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Clinical Profile of Severe Acute Malnutrition in Western Rajasthan: A Prospective Observational Study from India

Abstract

Introduction: The present study is undertaken to evaluate incidence and clinical profile of patients admitted with severe acute malnutrition and the assessment of relative contribution of various variables.

Methods and material: This prospective study was conducted at department of paediatrics Umaid hospital, Dr. S.N. medical college Jodhpur, for a period of 7 months on patients of severe acute malnutrition admitted in malnutrition treatment corner. A total of 75 cases were enrolled in the study and a detailed history and physical examination finding were recorded in pretested proforma at the time of admission by using standard methodology and anthropometric measurement expressed in standard deviation from the median of the reference population (NCHS).

Results: Incidence of severe acute malnutrition is 3.28%. Mean age of admitted patients was 14.92 ± 7.48 months and mostly belonged to lower socioeconomic scale, rural area and large family. Most of the caretakers were illiterate and in all cases, caretakers were mothers. In our study that 41.3%, 32.1%, 21.3% and 5.3% patients were in PEM grade IV, III, II and I respectively. Female patients were more severely malnourished than males (84.2% v/s 68.21%).Most common presenting symptom was fever (70.7%), followed by vomiting (52) and co morbidity associated with PEM was gastrointestinal (60%) followed by respiratory tract infection (52%). Mean duration of exclusive breast feeding was 2.6 ± 1.5 months and mean age of weaning was 8.4±3.9 months.78.7% children were still on breast feed at the time of hospitalisation and among them 40.7% of children were above 12 months of age. Mean age of starting semisolid and solid food was 11.6+3.53 months and most commonly used supplementary food was top milk in (100%), followed by chapati (42.3%) in patients.

Conclusion: On the basis of this study, we conclude that the problem of severe malnutrition is multi-dimensional and inter-generational in nature. The determinants of severe malnutrition includes household food insecurity, illiteracy, low socioeconomic status, lack of awareness to access health services, large family size and poor purchasing power etc. Besides these, faulty feeding practices, poor complementary feeding practices, ignorance about nutritional needs of infants and young children and repeated infections, also aggravates the malnutrition amongst children.

Keywords: Clinical Profile; Severe Acute Malnutrition

Research Article

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Abbreviations: NCHS: National Center for Health Statistics; SAM: Severe Acute Malnutrition; PEM: Protein Energy Malnutrition; MTC: Malnutrition Treatment Corner;

Introduction

India is home to greatest population of severely malnourished children in the world and accounts for over 20% of under-five childhood death every year and 2.1 million children in India do not survive to celebrate their fifth birthday [1]. National family health survey estimates reveal that 45.9% of India's children under 3 years are underweight, 39% are stunted and 23% are wasted and about 8 million (6.4%) children suffer from acute severe malnutrition and these children have high mortality rate ranging from 20% to 30% [2]. Severely malnourished children have a high mortality rate; almost 56% of childhood death is attributed to malnutrition. Optimal management of these acutely ill children and a good outcome depends on an evidence based regimen of care. Despite concerted efforts in recent years involving policy makers, health care providers and social organisations morbidity and mortality of malnutrition remains a challenge. Severe acute malnutrition (SAM) continues to be an important cause of mortality. In addition to critical care, a nutritional therapy followed by nutritional rehabilitation is a very important aspect for these children [3].

The present study was, therefore, undertaken to evaluate incidence and clinical profile of patients admitted with severe acute malnutrition and the assessment of relative contribution of various variables.

Methods and Material

This was a prospective study conducted in the malnutrition

treatment corner of the Umaid Hospital for women and child health, Dr. S.N. Medical College, Jodhpur for a period January 2010 to December 2010 on patients of severe acute malnutrition admitted in malnutrition treatment corner. Informed consent was obtained from the parents of all children. Institutional ethical committee approval was taken for the study.

Inclusion criteria were (age group 6 month to 5 years):

i. Weight for height/ length -3 SD (WHO/NCHS median height).

ii. Bilateral pedal oedema.

iii. Grossly visible severe wasting.

