse rate. For each identified case, one control matched for age and sex was recruited.

Statistical methods

The data were entered in MS Office Excel 2019, and analysis was done using the software package Epi Info (Version 7.2.2.6) from CDC, Atlanta, USA. Z-score was calculated for each child by using Anthro software (version 3.2.2, 2011).

Descriptive statistical analysis was done to compare factors associated with SAM. Chi-square test was applied to elicit association between SAM and risk factors among cases and controls. Odds ratio (OR) and adjusted odds ratios (AOR) with 95% confidence intervals (CIs) were calculated. To eliminate confounding effect, logistic regression analysis was done using cases and controls as dependent outcome variables. Independent variables included were sociodemographic details, antenatal service utilization, immunization history, and birth characteristics. All results were considered statistically significant at $P < 0.05$.

Results

Among cases, the majority of them (79.2%) were of 7–24 months of age group and 20.8% were belonging to 0–6 months of age group. More than half of cases were male (53.3%), and 46.7% were female. Working mothers and laborer fathers were statistically proven risk factors for SAM. Occurrence of SAM was significantly high with parent's illiteracy. The lack of sanitation practices was also statistically significant risk factor for SAM [Table 1]. A mother's mean age at time of her marriage was 19.3 years for cases and 20.4 years for controls. The mean age of mothers at the time of birth of study participants was 25.2 years for cases and 25.9 years for controls.

The number of total living children (>3) and <2 years of birth interval were risk factors for SAM. Mother's <4 antenatal care visits were associated with SAM. Immunization with Td vaccine and iron folic caid (IFA) + calcium tablet consumption by mothers during pregnancy was proved a protective factor against SAM occurrence [Table 2]. Home deliveries were associated with SAM. Birth weight < 2.5 kg was almost 3 times associated with SAM [Table 3]. The logistic regression analysis revealed that Father's labor work, poor hand washing practices by mothers, absence of toilet facility at home, and low birth weight of children were independent determinants of SAM.

Discussion

Among cases, the majority were from 7–24 months of age group. Similar findings were seen in the study conducted at Gambella, Ethiopia,[12] and at Bangladesh.[13] Children aged between 6–11 months and 12–23 months were 4 and 10 times more likely to be acutely malnourished than those aged 24–59 months, respectively.[14]

In this study, 53.2% were male and 46.7% were female. The study conducted at Aravalli district, Gujarat[15] also reported similar findings. In contrast, a study done by Kajol Dahal *et al*.[16] at Nepal found among cases and controls, 46% were male and 54% were female. This shows gender inequality by parents as they bring male children early to the health facility

Table 1: Sociodemographic profile of study participants

Sociodemographic profile	Cases (*n*=77), *n* (%)	Controls (*n*=77), *n* (%)	OR (CI)	*P*	AOR (CI)
Age					
0–6 months	16 (20.8)	16 (20.8)	-	-	-
6–24 months	61 (79.2)	61 (79.2)			
Sex					
Male	41 (53.3)	41 (53.3)	-	-	-
Female	36 (46.7)	36 (46.7)			
Socioeconomic class*					
Upper	55 (71.4)	65 (84.4)	0.5	0.05	-
Lower	22 (28.6)	12 (15.6)	(0.21 – 1.01)		
Mother's education					
Literate	46 (59.7)	71 (92.2)	7.9	<0.001	0.4
Illiterate	31 (40.3)	6 (7.8)	(3.1 – 20.6)		(0.1 – 1.8)
Father's education					
Literate	53 (68.8)	74 (96.1)	11.2	<0.001	0.9
Illiterate	24 (31.2)	3 (3.9)	(3.2 – 39.0)		(0.1 – 6.5)
Mother's Occupation					
Homemaker	53 (68.8)	74 (96.1)	0.1	<0.001	0.4
Working	24 (31.2)	3 (3.9)	(0.02 – 0.3)		(0.1 – 2.1)
Father's Occupation					
Services	22 (28.6)	48 (62.3)	4.13	<0.001	2.8
Laborer	55 (71.4)	29 (37.7)	(2.1 – 8.13)		(1.2 – 6.8)
Toilet facility at home					
Present	48 (62.3)	75 (97.4)	22.6	<0.001	0.1
Absent	29 (37.7)	2 (2.6)	(5.2 – 99.3)		(0.0 – 0.7)
Hand washing practices					
Good	29 (37.7)	53 (68.8)	0.3	<0.001	0.3655
Not good	48 (62.3)	24 (31.2)	(0.1 – 0.5)		(0.1 – 0.9)

