

Severe Acute Malnutrition (SAM): A Vicious Socio-Economic Problem in South India

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Abstract

Context: India is home to the greatest population of severely malnourished children in the world. *Aims:* To evaluate the clinico-epidemiological profile and co-morbidities of SAM children. To identify sociodemographic risk factors of SAM. *Settings and Design:* Prospective hospital based case study. *Methods and Material:* Study conducted from 1st Nov 2017 to 30th April 2019 included were children less than 5 years admitted to indoor pediatric ward and satisfying the WHO definition of SAM. *Statistical analysis used:* Data was entered in Microsoft excel sheet and SPSS software version 16 for windows was used for analysis. *Results:* Mean age of admitted children was 15.21±8.54 months. Male: female ratio was 1:1.22. Most common associated infections were acute respiratory tract infections (35.27%), and diarrhoea (31.75%). Anemia was an important co-morbidity (83.52%). Hypokalemia was the most common metabolic disturbance noted Mean duration of exclusive breast feeding was 3.1± 1.8 months. Most commonly used supplementary food was over diluted cow milk (43.67%). *Conclusion:* The findings of this study confirm the association of severe acute malnutrition with in appropriate infant and young child feeding practices. The problem of SAM is multidimensional (rural background, low socioeconomic status, maternal illiteracy, incomplete immunization etc) and tertiary care centres and NRC provide life-saving care for children.

Keywords: SAM; WHO; Anemia; Tertiary Care Centre.

Introduction

Of the 19 million SAM children among developing countries, eight million (42%) are in India. National family health survey-4 reported that the prevalence of under weight, stunting, and wasted among under five is 36% 38% and 28.5% respectively at the national level and 31.5% 32.6% and 24.8% in karnataka state. Around 6.4% suffer from SAM and these SAM children

have high mortality ranging from 20%-30%.¹ The prevalence of malnutrition varies across states like Madhya Pradesh recording the highest rate (55%) and Kerala among the lowest (27%).² A protein malnutrition survey carried out in ten areas of four States of South India among children under 5 years of age in families with a monthly income of less than Rs 100, estimated to constitute 85% of the population. This is believed to be due to a combination of socio-economic and societal factors including poverty, food insecurity, gender

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inequality, disease and poor access to health and developmental services.² Recovery rates in inpatient facilities to treat SAM children (NRCs) varied from state to state ranging from 37.1% to 65%.³

There is no published community/hospital based studies of SAM children in southern India; hence the present study was conducted.

Aims and Objectives

To evaluate the clinico-epidemiological profile, complications, and co-morbidities of SAM children. To identify socio-demographic risk factors of SAM

Materials and Methods

Present study was a hospital based prospective case study conducted from 1st November 2017 to 30th April 2019 in patients admitted to indoor Pediatric ward and PICU of Basaveshwar and Sangameshwar teaching and general hospital (Tertiary Care Centre) attached to M R Medical College Kalaburagi, Karnataka South India. Consent was obtained from parents of all children included in study.

Inclusion criteria

For 6 months-5 years age group: presence of any of the following :

- a) Weight for length/height < -3 standard deviation (SD)
- b) Bilateral pedal edema.
- c) Mid upper arm circumference < 11.5cm.

Exclusion criteria

Children with non-nutritional causes of SAM like cleft lip, cleft palate, CHD, bronchial asthma, GERD, pyloric stenosis etc

Statistical method

Data was entered in Microsoft excel sheet and SPSS software version 16 for windows was used for analysis. Fischer's exact test were used for nominal data.

Variables used in the study were as defined AGE: in months from date of birth. SEX: male or female

Education status of parents

Illiterate: The person who cannot read and write. Primary Education: The person who has studied up to 7th class. High school/Secondary education: The person who has studied up to 10 class. Higher Secondary: The person who has

studied up to 2nd year puc. Degree/Diploma: The person who has done a degree or diploma course.

Family Type:-Nuclear Family: It consists of married couples, their children while they are still considered as dependent. Joint Family: It consists of a number of married couples and their children who live in the same household. Three generation family: It consists of 3 generations related to each other by direct decent, living together.