Exclusion Criteria

Children with non-nutritional cause of severe acute malnutrition. Children with severe acute malnutrition those fit in these criteria and admitted in Umaid Hospital will be enrolled in study. Children will be managed in malnutrition treatment corner and these children will be treated by medical and nutritional means as needed. After admission, investigations like Haemoglobin, total and differential leucocytes count, ESR, urine and stool examination, Monteux Test, HIV ELISA , chest X-Ray, electrolytes and other investigations were done as and when required.

A detailed history and physical examination finding will be recorded at the time of admission by using standard methodology and anthropometric measurement expressed in standard deviation from the median of the reference population, this being the commonly use National Centre for Health Statistics (NCHS) standard as recommended for used by the world health organization. Socioeconomic status will be classified according to modified Kuppuswami scale [4].

Statistical Analysis

The data were entered in Microsoft excel sheet and SPSS software version 16 for windows was used for analysis of results.

Results

A total of 75 cases were enrolled in the study. Out of all admitted patients, 72 (96 %) were below 2 year of age. Male patient constituted 74.6 % of the total with a ratio of M: F = 2.9:1. The mean age of admitted patients was 14.92 ± 7.48 months. Majority of the cases, i.e. 66 (88%) were Hindus and among them 55 (83.3%) were living in rural area. 72 (96%) patients belong to lower socioeconomic scale (III, IV&V) and only 3 (4%) patients belonged to socioeconomic scale I and II. Most of the caretaker i.e. 67 (89.3%) were illiterate and father was literate in 49 (66.2 %) cases. In all cases, caretakers were mothers. 39 (52 %) patients had three or more children in their families including index case. Prevalence of severe malnutrition was more in families having 3 or more children. Majority of patients were either unimmunised or partially immunised i.e. 32 (42.7 %) and 33 (44 %) cases respectively. Only 10 (13.3%) patients were immunised as per age.

Out of all admitted patients, 31(41.3%) had grade IV, followed by 42 (32%) grade III, 16 (21.3%) grade II and 4 (5.3 %) grade I malnutrition. Out of 19 female patient, 16 (84.2%) had PEM grade III & IV while 68.2% male had PEM grade III & IV. Out of all severely malnourished patients, 35 (46.7%) had stunting and among them 14 (40 %) patients were severely stunted. Fever was the most common presenting complaint in 53 (70.7 %) patients, followed by vomiting in 39 (52 %), loose motion in 35 (46.7%), cough in 35 (46.7 %) and loss of appetite or weight loss in 23 (30.7%) patients. Other complaints were oedema in 11(14.7%), abdominal distension in 5 (6.7%), rash in 3 (4%) and convulsion and ear discharge in 2 (2.7%) patients each (Table 1).

Table 1: Distribution according to Presenting Complaints.

S. No.	Complaints	Number of patient n (%)
1	Fever	53 (70.7)
2	Vomiting	38 (50.7)
3	Loose motion	35 (46.7)
4	Cough	35 (46.7)
5	Loss of appetite (Weight loss)	23 (30.7)
6	Oedema	11(14.7)
7	Abdominal Distension	05 (6.7)
8	Rash	03 (4.0)
9	Convulsion	02 (2.7)
10	Bleeding	02 (2.7)
11	Ear discharge	02 (2.7)

Most common co-morbidity associated with malnutrition were gastrointestinal tract disturbances in 45 (60%), followed by respiratory tract infection in 39 (52%), urinary tract infection in 3 (4.0%), otitis media in 2 (2.7%) and septicaemia in 1 (1.3%) patients. Other associated infections were tuberculosis in 7 (9.3 %), dysentery in 5 (6.7%), measles in 3 (4.0%), HIV in 3 (4.0 %) and malaria in 1 (1.3%) (Table 2). Most common observed vitamin deficiency was vitamin B in 30 (40%), followed by vitamin A in 21 (28 %), vitamin D in 5 (6.7 %) and vitamin C in 1(1.3%) patient. Angular stomatitis and conjunctival xerosis were the most common deficiency sign.