*Socioeconomic class, upper class includes class I, II, III and lower class includes class IV, V. **P*<0.05 was statistically significant, OR: odd's ratio, CI: confidence interval, AOR: adjusted odd's ratio

Table 2: Obstetric history of study participant's mother

Obstetric history of mother	Cases (*n*=77), *n* (%)	Controls (*n*=77), *n* (%)	OR (CI)	*P*	AOR (CI)
Total No. of living children					
≤2	52 (67.5)	67 (87)	0.31	<0.001	
≥3	25 (32.5)	10 (13)	(0.14–0.7)		
Birth interval (in years)					
<2 and NA*	46 (59.7)	45 (58.4)	1.05	<0.001	1.9
≥3	31 (40.3)	32 (41.6)	(0.55 – 2)		(0.8–4.9)
No. of antenatal visit					
<4	28 (36.4)	1 (1.3)	43.43	<0.001	-
≥4	49 (63.6)	76 (98.7)	(5.72–329.59)		
Td doses					
Taken	59 (76.6)	77 (100)	-	<0.001	-
Not taken	18 (23.4)	0			
IFA and calcium consumption during pregnancy					
Taken	51 (66.2)	74 (96.1)	12.57	<0.001	-
Not taken	26 (33.3)	3 (3.9)	(3.61–43.76)		
IFA and calcium consumption during postpartum period	3 (3.9)	2 (2.6)	1.52	0.65	-
Taken	74 (96.1)	75 (97.4)	(0.25–9.36)		
Not taken					
Weight gain during pregnancy					
<9 kg	71 (92.2)	63 (81.8)	2.62	0.06	-
≥9 kg	6 (7.8)	14 (18.2)	(0.95–7.25)		

*NA=1st child of their parents. **P*<0.05 was statistically significant, OR: odd's ratio, CI: confidence interval, AOR: adjusted odd's ratio

Table 3: Birth characteristics of study participant

Birth characteristics of study participant	Cases (*n*=77), *n* (%)	Controls (*n*=77), *n* (%)	OR (CI)	*P*	AOR (CI)
Gestational age					
Term and post-term	67 (87)	72 (93.5)	0.47	0.17	-
Preterm	10 (13)	5 (6.5)	(0.1–1.4)		
Place of birth					
Institutional	73 (94.8)	77 (100)	-	0.04	-
Home	4 (5.2)	0			
Type of delivery					
Normal	64 (83.1)	59 (76.6)	1.5	0.31	-
LSCS*	13 (16.9)	18 (23.4)	(0.7–3.33)		
Baby cried soon after birth					
Yes	71 (92.2)	75 (97.4)	2.84	0.15	-
No	6 (7.8)	2 (2.6)	(0.6–14.5)		
Birth weight					
<2.5 kg	34 (44.2)	17 (22.1)	2.79	0.00	0.1
≥2.5 kg	43 (55.8)	60 (77.9)	(1.4–5.3)		(0.0–0.4)

*LSCS: lower (uterine) segment cesarean section, OR: odd's ratio, CI: confidence interval. **P*<0.05 was statistically significant, OR: odd's ratio, CI: confidence interval, AOR: adjusted odd's ratio

and health of female children often gets neglected. In this study, no statistically significant association was noted between low SES and SAM and it was supported by findings of study done by Sam M David *et al*.[11]

The present study indicated that low parenteral education had association with SAM. A study conducted by Teshome Abuka *et al*.[17] and Gatjiek Tut Wie and Dereje Tsegaye[12] also found similar findings. Parents with higher education might have more knowledge of a balanced diet to improving the nutritional status of their children.[18]

This study found that mothers of a majority of study participants were housewives. These findings were supported by findings of study done at Vellore[11] and at Gambella, Ethiopia.[12] A homemaker mother can give her maximum time to their children. This study observed that fathers of a majority of cases were laborers. Studies conducted at Yavatmal district, Maharashtra,[6] and Aravalli District, Gujarat,[18] also found similar findings. Evidence shows that families with unemployed fathers and those with low wages cannot afford more quantity of food.

In the present study, more than one-fourth of cases had no toilet facility at home. This observation was similar to the findings of the study done at Ethiopia[17] and Karnataka.[19] This study stated that mothers who were not following good hand washing practices was a risk factor for SAM. Similar findings were also found in a study done at rural parts of Maharashtra.[6] Good handwashing practices are very important steps to prevent diseases which are feco-orally transmitted and SAM occurrence.