Residency details- Urban (Kalaburagi district)/ Rural

Birth Order

The living siblings were taken into consideration for birth order of living children. Birth Interval: The interval between the next living child and the study child was considered. Family Size: It consists of the total number of children a mother has born at the time of study.

Exclusive Breast Feeding

Feeding the child with only breast milk for a minimum duration of 6 months (vitamins, minerals and medicines can be given if required for child's health or for minor ailments. A child fed on water; any other liquids or solids during the early 6 months will not be considered as exclusively breast-fed. Appropriate Age at Weaning: This was considered as 6 months. pre lacteal feeds: Feeds given to the newborn before starting breast-feeding. Top milk feeding: Any milk apart from breast milk introduced before the age of 6 months (Animal Milk/Formula Milk)

Complete Immunization Status

Children who had been administered all the recommended vaccines up to one year of age (i.e 1 dose of BCG, 3 doses of DPT, 3 doses of OPV and 1 dose of Measles) as per UIP guidelines. Incomplete/Partial immunization status: Children who have not received one or more recommended vaccines up to one year of age as per uip guideline

Hypnatremia- serum sodium levels >145meq/l, Hyponatremia - serum sodium levels <135meq/l, Hypokalemia - serum potassium levels <3.5meq/l

RESULTS

In the present study a total of 158 SAM cases were studied. Table 1 depicts the characteristic features of SAM children showing female preponderance than male among all age groups from six months to 60 months with higher proportion among six to 12 months.

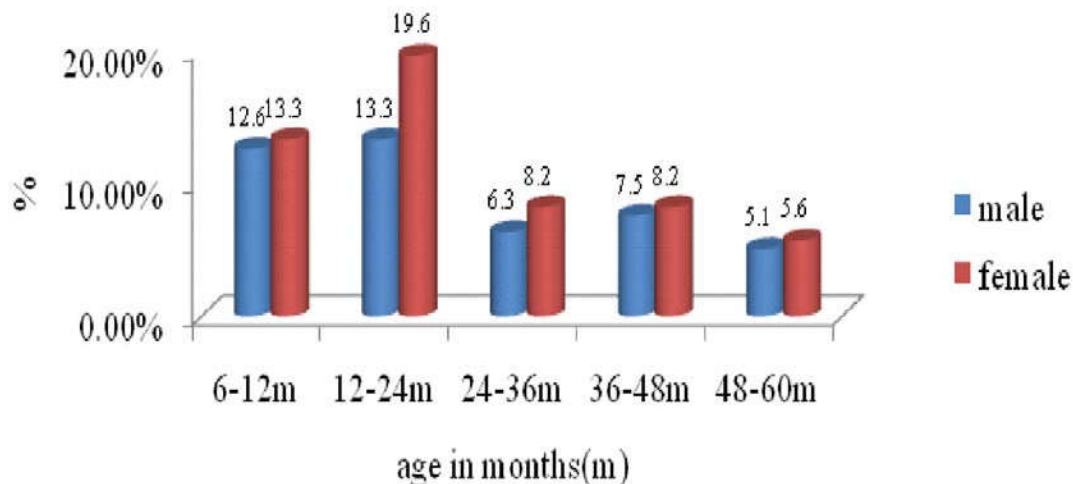
Table 1: Characteristics of SAM children over the 2 years period.

AGE in months	MALE		FEMALE		TOTAL	
	No.	%	No.	%	No.	%
6-12	20	12.65	21	13.29	41	25.94
>12-24	21	13.3	31	19.62	52	32.91
>24-36	10	6.32	13	8.22	23	14.55
>36-48	12	7.59	13	8.22	25	15.82
>48-60	8	5.06	9	5.69	17	10.75
TOTAL	71	44.95	87	55.05	158	100

Table 2: Socio-Demographic factors attributing to SAM.

Sociodemographic Factors			Number	%
Education status of parents	Education status of mother	Illiterate	95	60.14
		Primary	40	25.31
		Secondary	16	10.12
		Higher secondary	7	4.4
		College/degree	0	0
	Education status of father	Illiterate	56	35.47
		Primary	72	45.56
		Secondary	20	12.65
		Higher secondary	8	5.06
Socioeconomic status	College/degree	2	1.26	
	Upper	1	0.63	
	Upper middle	4	2.53	
	Lower middle	9	5.69	
	Upper	53	33.56	
Lower	91	57.59		
	Urban	53	33.54	
Rural	105	66.45		

Depicts sociodemographic factors like education, socioeconomic and literacy status of parents attributing to SAM.

