

## PREVALENCE OF OEDEMATOUS MALNUTRITION IN EARLY INFANCY

Ayesha Begum<sup>1</sup> Jhulan Das Sharma<sup>2</sup> Abul Kalam Azad<sup>3</sup> Nasir Uddin Mahmud<sup>3</sup> Mainuddin Ahmad<sup>4</sup>

### Summary

*Severe malnutrition is the most important child health problem of the developing world. In lieu that earlier view that nonoedematous malnutrition (marasmus) presents earlier than oedematous malnutrition (kwashiorkor) present study showed that oedematous malnutrition also appears in early infancy.*

*The objective of the study was to find out the prevalence of oedematous malnutrition in early infancy which can help early recognition and proper management of such patients.*

*This is a cross sectional study and was carried out in the Department of paediatrics, Chittagong Medical College Hospital from June, 2008 to May, 2009. Total fifty patients were included in this study. The study subjects were 0 to 1 year aged child suffering from severe malnutrition. A thorough physical examination was carried out after taking a detailed and careful history of every case. Weight was recorded by "Misaki" baby weighing scale and length was taken by infantometer. The degree of malnutrition was determined according to WHO criteria. Results were subjected to appropriate tests and were analyzed by SPSS program version 15.0.*

*The study reflected that 56% of edematous malnutrition patients developed oedema before 6 months of age. It revealed that there was no age specificity regarding development of severe PEM. The study observed that a few (22%) of severely malnourished infants developed typical hair change and only 20% developed typical skin change. A good number (46%) of studied patients showed normal appearance. In contrary to the classical view, oedematous malnutrition can occur in early infancy without inevitable association with skin changes, hair changes and mental changes.*

**Key words:** malnutrition; infancy; skin changes

### Introduction

Malnutrition is the single most important child health problem of the developing world. Malnutrition is the underlying factor in about 50 percent of under five deaths. In the developing world malnutrition is highest in South Asia. This disorder results from an array of interrelated factors including inappropriate feeding & care, inadequate sanitation, poor access to health service & limited knowledge of the benefits of exclusive breastfeeding and complimentary feeding practice<sup>1</sup>. Bangladesh has the highest rates of malnutrition in the world<sup>2</sup>.

In Bangladesh everyday around 900 children die of malnutrition that have a history of poor dietary intake in the earliest month of their life<sup>3</sup>. One third of the world's populations suffer from malnutrition<sup>4</sup>. In a one year period malnutrition causes 1 million death in children under the age of five. Global cost of malnutrition amounts to 19 billion dollar in lost work performance & related expenditure in adult<sup>5</sup>. Sixty eight percent of Bangladeshi children are malnourished and a third of all babies are born under weight<sup>6</sup>. More than half of all childhood deaths are associated with the malnutrition.

Girls are more at risk of malnutrition. Malnourished children are less likely to perform well in school<sup>7</sup>.

The severe malnutrition is currently classified into oedematous (Kwashiorkor and marasmic kwashiorkor) and non-oedematous (marasmus) malnutrition<sup>8</sup>. Literature review shows that marasmus usually present at a younger age than kwashiorkor often in child under one year of age and kwashiorkor is usually found in a child between 1 to 3 years of age<sup>9</sup>.

The three essential features of kwashiorkor are oedema, growth retardation and mental changes. The face looks puffy with psychological changes like apathy and an expression of misery. kwashiorkor follows occurrence of dysadaptation in a marasmic child<sup>10,12,19</sup>. Recently it is stated that kwashiorkor is a weaning disease and its age of onset depends on the local pattern of breastfeeding,

1. MD Student of Paediatrics  
Chittagong Medical College, Chittagong
2. Associate Professor of Paediatrics  
Chittagong Medical College, Chittagong
3. Assistant Professor of Paediatrics  
Chittagong Medical College, Chittagong
4. Associate Professor of Paediatrics  
Dhaka Medical Collage, Dhaka

**Correspondence :** Dr Ayesha Begum

time of introduction of non milk diet and cessation of lactation<sup>11</sup>. However published evidences in favour of our study are scanty and we believe that a pattern of clinical presentation associated with severe PEM is showing a changing trend<sup>20</sup>.

Our recent clinical observation is that severe PEM patients presents in substantial number with nutritional oedema at a very early infancy without any other classical manifestations of kwashiorkor, for example without hepatomegaly or skin manifestation. Oedematous malnutrition patients presents with normal appearance instead of classical apathetic or misery look. From our observation oedematous malnutrition patient present with oedema even without significant classical dermatoses and hair changes. Mothers of these babies are not concerned about their oedematous children. Oedematous malnutrition is a medical emergency. In different literatures these oedematous malnutrition patients have been termed 'