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Original Research Article

Clinicoepidemiological and laboratory profile of children with severe acute malnutrition admitted to a tertiary care centre

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ABSTRACT

Background: Severe Acute Malnutrituon (SAM) is a form of malnutrition where there is an imminent threat of death to the child. The chances of complications are very high and in most case child requires hospitalization for stabilization and rehabiliatation. Objective of study the clinicoepidemiological and laboratory profile of children with severe acute malnutrition (SAM) admitted to a Nutritional Rehabilitation Centre (NRC) of our hospital.
Methods: A retrospective chart review of admitted patients. Nutritional Rehabilitation centre (NRC) at GB Pant Hospital Government Medical College Srinagar over a one year period between June 2017 and June 2018.
Results: Total of 187 patients of SAM was admitted in NRC during the study period. One hundred and eight (57.7%) were males and 79(42.3%) were females .Patients were equally among various districts. Infants (<12months) constituted the majority of admissions (54.5%). Marasmus was by far the commonest phenotype presenting as SAM (85.5%).Respiratory comorbidity was the commonest present in about 41 (26.3%) followed by daiarrhea in 32(20.5%). Delayed initiation of complimentary feeding was found in 75(40.1%) while early weaning was found in another 55 children (29.4%). Birth order more than three was present in 92 children (49%). Mother's literacy status had a direct bearing on the prevalence of SAM. Most of the children were from rural background (75%).Most belonged to low economic and income class as around 65.2% had a very meager family income.
Conclusions: SAM is more common in Infants and in children from rural background. It is highly associated with faulty feeding practices including lack of breast feeding and presence of mixed and faulty feeding. It is also associated with increasing birth order, low maternal education and low family income Pneumonia and diarrhea are leading comorbidities. Hypoglycemia and hypothermia are leading complications. Marasmus is the commonest phenotype.

Keywords: Complications, Risk factors, Severe acute malnutrition

INTRODUCTION

According to World Health Organization, protein energy malnutrition (PEM) refers to "an imbalance between the supply of protein and energy and the body's demand for them to ensure optimal growth and function". For a layman malnutrition is the condition that occurs when the body does not get enough nutrients. It is the biggest enemy of child welfare in India. It speaks about the seriousness and commitment of governments towards the health of our children. It acts as the objective marker of the overall health of the society or country authors live in. Since children make the future men and women, PEM has far reaching consequences. To be specific PEM is one of the leading killers of children in India. Among those who survive it affects almost every system of the child.

Growth, Development behavior, cognition, intelligence, immunity, etc are all victims. Studies have shown that stunting is associated with poor developmental attainment in young children poor school achievement or intelligence levels in older children significant functional impairment in adult life. Such children grow into adults with limited biological and intellectual abilities and diminished working capacity. In women, stunting is a matter of great concern in terms of increased obstetric risks. Finally, stunted children frequently experience social disadvantages, which themselves may detrimentally affect their development. More than half (54 percent) of all deaths before age five years in India are related to malnutrition.[1] Because of its extensive prevalence in India, mild to moderate malnutrition contributes to more deaths (43 percent) than severe malnutrition (11 percent).[1] WHO and UNICEF defines Severe Acute Malnutrition (SAM) for children aged 6 months to 60 months as Weight-for- height/length (Z-Score below -3SD of the median WHO child growth standards, by visible severe wasting, bipedal edema; and mid-upper arm circumference below 115mm. Authors wanted to assess the profile of children with SAM admitted to the nutritional rehabilitation center (NRC) at GB Pant Hospital which is an associated hospital of the Government Medical College Srinagar, Jammu and Kashmir, India.

METHODS

This was a retrospective review of case records pertaining to all PEM patients admitted to the NRC at GB Pant Hospital Government Medical College Srinagar over a one year period between June 2017 and June 2018. GB pant hospital is a tertiary care pediatric hospital in Kashmir valley that caters to child population from Kashmir, ladakh and parts of Jammu. NRC is being run under the aegis of National Helath Mission (NHM) and is completely supported by it. It has eight beds with 4 dedicated nurses, 2 nutritionists and a Medical officer. The daily patient care at the centre is supervised by the pediatrics faculty of the Government Medical College Srinagar of which GB Pant hospital is a part

Admission cum inclusion criteria

Children 6-59 months with any of the following:

- MUAC <115mm with or without any grade of oedema.
- WFH <-3 SD with or without any grade of oedema
- Bilateral pitting oedema.