Table 2: Distribution according to disease pattern.

S. No.	Morbidity	No. of patient n (%)
1	Acute diarrhoea vomiting	28 (37.3)
2	Bronchopneumonia	23 (30.7)
3	Upper respiratory tract infection	16 (21.3)
4	Acute vomiting	10 (13.3)
5	Tuberculosis	07 (9.3)
6	Acute diarrhoea	07(9.3)
7	Dysentery	05 (6.7)
8	Measles	03 (4)
9	HIV	03 (4)
10	Urinary tract infection	03 (4)
11	Otitis media	02 (2.7)
12	Septicaemia	01 (1.3)
13	Malaria	01 (1.3)

Among all admitted patient with SAM, 64 (85.3%) patients were anaemic at the time of admission and out of them 38 (59.3%) had moderate, 19 (29.7%) had severe and 7 (10.9 %) had mild anaemia. 14.7% patients had normal haemoglobin Level. Out of 75 patients, hypoglycemia was detected in 16 (21.3%) cases having blood sugar less than 54 mg/dl, among them 3 (18.7%) patient had sugar less than 40 mg/dl. Only 7 (9.3%) patients had exclusive breast feeding up-to 5 months of age. Nearly 74.7% children were exclusively breast fed up-to two months of age. Only two patients were exclusively breast fed up to 6 months of age. Mean duration of exclusive breast feeding was 2.6 ± 1.5 months (Table 3).

Table 3: Duration of Exclusive Breast Feeding.

S. No.	Duration (month)	No. of patient n (%)
1	Upto 1 month	66 (88)
2	Upto 2 month	56 (74.7)
3	Upto 3 month	36 (48)
4	Upto 4 month	20 (26.7)
5	Upto 5 month	7 (9.3)
6	Upto 6 month	2 (2.7)
7	More than 6 month	0

Weaning had been started in 52 (69.3 %) at the time of admission, among them in 13 (25 %) weaning was started before 6 months of age, in 18 (34.6 %) between 6 to 9 months, in 16 (30.8 %) between 9 to 12 months and in 5 (9.86 %) patients after 12 months of age. Out of 75 patients, 23 (30.7 %) patients with different age groups were yet not started weaning at the time of hospitalisation, among them 10 (41.6%) were between 9 to 12 months of age and 5 (20.8%) were above 12 months of age (Table 4).

Table 4: Distribution according to Age of Weaning.

S. No.	Age of weaning	Weaning started n (%)	Semi Solid & solid food started n (%)
1	<6 month	13 (25)	0
2	6-9 month	18 (34.6)	11 (33.3)
3	9-12 month	16 (30.7)	10 (30)
4	>12 month	5 (9.6)	12 (36.4)
	Total	52	33

Out of all patients, those started supplementary food, 33 (63.5%) patients were started semisolid and solid foods along with top milk. Semisolid and solid foods were started between 6 to 9 month in 11 (33.3%), between 9 to 12 month in 10 (30 %) and after 12 month in 12 (36.4%) patients. Solid or semisolid foods were started after 9 month of age in 22 (66.7%) patients. Mean age of weaning was 8.4±3.9 months and mean age of starting semisolid to solid food was 11.6±3.53 month. Most common used supplementary food was top milk in 52 (100%), followed by chapati in 22 (42.3%), khichadi /daliya in 17 (32.7%) and dal/rice in 10 (19.2%) patients. Most common used top milk was goat milk (61.5%). Most commonly used weaning method was by katori spoon and cup in 39 (75 %) patients, followed by bottle in 9 (17.3 %) and both bottle and katori spoon in 4 (7.7%) patients.