**Fig. 1:** Multiple bar diagram showing frequency distribution of Age and Sex of children with SAM

EDUCATION STATUS OF MOTHER

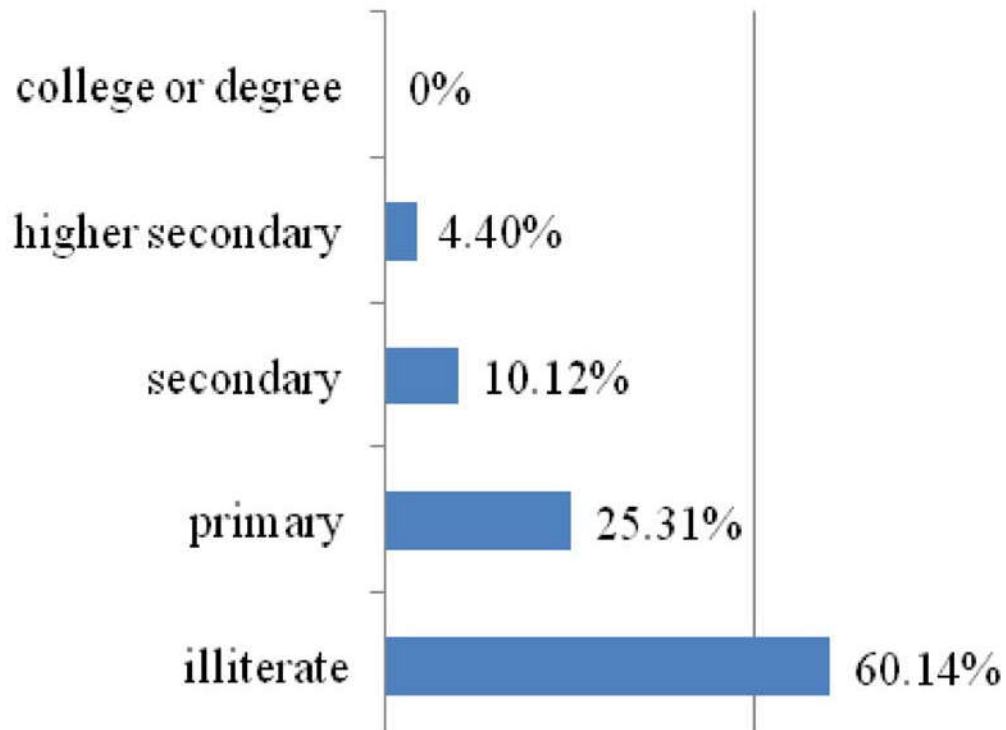


Fig. 2: Simple bar diagram representing education status of mother of cases with SAM