With any of the following complications

- Anorexia (Loss of appetite)
- Fever (39 degree C) or Hypothermia (<35 C)
- Persistent vomiting
- Severe dehydration based on history and clinical examination
- Not alert, very weak, apathetic, unconscious, convulsions
- Hypoglycemia
- Severe pneumonia
- Extensive superficial infection requiring IM medications
- Any other general sign that a clinician thinks requires admission for further assessment or care

All the relevant data regarding history, examination and risk factors of PEM was retrieved from the case records and data was analysed. Cases with inadequate or incomplete records were excluded. Patients more than 6 years were excluded.

All the data was entered in Microsoft excel spread sheet and analysed with SPSS recent version statistical software. Discrete variables were presented as percentages while continues variables were presented as mean±SD.

RESULTS

Total of 187 patients of SAM were admitted in NRC during the study period. One hundred and eight (57.7%)were males and 79(42.3%) were females .Patients were equally distributed between north (35%), south (31%) and central Kashmir (30%)districts while a small number was from jammu and ladakh region (9%) (Table 1).

Table 1: Demography of the studied patients.

Residence	Number
North	65(34.7%)
South	58(31.01%)
Central	56((29.9%)
Jammu and ladakh	8(9.49%)

Infants (<12 months) constituted the majority of admissions (54.5%) followed by children between 1 to 2 years of age (24.5%). children between 2-5 years of age constituted the smallest group (21%) (Table 2).

Table 2: Age group distribution.

Age group	Number (%)
1 year	102(54.5%)
1-2 years	46 (24.5%)
2-5 years	29(21%)

Marasmus was by far the commonest phenotype presenting as SAM. 160 children out of 189 (85.5%) presented as marasmus. 20 children (10.69%) presnetd as Kwashiorkar. The rest presented as marasmic kwashiorkor (7%) (Table 3).

One hundred twenty one (65%) children had moderate to severe anemia (Hb <10 gm%) out of which 62

patients(32%) had severe anemia (Hb <7gm%). Fourteen (7.4%) had overt rickets.

Table 3: Type of PEM.

Type of PEM	Number (%)
Marasmus	160(85.56%)
Kwashiorkar	20(10.69%)
Marasmic Kwashiorkar	7(3.75%)

Almost all children included in the study had associated comorbid conditions either contributing to the malnutrition or arising out of malnutrition or a combination of both. Respiratory comorbidity was the commonest present in about 41 (26.3%) of patients. All these patients had pneumonia. It was followed closely, in 32 (20.5%) pateints by gastrointestinal morbidity with diarrhea and dehydration being the commonest. Persistant/chronic diarrhea was found in 6 of these patients. Seventeen (11%) patients had associated neurological comorbidities. Out of these 10 had cerebral palsy while 7 had neurodegenerative disorders (Leighs disease 2, leucodystrophy 3, undiagnosed 2). Tuberculosis was diagnosed in 15 patients (9.6%) while 16 (10%) and 15 (10%) patients had sepsis and urinary tract infection respectively. Congenital heart disease was present in 10 patients (VSD 5, AVSD 2, TOF 2.PDA 1) Table 4 depicts the associated comorbidities.

Table 4: Associated comorbidities.

Involvement	Number (%)
Respiratory	41 (26.3%)
Gastrointestinal	32(20.5%)
Neurological	17(10.9%)
Cerebral palsy	10
Leighs	2
Leucodystrophy	3
Undiagnosed	2
Cardiovascular	10 (5.5%)
VSD	5
AVSD	2
TOF	2
PDA	1
Sepsis	16(10.2%)
Tuberclosis	15(9.6%)
Urinary tract infection	15(9.6%)
Others	10(5.5%)

Hypoglycemia was documented in 56 (29.9%) patients, while hypothermia was present in 71(38%) patients at the time of presentation. Dyselectrolytemia was present in 32 (20.3%) patients. Dehydration was present in 26 patients (Table 5).

While evaluating for the main risk factors for malnutrition in these patients authors found that a large proportion (120/187, 69.5%) of these patients had not received exclusive breast feeding during the first six months of life and were either on mixed or complete top feeding. Out of 120 children 78 were fed over diluted formula while the other 44 were fed diluted cow's milk with bottle with or without breast feeding. Delayed initiation of complimentary feeding was found in 75(40.1%) while early weaning was found in another 55 children (29.4%). Birth order more than three was present in 92 children (49%). Mothers literacy status revealed that 55% mothers were illiterate while 16% were educated up to primary, 12 % from primary to middle, 10% upto high and only 9% above high school education. Most of the children were from rural background (75%).Most belonged to low economic and income class as around 65.2% had a very meager family income of below 5000 Rs/month. Table 6 depicts the risk factors for malnutrition in the studied patients (Table 6).

Table 5: Associated complications.