Out of 75 patients, 16 (21.3%) were stopped breast feeding at the time of hospitalisation, among them 6 (37.5 %) stopped breast feeding before 6 month of age, 1 (6.2%) between 6 to 9 month, 2 (12.5 %) between 9 to 12 month and 7 (43.7%) patients after 12 months of age. , 59 (78.7%) patient of different age group were still on breast feed, among them 16 (27.1%) patients were between 6 to 9 month, 19 (32.2%) between 9 to 12 month and 24 (40.67%) were above 12 month of age. Out of these 59 patients, 36 (61%) patients also received top feed along with breast feed and 23 (39%) patients were still not started complementary feeding, among them 14 (60.8%) patients were above 9 month of age. 23 (30.7%) patients were on breast feed only and yet not started weaning; among them 9 (39.1%) patients were below 9 months of age and 14 (60.9%) patients were above 9 months of age (Table 5). Severity of malnutrition (III & IV) was more in patients of above 9 months of age as compared to those below 9 months of age (78.5% v/s 55.5%).

Table 5: Degree of malnutrition in patients those still on breasts feed only.

S. No.	Age group	No. of patients	Degree of malnutrition n (%)			
			I	II	III	IV
1	<9 month	9	1 (11.1)	3(22.2)	4(44.4)	1(11.1)
2	>9 month	14	1(7.1)	2(14.4)	5(35.7)	6(42.8)
	Total	23	2	5	9	7

Discussion

Protein energy malnutrition (PEM) predominantly seen between infancy and childhood i.e. from 6 months to 5 years of age. Severe malnutrition is not only an important cause of morbidity and mortality, but also leads to permanent impairment of physical and possibly mental growth of those who survive. In addition to critical care, a nutritional therapy followed by nutritional rehabilitation is a very important aspect for these children. Thus, present study was conducted in malnutrition treatment corner (MTC) of Umaid hospital for women and children health Dr. S.N. medical college, Jodhpur to find out the incidence, clinical profile of severe acute malnutrition.

In this study, incidence of severe acute malnutrition was 3.28%. According to recent national family health survey prevalence of severe acute malnutrition is 6.4% [2]. This high prevalence was due to lack of awareness about malnutrition in community especially in rural population due to high illiteracy level of mothers and lower socioeconomic status of family. Since NFHS is community based while our study was hospital based and in India parents generally do not seek medical advice for these malnourished children until unless they suffer from some of the acute complications of SAM e.g. diarrhoea, vomiting, bronchopneumonia, fever, convulsion, skin infection etc.

Out of total 75 patients enrolled in the study, 96% patients were below 24 months of age. The mean age of admitted patients was 14.92±7.48 months. Sharma [5] in their study also reported that prevalence of malnutrition is significantly high in children less than 24 months of age. Similarly, Mamidi et al. [6] in their study on hospital based treatment of severe malnutrition reported that 71.1% of children were below 24 months of age. In

initial 2 to 3 year of life rapid growth occurs and requirement of substrates for energy and building of tissue also increases, thus deficiency of protein, energy and other micronutrients in these year results in malnutrition.

In the enrolled subjects of our study, males were more than females (74.6% v/s 25.4%) with a ratio of 2.9:1. Similar to our study, Ashraf et al. [7] reported that malnutrition is relatively more common in males as compared to that of females (53.7% v/s 46.3%). Likewise, Aneja et al. [8] in their study on malnutrition observed that 55.5% of children were males as compared to females (44.5%). But Joshi et al. [9] observed that incidence of malnutrition was higher in females (78%) as compared to that in males (22%). Singh et al. [10] and Rao et al. [11] reported that extent of malnutrition was significantly higher in girls than boys i.e. ($p<0.05$) and ($p<0.01$) respectively. This difference may be due to the fact that Joshi et al. [9], Singh et al. [10] and Rao et al. [11] did field studies in general population where malnutrition is more common in female counterpart as compared to male whereas Ashraf et al. [7], Aneja et al. [8] and present studies were hospital based where male patients were more than female which might be due to the fact that male children are bought to hospital early and are given more importance. Moreover male child gets more medical attention than female and in rural area parents usually does not seek medical advice for female child. Ritual and social norms are also responsible for it.