EDUCATION STATUS OF FATHER

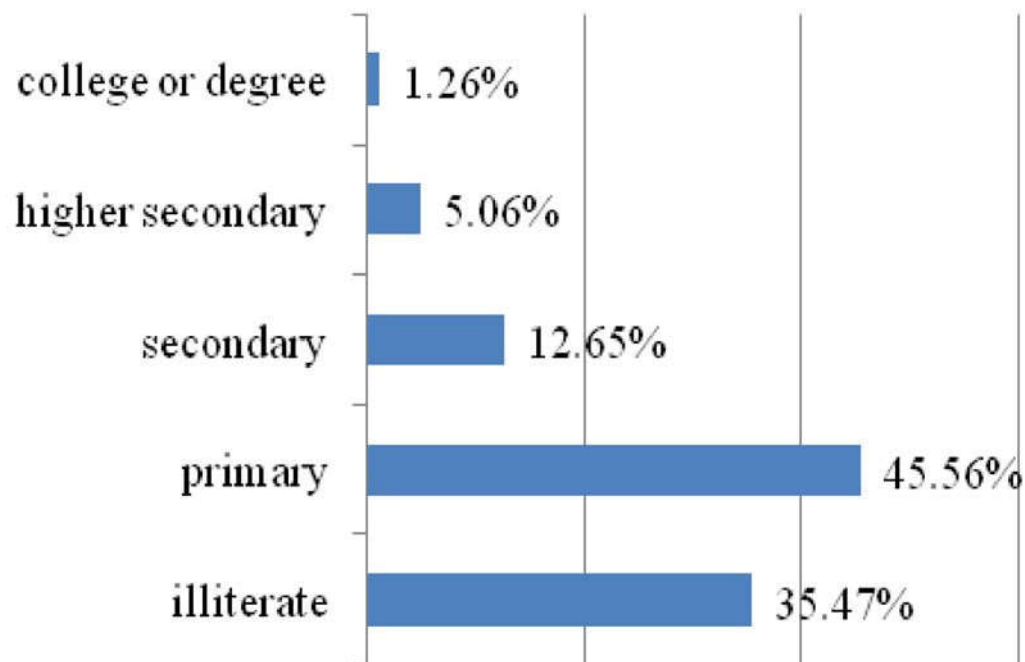


Fig. 3: Simple bar diagram representing education status of children with SAM

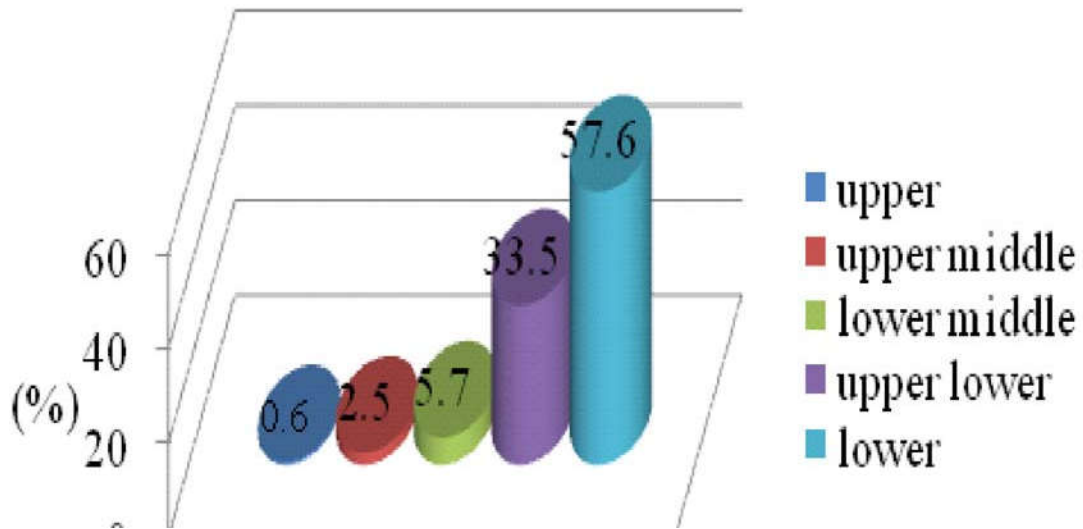


Fig. 4: Simple bar diagram showing socioeconomic status (as per modified kuppuswamy scale) of children with SAM