Complications	Number (%)
Hypoglycemia	56 (29.9%)
Hypothermia	71(38%)
Dehydration	269(13.9%)
Dyeelectrolytemia	32(17.11%)
Hypokaklemia	24
Hyponatremia	5
Hypernatremia	3

Table 6: Risk factors.

Risk factor	Number	%
Lack of EBF	120	69.5
Overdiluted formula	78	
Diluted cow's milk	42	
Early weaning	55	29.4
Delayed complimentary feeding	75	40.1
Economic class (Income less than 5000/month)	122	65.2%
Education of mother	102	54.5
Illiterate	30	16.07
Upto primary	23	12.3
Upto middle	20	10.7
Upto high	12	6.4
More than high		
Birth order	52	27.8
1	43	22.9
2	56	29.9
3	36	19.25
4>4		
Rural	140	74.8%

DISCUSSION

The state of nutruition in children is very grim especially in Lower and middle income countries (LMIC). UNICEF data 2018 suugests that although these countries have only one half of the under five children population of the

whole world but they have almost two thirds of the stunted children and almost three quarters of wasted children. To put it in numbers around 55% of stunted children live in Asia while 39% of stunted children live in Africa. Around 69% of wasted children live in Asia while 27% of such children live in Africa.[2] National family Health Survey IV (NFHS IV) has come up with the recent country wide health statistics. The nutritional state of Indian children is not very encouraging. According to this survey 38% of the under 5 children living in India are stunted while 36% are underweight while 21% are wasted. In Jammu and Kashmir according to same survey 27% children living in the region are stunted while, 17% are underweight while 12% are wasted.[1]

Severe Acute Malnutrituon is a form of malnutrition where there is an imminent threat of death to the child. The chances of complications are very high and in most case child requires hospitalization for stabilization and rehabiliatation. Authors tried to look at these cases admitted at a nutritional rehabilitation centre of our instituition and triued to get an idea about the intensity and pattern of this form of malnutrition and its risk factors.

Infants (<1 year) constituted the largest group. More than half of the studied patients were infants. The proportion of children with SAM fell as age increased. The reason for this could be the fact that infants are more vulnerable to acute malnutrition and secondly they manifest early with signs and symptoms so that medical attention is sought earlier. In contrast in older children, although equally or even more vulnerable, the acute symptoms take time to manifest and medical attention is sought either late or not at all. Further the rate of complications is lesser in older children as compared to infants and hence rate of hospitalization in infants is more. However, if authors talk of malnutrition in general, the prevalence of stunting and wasting is higher in older age group as compared to infants. Infact NFHS IV data suggests that, as feeding practice changes with age, a fourfold increase in the prevalence of stunting is seen from 20.1% (0-6 months) to 46.9% (12-23 months). (Ref NFHS IV).[1]

Malnutrition including acute severe form affects both genders equally and there is no gender predilection associated with it. In our study authors did not come across any gender differences, although males were more (57%) as compared to females (42%) but the difference was not statistically significant. The increased number of male admissions might also be due to the preferential treatment of male children in socioculturally and economically backward sections of the society. NFHS IV reported an underweight prevalence of 38.9% among girls compared with boys (37.9%)(ref NFHS IV) In one of the studies that studied gender inequalities while rearing of children, timely feeding and continuation of breast feeding was seen more among boys than girls.[1] The median duration of breast feeding was 2 months longer for boys than girls. Early weaning of the girl child was done to increase chances of having a boy in the next pregnancy.[3]

Almost all districts and parts of the Kashmir valley were equally represented in the study sample thereby signifying the universal penetrance of malnutrition across the region. There were less number of children from Jammu and Ladakh region as most of the patients from these regions go to their respective regional hospitals, only areas adjoining Kashmir valley feed this hospital. NFHS IV data also suggests that the prevalence of stunting is almost similar across Kashmir districts with the highest of 31% in Kupwara district and lowest of 18% in Anantnag, with other districts falling in between.[1]

Marasmus was by far the most common form of malnutrition presenting as SAM as it was presenting in whooping 85.5% of the children studied, while kwashiorkor was present in only 11%, Rest had marasmic kwashiorkor. This finding is in agreement with many other studies which have shown marasmus to be a principal form of malnutrition.

Almost two third of studied population had anemia while one third had severe anemia. Anemia is regarded as a suurigate marker of malnutrition and it goes hand in hand with other manifestations of malnutrition. Iron deficiency is the usual cause although in some dual deficiency anemia where there is associated deficiency of methylcobalamin and folic acid is also present. Overt rickets was also seen in a proportion of the patients (10%). As authors know that rickets is a disease of growing bones, this manifestation might be obscured due to hampered bone growth in malnutrition patients Although it does manifest in severe cases.