In the index study, majority of the cases (88%) were Hindus and malnutrition was more (82.7%) in rural area. This represents the prevalence of these two communities in local population. Similarly, Malik et al. [12] reported that malnutrition was more in Hindus as compared to Muslims (70.7% v/s 29.2%) but the severity of malnutrition (PEM grade III and IV) was more in Muslims which may be due to the fact that Muslims has large family size, low literacy level and belonged to low socioeconomic status. Singh et al. [10] and Rao et al. [11] also observed the same. Ashraf et al. [7] in their study revealed that malnutrition was more prevalent ($p<0.01$) in children living in nonindustrial than industrial area (82.8% v/s 17.1%). Poor nutritional status of rural children compared to their urban counterparts is due to the cumulative effect of a series of less favourable conditions, including lower socioeconomic conditions, improper maternal prenatal and birthing care, poor quality of complementary feeding and poor immunization status.

We observed that in the enrolled patients, 96% patients belonged to lower socioeconomic status (Kuppuswami scale III, IV & V) [4]. Severe malnutrition was infrequent in upper socioeconomic class. Soni et al. [13] and Ashraf et al. [7] in their studies reported that majority of malnourished children belonged to lower socioeconomic status (IV and V) i.e. 72.8% and 90% respectively. Likewise, Rao et al. [11], Singh et al. [10] and Swaminathan et al. [14] also reported that malnutrition is related to per capita income and socioeconomic condition. A study by Wagstaff and Watanabe [15] found inverse relation between underweight and socioeconomic inequality. These results indicate that unavailability of food, poor purchasing power, inappropriate distribution and inadequate utilization might make the children vulnerable to malnutrition in a deprived community.

We observed that 89.3% caretakers were illiterate and in almost all cases mothers were the caretaker. Fathers were literate in 66.2% cases. Similar to our study, Joshi et al. [9] observed that malnutrition was more (64%) in children whose mothers were educated up-to primary level as compared to those educated up-to secondary or higher level (31%). Likewise, Mittal et al. [16] reported that prevalence is the highest where mothers are illiterate (60.9%) compared to 21.2% where mothers were educated more than high school. Sharma [5] in his study also reported that most of the children belong to low income group respectively and prevalence of PEM was more (70%) in children whose mothers were illiterate. High prevalence of under nutrition of both kinds among under-fives highly suggests that there is a strong need for educating the mothers about timely weaning and weaning foods which are easily available at home as well as in local market, that too at low cost. The number of malnourished children decreased as the literacy status of mothers improved because better education makes the mother aware of the importance of immunisation, breast feeding, family planning and birth spacing, hygiene and a balance diet.

In the enrolled patient, prevalence of severe malnutrition was higher (52%) in the family having 3 or more children. Rao et al. [11] in their study on malnutrition in urban slums reported that average family size was 5.77. Likewise, Sharma [5] also reported that prevalence of malnutrition significantly higher in families having more than 2-3 sibling. It might be due to relatively low per capita income and poor childcare practices. Most of the children in our study were either unimmunised (42.7%) or partially immunised (44%). Sharma [5], Shah [17] and Devdas et al. [18] observed that better the socioeconomic and educational status of mothers; better was the immunisation status of children. It is due to the fact that most of the children in our study belonged to rural area and their mother's literacy and socioeconomic status was also low. A substantial proportion of rural parents are unaware of the protective value of immunisation.

The results of the present study showed that 41.3%, 32.1%, 21.3% and 5.3% patients were in PEM grade IV, III, II and I respectively. Female patients were more severely malnourished than males (84.2% v/s 68.21%). Females are more likely to be malnourished than males and severity of malnutrition is also more in female children. Similar to our study, Mittal et al. [16] observed that more males (35.29%) were affected with lower grades of PEM (grade I and II) than females (32.85%), whereas severe grades of PEM (grade III and IV) were common in females (5.71%) than in males (2.94%).