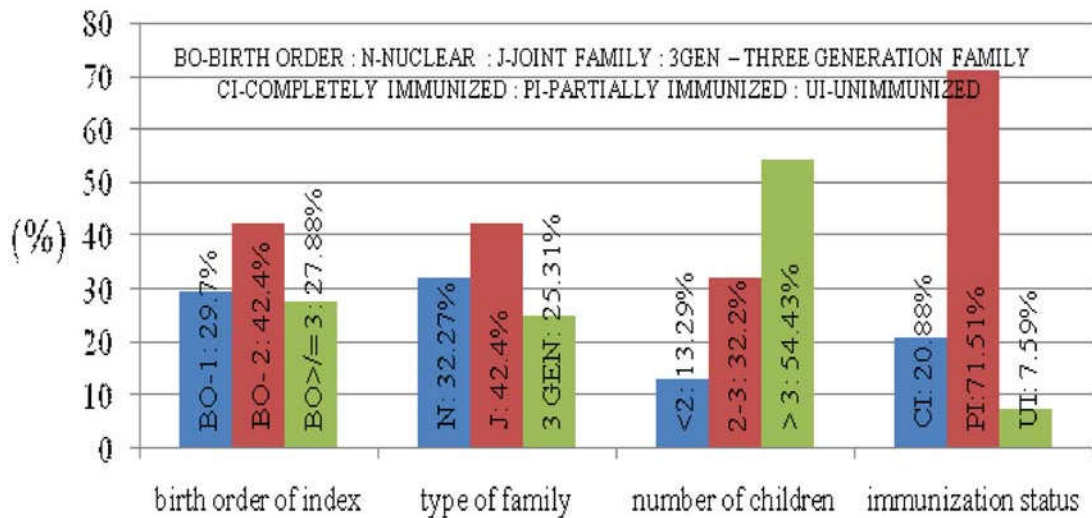


Fig. 5: Multiple bar diagram representing birth order ,type of family and immunization status of children with SAM

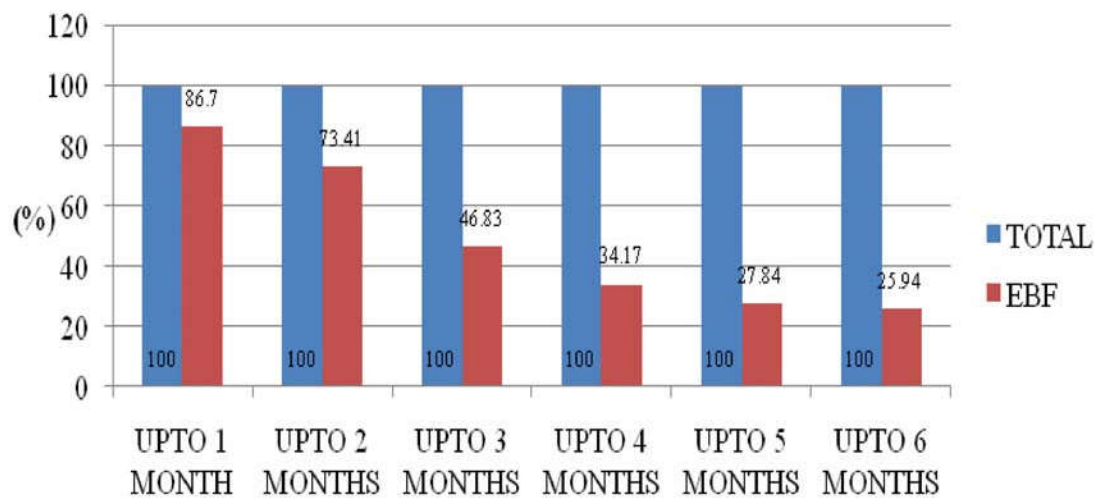


Fig. 6: Multiple bar diagram representing feeding practices in children with SAM

Table 3: Familial ,Feeding & Dietary factors attributing to SAM.

Factors			Number	%	
Familial status	Family size	Upto 5	51	32.27	
		>5	107	67.72	
	Birth order of index case in family	1	47	29.7	
		2	67	42.4	
		>/=3	44	27.88	
		Type of family	nuclear	51	32.27
	Number of children below 5year age	Three generation	Joint	67	42.4
			<2	40	25.31
			2-3	21	13.29
	Spacing between two children <24months		2-3	51	32.2
>3			86	54.43	
Completely immunized			86	54.43	
Partially immunized			33	20.88	
Immunization Status		Unimmunized	113	71.51	
			12	7.59	
Feeding factors	Prelacteal feeds given		97	61.39	
	EBF upto	1months	137	86.70	
		2months	116	73.41	
		3months	74	46.83	
		4 months	54	34.17	
		5months	44	27.84	
		6months	41	25.94	
	Mixed feeds(supplemental)	Animal milk(ex:over diluted cows milk)	Formula milk	69	43.67
			Bottle feeds	48	30.37
			Adequate complementary feeds	72	45.56
		45	28.48		

Depicts household, feeding and dietary factors and immunization status observed in children with SAM.

Table 4: Clinical characteristics and complication in SAM.