In this study, parents having more than two children were shown as a risk factor for SAM. This observation was similar to the findings of the study done at southern India.[11] The possible explanation could be children receiving less attention when there are more than one of them.[13] This study observed that a majority of study participants had <24 months of birth interval. The findings of the study conducted at Nepal[20] supported the results obtained in this study.

In the present study, among cases, 36.4% mothers took <4 antenatal care visits, only 23.4% mothers of cases had not received even a single dose of Td injection, and among cases, 33.7% and 3.9% controls had mothers who had not consumed IFA and calcium tablets during pregnancy. For better outcomes and early diagnosis of high-risk pregnancy, frequent antenatal visits are mandatory. Iron and calcium requirement increases during pregnancy and post-partum period, which can be fulfilled by iron and calcium supplementation. Td injections during pregnancy are beneficial to both mother and child by protecting against tetanus disease.[21]

In the study, most of the mothers had gain <9 kg weight during their pregnancy. Poor maternal nutrition can also lead to stillbirth, low birthweight, wasting, and developmental delays for children.[22] This study did not find any significant association between prematurity and the child's nutritional status. This result was consistent with the findings of study conducted at Vellore.[11]

In this study, a majority of study participants (94.8% cases and 100% controls) had institutional birth. These findings are supported by NFHS-5 data.[4] In the present study, 44.2% cases and 22.1% controls had birth weight <2.5 kg. Similar studies conducted in different countries also observed an association between malnutrition and low birth weight.[23-27] This study found that father's labor work, poor hand washing practices by mothers, absence of toilet facility at home, and birth weight of study participants were independent risk factors. The study done at Kavre, Nepal,[16] also stated that father's occupation was an independent risk factor.

Limitations: The sample size of the study was small, and findings of controls from the immunization clinic were also difficult due to COVID-19 pandemic and its lockdown. Inclusion of cases only from NRC may lead to selection bias.

Conclusion

The present study reveals that factors like illiterate parents, labor work of fathers, working mothers, and poor hygienic practices by mothers are associated with SAM. Poor antenatal care practices of mother and low birth weight of child were also found risk factors for SAM.