Out of all severely malnourished patients, 46.7% had stunting; of which 40% were severely stunted. Mittal et al. [16] also reported that 38.38% had low weight for age whereas 46.06% had low height for age. The most common presenting symptom in the present study were fever (70.7%), followed by vomiting (52%), loose motion (46.7%) cough (46.7%) and loss of appetite or weight loss (30.7%).Other common presenting symptom were oedema (14.7%), abdominal distension (6.7%) and ear discharge (2.7%). Bernal et al. [19] and Bagga et al. [20] in their study also reported diarrhoea and fever as common presenting symptom. Ashraf et al. [7] also reported that diarrhoea (25.8%) and fever/vomiting (30.9%) were the common presenting symptom in malnourished children.

Most common co morbidity associated with PEM was

gastrointestinal (60%) followed by respiratory tract infection (52%), UTI (4%) and otitis media (2.7%). Other associated co-infection were tuberculosis (9.3%), dysentery (6.7%), measles (4%), HIV (4%) and malaria (1.3%), Sharma et al. [5] reported in his study that the incidence of malnutrition interlinked with infections was 4%. Diarrhoea and dysentery constitute majority of infections (about 50%) and second most common infection was recurrent upper and lower respiratory infection. Bernal et al. [19] reported that most common associated illness at admission was diarrhoea (68.4%), among these 31.5% were dehydrated. Diarrhoea and dysentery constitute majority of infection (50%) and second most common infection was respiratory tract infection. Vijakaram and Bhaskaran [21] in their study found a significant association between PEM and Tuberculosis. Thrustans et al. [22] reported that overall prevalence of HIV in severely malnourished patients is 21.6%. Malnutrition adversely affects the immune status of children and makes them more vulnerable to infections. In severely malnourished patients, both acquired immunity i.e. lymphocyte functions as well as innate host defence mechanisms i.e., macrophages and granulocytes are affected. Diminished immune functions render undernourished patients more susceptible to infections.

We found out that, Vitamin B deficiency was most common (40%) followed by Vitamin A (28%), Vitamin D (6.7%) and Vitamin C (1.3%) and most common deficiency sign were cheliosis, angular stomatitis and conjunctival xerosis . Chainani et al. [23] in their study compared different vitamin deficiency between malnourished and normally nourished children and observed prevalence of vitamin A deficiency in (15.7% v/s 1.8%), vitamin B in (7.6% v/s o.4%), vitamin D in (11.9% v/s 2%) and vitamin C in (1.1% v/s o %) children. Sharma et al. [24] also reported vitamin A deficiency in 8.7% and vitamin B in 32.5% of malnourished patients. Mathur et al. [25], Singh et al. [26], Choudhary et al. [27] and Chandna and Sehgal [28] also reported that angular stomatitis, xerosis of conjunctiva, cheliosis and glossitis were the most common vitamin deficiency sign. The different vitamins deficiency seen in SAM patients is because of lack of adequate nutritious food intake and the food which is taken have very low amount of vitamins and minerals making them deficient in the required vitamins.

In the present study, 85.3% patients were anaemic at the time of admission and out of them 10.9 % had mild, 59.3% had moderate and 29.7% had severe anaemia. Soni et al. [13] in their study reported that incidence of anaemia was 60% in malnourished children and among them majority (69.2%) of children had haemoglobin level between 5 gm/dl to 7 gm/dl. Anaemia in PEM has been attributed to a number of factors including nutritional deficiencies, infections, blood loss, haemolysis, and erythroid hypoplasia, ineffective erythropoiesis due to vitamin B12 and folic acid deficiency and adaptation to lower metabolic oxygen requirements.

There is general agreement that fasting blood glucose is lower in malnourished children then in recovered or normal children, though there is wide variation in the blood glucose levels in various studies. In the index study apart from anaemia, hypoglycaemia was detected in 21.3% cases having blood sugar less than 54mg/dl. Mild to moderate hypoglycaemia is quite common in cases of PEM which has no risk of mortality but symptomatic profound hypoglycaemia is life threatening and requires urgent treatment. Symptomatic hypoglycaemia is more common in marasmus where energy stores are depleted.