Characteristics	Number	%	
Anemia	132	83.54	
Infections	Acute gastroenteritis	96	60.75
	Acute respiratory tract infections	78	49.36
	Urinary tract infections	20	12.65
	Skin infections	16	10.12
	Sepsis	12	7.59
	Otitis media	8	5.06
	Tuberculosis	6	3.79
Signs of Vitamin deficiencies	vitamin A deficiency	43	27.21
	vitamin B deficiency	64	40.56
	vitamin C deficiency	8	5.06
Skin changes of malnutrition	31	19.64	
Hair changes of malnutrition	56	35.44	
Metabolic disturbances			
Hypokalemia	36	22.73	
Hyponatremia	25	15.82	
Hypernatremia	19	12.02	
Shock	11	6.96	

Table 4 depicts the common clinical features, co morbidities and complications noted among SAM children. Anaemia was found to be highly prevalent invariably present among the patients attributed to vitamin and micronutrient deficiency seen these children. Common infections noted were diarrhea and respiratory infections followed by less common infections like UTI, otitis media and sepsis. Vitamin B deficiency was present in majority of the children followed by vitamin A and C deficiencies.

Discussion

Nutrition is vital for individual growth and the focal point of health and well being. Preschool children are mainly nutritionally vulnerable segment of the population. Nutrition during the first five years has an impact not only on growth and development in growing age group but also acts as a determinant of nutritional status in adolescent and adult life. SAM is a preventable and treatable cause of childhood mortality and morbidity. In our study, the mean age of admitted patients was 15.21 ± 8.54 months. Maximum number of children (approx. 57%) were within 6-24 months of age.

Similarly, studies by Choudhary⁴ reported most of the cases (96% and 71% respectively) were less than two year. In the first two years of life, rapid growth and development occurs and demands of substrates for energy and building of tissues also rises, thus leading to deficiency of energy, protein and micronutrients often leading to malnutrition. Also, growth and nutritional requirement is maximum during younger age group

In our study, females were more than males (55.05% vs 44.95%) with a ratio of 1.22:1. Higher number of female patients was also found by Joshi⁵ (78% vs 22%). Singh et al and Rao et al. also reported that extent of malnutrition was significantly higher in girls $p < 0.05$ and $p < 0.01$ respectively. All these 3 studies were community based studies. Choudhary et al., Ashraf et al. & Goyal² described higher incidence of malnutrition in males (74.6%, 53.7% & 84.3% respectively) in their hospital based studies. They postulated that due to ritual and social norms, parents give more importance and seek medical advice more often for male child. However, our study, despite being a hospital based one, showed higher number of female patients.

In our study, maternal and paternal illiteracy

rates were 60.14% and 35.47%. 25.31% of mothers studied upto primary school, 10.12% studied upto secondary and only 4.4% studied upto higher secondary and none upto college or degree. The percentages for fathers being 45.56%, 12.65%, 6.32% respectively. Higher illiteracy rates were described by Chowdhury⁴ (89.3% mothers and 66.2% fathers) and Goyal² (60.6% mothers and 39.4% fathers). This was due to regional variation of literacy rates. Joshi⁵ and Mittal et al described education beyond high school level among 31% and 21.2% of mothers of SAM children, which was similar to our study.

We observed that in the enrolled patients, 96.84% patients belonged to lower socio-economic strata (Kuppuswamy scale III, IV, V). Chowdhury⁴ & Goyal² reported 96% & 83.6% patients belonging to lower socio-economic strata. This indicates that poor purchasing power, unavailability of food, improper distributions make the children vulnerable to malnutrition in a deprived community.

Among the registered patients 66.45% were residents from rural area as compared to 33.54% from urban strata. Pravati jena et al⁶ reported 84.8% belonging to rural areas & this may well be because of proven fact that families with a lot of kids would possibly expertise a lot of economic strain for food consumption. In line with United Nations International Children's Emergency Fund (United Nations Children's Fund) knowledge, globally, over third of kids in rural households area unit undernourished⁷. Rural kids suffer a lot of as a result poor financial condition, poor maternal education and nutrition, lack of prenatal and newborn care, poor health promoting activities, inadequate complementary feeding.