Recommendations

Many of the identified risk factors are modifiable, with improvement in mother's education which in turn will improve her child rearing practices as well as health seeking behaviour and self-care during ANC period.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Severe acute malnutrition-Clinical guidelines. Available from: https://www.nhm.gov.in/images/pdf/programmes/child-health/IEC-materials/PARTICIPANT-MANUAL_FBCSA-Malnutrition.pdf. [Last accessed on 2022 Jan 29].
2. Community-based Management of Severe Acute Malnutrition. A Joint Statement by the World Health Organization, the World Food Programme, the United Nations System Standing Committee on Nutrition and the United Nations Children's Fund; 2007. Available from: https://iris.who.int/bitstream/handle/10665/44295/9789280641479_eng.pdf?sequence=1&isAllowed=y. [Last accesed on 2023 Mar 01].
3. Children: improving survival and well-being. Available from: https://www.who.int/news-room/fact-sheets/detail/children-reducing-mortality. [Last accessed on 2022 Jan 30].
4. National Family Health Survey-5 2019-21, India Fact Sheet. Ministry of Health and Family Welfare; 2022. Available from: https://rchiips.org/nfhs/NFHS-5_FCTS/India.pdf. [Last accesed on 2023 Mar 01].
5. National Family Health Survey-5, 2019-20. State Fact Sheet-Gujarat, 2021. Available from: https://rchiips.org/nfhs/NFHS-5_FCTS/Gujarat.pdf. [Last accesed on 2023 Mar 01].
6. Ambadekar NN, Zodpey SP. Risk factors for severe acute malnutrition in under-five children: A case-control study in a rural part of India. Public Health 2016;142:136-43.
7. Imam A, Hassan-Hanga F, Sallahdeen A, Farouk ZL. Socio-demographic and household-level risk factors for severe acute malnutrition in pre-school children in North-Western Nigeria. J Trop Pediatr 2020;66:589-97.
8. Bhadoria AS, Kapil U, Bansal R, Pandey RM, Pant B, Mohan A. Prevalence of severe acute malnutrition and associated sociodemographic factors among children aged 6 months–5 years in rural population of Northern India: A population-based survey. J Fam Med Prim Care 2017;6:380-5.
9. Williams PCM, Berkley PJA. Sever Acute Malnutrition Update: Current WHO Guidelines and the WHO Essential Medicine List for Children. Geneva, Switzerland: World Health Organization; 2016. p. 1-40.
10. OpenEpi Menu. Available from: http://www.openepi.com/Menu/OE_Menu.htm. [Last accessed on 2021 Feb 28].
11. David SM, Pricilla RA, Paul SS, George K, Bose A, Prasad JH. Risk factors for severe acute malnutrition among children aged 6 – 59 months: A community - based case - control study from Vellore, Southern India. J Family Med Prim Care 2020;9:2237-43.
12. Tsegaye D, Tut G. Determinants of acute malnutrition among children aged 6 – 59 months visiting public health facilities in Gambella Town, Southwest Ethiopia. Nutr Diet Suppl 2020;12:147-56.
13. Hoq M, Ali M, Islam A, Banerjee C. Risk factors of acute malnutrition among children aged 6-59 months enrolled in a community-based programme in Kurigram, Bangladesh: A mixed-method matched case-control study. J Health Popul Nutr 2019;38:1-7. doi: 10.1186/s41043-019-0192-2.
14. Seid A, Seyoum B, Mesfin F. Determinants of acute malnutrition among children aged 6 – 59 months in public health facilities of pastoralist community, Afar region, Northeast Ethiopia: A case control study. J Nutr Metab 2017;2017:1-7. doi: 10.1155/2017/7265972.
15. Rana R, Vaze G, Christian P, Gupta P. Determinants of acute malnutrition among under five children in aravalli district of Gujarat, India: A community-based case-control study. Int J Health Sci Res 2019;9:1-8.
16. Dahal K, Yada DK, Baral D, Yadav BK. Determinants of severe acute malnutrition among under 5 children in Satar community of Jhapa, Nepal. PLoS One 2021;16:1-12. doi: 10.1371/journal.pone.0245151.
17. Abuka T, Jembere D, Tsegaw D, Jembere D, Tsegaw D. Determinants for acute malnutrition among under-five children at public health facilities in Gedeo Zone, Ethiopia: A case-control study. Pediatr Ther 2017;7. doi: 10.4172/2161-0665.1000317.
18. Musa MK, Muhammad F, Lawal KM, Alauddin Chowdhury ABM, Hossain A. Risk factors of severe acute malnutrition among under-five children: A hospital-based study in Bangladesh. J Med Sci Heal 2017;3:13-21.
19. M. R. Prashanth, Savitha M. R. PB. Risk factors for severe acute malnutrition in under-five children attending nutritional rehabilitation centre of tertiary teaching hospital in Karnataka: A case control study. Int J Contemp Pediatr 2017;4:1721-6.
20. Pravana NK, Piryani S, Chaurasiya SP, Kawan RThapa RK, Shrestha S. Determinants of severe acute malnutrition among children under 5 years of age in Nepal: A community- based case – control study. BMJ Open 2017;7:1-7. doi: 10.1136/bmjopen-2017-017084.
21. Reproductive Maternal Newborn Child Adolescent Health Plus Nutrition (RMNCAH+N). Joint Secretary (RCH), MoHFW. Available from: https://nhm.gov.in/index1.php?lang=1&level=1&sublinkid=794&lid=168. [Last accesed on 2023 Mar 01].
22. Maternal nutrition | UNICEF. Available from: https://www.unicef.org/nutrition/maternal. [Last accessed on 2021 Dec 27].
23. Ranchi Low Birth Weight Project. Reducing Incidence of Low Birth Weight using a Community based Life Cycle Strategy. Krishi Gram Vikas Kendra Child In Need Institute Social Initiatives Group, ICICI Bank; 2006. Available from: https://icicifoundation.org/wp-content/uploads/2018/03/Project_doc_3.pdf. [Last accessed on 2023 Mar 01].
24. Bomela NJ. Social, economic, health and environmental determinants of child nutritional status in three central asian republics. Public Health Nutr 2009;12:1871-7.
25. Enweronu-Laryea CC, Aryee INA, Adei EAP. Severe acute malnutrition in very low birth weight preterm infants. J Parenter Enter Nutr 2012;36:354-7.
26. Mukuku O, Mutombo AM, Kamona LK, Lubala TK, Mawaw PM, Aloni MN, *et al*. Predictive model for the risk of severe acute malnutrition in children. J Nutr Metab 2019;2019:1-7. doi: 10.1155/2019/4740825.
27. D'Onofrio BM, Class QA, Rickert ME, Larsson H, Långström N, Lichtenstein P. Preterm birth and mortality and morbidity: A population-based quasi-experimental study. JAMA Psychiatry 2013;70:1231-40.