Breast milk is the best available food for infant and those who have been deprived of this, are expected to show a greater prevalence of malnutrition. We observed that only 9.3% patients had exclusive breast feeding up-to 5 month of age. Nearly 74.7% children were exclusively breast fed up-to two months of age. Mean duration of exclusive breast feeding was 2.6 ± 1.5 months. Likewise, Aneja et al. [8] reported in their study that among 155 children (6-12 months of age), nearly, 41% were exclusively breastfed for less than two months and only 20 % were exclusively breastfed till the age of 5-6 months. The mean weight of children who were exclusively breastfed for two months was 4.5 ± 3.9 kg as compared to 6.0 ± 4.5 kg for those who were exclusively breastfed for 6 months. Similarly, Mallik et al. [12] also reported that among the children less than two years, malnutrition was observed significantly more in those who were not exclusively breast fed than the children exclusively breast fed for 4- 6 months. This could be explained as breast milk is a complete source of all vitamins, proteins, fat and carbohydrate for the growing child and also decreases chances of infections in exclusively breast feed infants in the initial six month of age.

Out of 75 patients enrolled in the study, 21.3% children stopped breast feeding at the time of hospitalisation, among them 37.5% stopped before 6 months of age and another 43.7% were breast fed beyond 12 month of age. 78.7% children were still on breast feed at the time of hospitalisation and among them 40.7% of children were above 12 months of age. Singh et al. [10] conducted a study on infant feeding and weaning practices in the rural communities in Rajasthan and observed that only 23% of mothers initiated breast feeding within 24 hours of delivery and most mothers breast feed for at least 2 years. Similarly, Rasania and Sachdev [29] conducted a study to assess the nutritional status and breast feeding practices among children and observed that, the duration of breast feeding was found to be significantly associated with malnutrition ($p<0.05$). Duration of breast feeding showed indirect relation to the nutritional status, longer the duration of breast feeding beyond the age of 6 months, higher the prevalence and severity of malnutrition. Different studies found increase in mild to severe malnutrition in children who were breast fed during second year of life. Prolonged breast feeding may reduce the consumption of complementary foods without an equivalent increase in human milk intake, thereby, diminishing total energy intake. Hossain et al. [30] and Nube and Assenso-Okyere [31], while assessing the effect of prolonged breast feeding on the nutritional status, observed considerably lower nutritional status of children who continue to receive the breast milk up-to 2nd and 3rd year of life in comparison with fully weaned children in the same year.

Out of 75 patients of the present study, 30.7% patients were on breast feed only and yet not started weaning and among them 60.9% patients were above 9 months of age. Severity of malnutrition (PEM grade III & IV) was more (78.5%) in those patients who were on breast feed only above 9 months of age compared to those below 9 months of age (55.5%). Similarly, Nube and Assenso-Okyere [31] also observed that higher prevalence of malnutrition is associated with prolonged breast fed children because weaning is delayed or supplementary feeding is not given to these children at appropriate time. This

association of severe degree of malnutrition with prolonged breast-feeding is also in agreement with the findings of Jahan and Hassan [32] and Hossain et al. [33]. This study observations strengthen the view that breast feeding should be supplemented with complementary feeding after six month of age as nutrition and calorie requirements in these infants increases after six month which cannot be completed by exclusive breast feeding.