In 42.47% cases, the families were joint and in 42.40% cases the birth order of the affected child was 2 and number of children in family > 3 were 54.43% and birth spacing < 24 months in 54.43% patients. Prevalence of SAM was 52% in the family have 3 or more children in the study by Chowdhury⁴ Sharma et al. also reported the prevalence of malnutrition to be significantly higher in families having more than 3 children due to lower per capita income and poor childcare practices. Abel Gebre et al.⁸ reported children living in households with greater than or equal to five family members had 2.7 times higher risk to be wasted Pragati Chaudary et al.⁹ reported 51.8% children of birth order two. M. R, Prashanth et al. reported 39.8% of patients had birth spacing < 24 months. Effect of larger family

size with overcrowding and inadequate spacing are implicated as risk factor SAM. This supports the notion that non nutritional factors should be essential components in the effort to reduce SAM.

Approx 7.6% of children were unimmunized and 71.51% were partially immunized in our study. The percentages were 42.7% versus 44% and 24% versus 62.3% in studies by Chowdhury⁴ and Tariq et al. Thus, failure of complete immunization is associated with SAM.

Exclusive breastfeeding upto 6 months was done in 25.94% cases and 74.04% were mixed fed. 45.56% mother practised bottle-feeding and 61.39% children received pre-lacteal feeds. The percentages were 32%, 35%, 39.7%, 25% in the study by Devi.¹⁰ In the study by Tariq et al, 41% were exclusively breast-fed, 32% were predominantly breastfed and 26.2% were mixed fed.

Aprameya et al. reported exclusive breastfeeding in 20.9% and bottle feeding in 58.2% cases. In our study only 28.48% received adequate complementary feeds. Over diluted cow's milk (43.67%) was the most common top milk supplementation in our study whereas Chowdhury⁴ reported it to be goat's milk. Bottle fed babies are more prone to infections due to poor hygienic condition of both bottle and nipple, and high incidence of bottle feeding have been reported by Aneja et al. (28.3%), Chowdhury (17.3%)⁴ and Rasamia et al. (65.8%)

Use of prelacteal feeds is not recommended as it can make infant ill and interferes with breastfeeding and poor hygiene by using bottles for supplemental feeding before six months increases risk of infant for acute gastroenteritis and acute respiratory tract infections and starts vicious cycle of malnutrition

As a global public health recommendation, infant should be exclusively breastfed for 1st six months of life to achieve optimal growth and development. thereafter to meet their evolving nutritional requirement, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continued upto 2 years of age

AGE (Acute Gastroenteritis) 60.75% was the most common associated infection followed by ari (acute respiratory tract infections) 49.36% in our study.

Chowdhury⁴, Tariq et al. also described similar findings. Most common vitamin deficiency was vitamin B as also described by Chowdhury⁴.

The Government of India is currently strengthening the Integrated child development (ICDS) scheme, working on national guidelines on community-based management of severe acute malnutrition in India (CMAM), and allowing controlled use of ready-to-use therapeutic food (RUTF) in various states, so that in the years to come, more SAM children can be taken care well at home. However, in a vast country like India where there is deficiency of community health workers, it would be difficult to monitor the domiciliary care, especially in remote areas hence it is vital to continue with the functioning of NRCs. India has long way to go and as more studies like this present one is published, it would be more interesting and informative to know about the further developments.

Conclusion

Mean age of admitted children was 15.21±8.54 months Male: female ratio was 1:1.22.

Sociodemographic risk factors identifies in the study were lower socio-economic scale, rural areas, higher illiteracy rates among parents more so in mothers, inadequate spacing and large families.

Common faulty infant and child feeding and dietary factors noted were delayed initiation, poor continuation of breastfeeding within 6 months and delayed complementary feeding

Mean duration of exclusive breast feeding was 3.1±1.8 months. Most commonly used supplementary food was over diluted cow milk (92%). Most common associated infections were acute respiratory tract infections (49.36%), and diarrhoea (60.75%). Anaemia was an important co-morbidity invariably present (83.54%). Hypokalemia was the most common electrolyte disturbance noted

The problem of SAM is multidimensional and tertiary care centres provide life-saving care for children as demonstrated by the high survival rates

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