Malnutrition seldom kills by itself. However the maximium morbidity associated with malnutrition is because of the complications of SAM or associated comorbid conditions. The most important being infection and sepsis. The vicious cycle of infection and undernutrition go hand in hand. It causes secondary immunodefeciency. Measles, pneumonia, diarrhea, helmimthic infections are leading killers in PEM.[4,5]

Dyselectrolytemias hyoglycemia and dehydration are also responsible for a large number of deaths in SAM. In our study pneumonia was the commonest comorbidity which was followed by diarrhea and dehydration, other comorbidities included neurological. Neurological co morbidities were present earlier and authors were not because of SAM. These neuroloigval conditions most probably contributed to malnutrition in these children. Similarly cardiovascular comorbisities described were present beforehand and contrinbuted to the malnutrition.

Hypoglycemia was the commonest complication encountered in children with SAM, followed by Hypothermia and dyselectrolytemis. These complications usually ocurred in combination.

Absence of breast feeding and presence of faulty feeding was found to be very prevalent in our children with SAM. Authors believe this to be an important risk factor for development of SAM in our children. Over diluted formula or diluted Cow's milk were the main reasons for faulty feeding. All of these reported to be breast feeding their babies as well which however was not adequate. Data from whole country as reported by NFHS suggests that breast feeding practices are not optimal. Only fifty-five percent of infants under age six months are exclusively breastfed the median duration of breastfeeding in India is 29.6 months. This means that half of children have stopped breastfeeding by age about 30 months. The median duration of exclusive breastfeeding is 2.9 months while median duration of predominant breastfeeding is 5.8 months only.[1] Huge number of our partients had delayed initiation of complimentary feeding (70%) or early weaning. Both these aspects of faulty weaning practices were seen in alarge proportion of our study population. Both delayed initiation and early weaning have been associated with poor nutrition in children. One of the studies found that lack of colostrum and inappropriate complementary feeding were significantly associated with underweight and stunting.[6] Another study found that prelacteals, rejecting colostrum as witch's milk , delayed initiation of complimenatry feeding for fear of infections and customary dietary restrictions were associated with poor nutritional status in studied children.[7]

Almost half (49%) of the patients of SAM in our study population were born at a birth order three or more. Our finding is in agreement with findings from earlier studies which have demonstrated that higher birth order is associated with higher odds of having malnutrition. One of the studies found that the proportion of undernutrition in higher birth order (>3) was more than those with first birth order.[8] NFHS IV observed that lower birth orders were an advantage. The prevalence of undernutrition declined from a birth order of >3 (48.5%) to 1 (13.3%).[1] Severe undernutrition was seen rarely in children with first birth order. This can be explained for a simple reason that with each additional child born to a family, the resources are divided among the growing family. With each growing birth order the expenses are stretched beyond the earning capacity of the family and hence malnutrition sets in.

Most of the mothers of our children were either Illiterate or educated below primary level. One of the studies observed a decreasing trend in all forms of undernutrition when the literacy status of mother increased. It also observed that children of illiterate women are twice as likely to show signs of underweight and stunting as those who had at least completed high school. (51% against 24%). It also observed that children whose mothers are illiterate have 3 times higher prevalence of wasting than literate mothers.[8]

Socioeconomic class is also an important determinant of malnutrition in children. Children belonging to poor families are more vulnerable to malnutrition. Almost 63% of our children with SAM belonged to families with monthly family income less than 5000 Rs. Undernutrition is more common in the lower income groups .Even if malnutrition is present in the upper income group, it is limited to the milder forms.[8] The prevalence of stunting decreases steadily with an increase in wealth quintiles, from 51 percent of children in households in the lowest wealth quintile to 22 percent of children in households in the highest wealth quintile.[1]

Almost three quarters of children belonged to rural areas. Authors found being from rural background has a significant association with SAM. NFHS 4 data shows that except Tripura, the prevalence of undernutrition is higher in rural than urban children in all states.[1] Another study found that stunting is higher among children in rural areas (41%) than urban areas (31%).[9]

In addition to above maternal malnutrition and height has been studied and found to have a direct beraing on the nutrition of the child. Women with height <145 cm and body mass index <18.5 are likely to give birth to low birth weight children.[10] With a low birth weight prevalence of 28%, these children are already compromised before birth. This risk factor although very important has not been addressed by our study.

Conclusion of this study malnutrition is highly prevalent among children living in low and middle income countries. India is home to a large number of stunted and wasted children. SAM is more common in Infants and in children from rural background. It is highly associated with faulty feeding practices including lack of breast feeding and presence of mixed and faulty feeding. It is also associated with increasing birth order, low maternal education and low family income Pneumonia and diarrhea are leading comorbidities. Hypoglycemia and hypothermia are leading complications. Marasmus is the commonest phenotype.

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