We observed in the present studythat 69.3% patients had started weaning at the time of hospitalization and among them 25% started before 6 months of age and another 40.7% after 9 months of age. Amongst these patients, 63.5% started semisolid to solid food along with top milk. It was observed that only 33.3% children were consuming semisolid to solid foods at 6 to 9 months of age and rest of patients started weaning after 9 months of age. 30.6% patients did not start weaning at the time of admission and among them 65.2% were above 9 months of age. Mean age of weaning was 8.4+3.9 months and mean age of starting semisolid and solid food was 11.6+3.53 months. Rasania and Sachdev [29] in their study reported that weaning was started at optimum age (4-6month) in 42.9% children, started early (<4month) in 24.5% and in rest it was delayed beyond 6 months of age. Severe malnutrition was significantly higher ($p<0.05$) in children where weaning was delayed. Likewise, Aneja et al. [8] in their study on urban slums children (age 6 to 12 months), observed that 82.0% children received top milk and among them about 68% children started receiving it when they were less than 6 months of age. It was also observed that only 47% children were consuming semi-solids at 6 to 7 months of age. Similarly, Singh et al. [10] also reported that only 24.7% of mothers introduced supplementary foods before 6 months of age and mean age of food supplementation initiation was 8.7 months. Delayed weaning is also detrimental to health. Prevalence of malnutrition was more in children where breast-feeding was continued for longer period, because as the age advances, breast milk remains inadequate for the children.

Apart from age of weaning, type of supplementary food and method of feeding are also important. In our study, we observed that 69.3% patients received top milk supplementation and most commonly used top milk was goat milk. The most common supplementary semisolid food given was Chapatti followed by Khichari. Common mode of feeding top milk was katori spoon (75%) followed by bottle (17.3%) and both katori spoon and bottle (7.7%). Aneja et al. [8] also reported that most common mode of feeding top milk was katori spoon (67.7%) followed by bottle (28.3%) and most common complimentary semisolid food was khichadi followed by rice. Rasania and Sachdev [29] also observed in their study that 65.8% of mothers were using bottle for feeding top milk and overall malnutrition prevalence was higher ($p<0.001$) in bottle fed children (83%) and most common supplementary foods were milk, rabadi, rice, and roti. Inspite of heavy efforts to stop bottle feeding in children, it is still prevalent to a large extent in community, so much so up-to 25%. This shows that more intensive measure have to be taken to eradicate it from community. Bottle fed children are more prone to get infection due to poor hygienic conditions of both bottle and nipple.The bottle feeding should not be encouraged in the society as this is very detrimental for infant health and makes the infant prone to various infections like diarrhoea and starts the vicious circle of PEM.

Conclusion

On the basis of this study, we conclude that the problem of severe malnutrition is multi-dimensional and inter-generational in nature. Prevalence of severe acute malnutrition is still high in community (6.4%) as well as in hospital setting (3.28%). The determinants of severe malnutrition includes household food insecurity, illiteracy, low socioeconomic status, lack of awareness to access health services, large family size and poor purchasing power etc. Besides these, faulty feeding practices, poor complementary feeding practices, ignorance about nutritional needs of infants and young children and repeated infections, also aggravates the malnutrition amongst children. So there is strong need to educate the parents, especially mothers about nutritive diets that they can prepare at home with available means or can be purchased from market at low cost . Apart from nutritional education, importance of breast feeding, time of weaning, birth spacing, family planning, immunisation and literacy, have to be realised to the parents. It is very important to communicate to the policy planners the urgency to address the problem of severe acute malnutrition.The policy planners should concentrate on adequate nutrition of the girl child because the malnourished mother give rise to malnourished and small for gestational age newborn and also this leads to early weaning from breast feeding and hence this vicious cycle of PEM continuous in the society. The other thing which should be focused is the proper follow up of these malnourished children and to see the adequate growth of these children's. The parents of these children's need to bre sensitized about the problem of their child and explained about the care needed. As the problem of PEM is seen mainly in low status population, hence they must be educated about the low cost and nutritious food.

Authorship Contribution Ship

RPN, MC, DS: Substantial contributions to the conception or design of the work and the acquisition, analysis, or interpretation of data for the work.

TN, AP, BDG, AP: Drafting the work or revising it critically for important intellectual content.

RPN, MC, DS, TN,AP, BDG, AP: Final approval of the version to be published.

RPN, MC, DS, TN, AP, BDG, AP: Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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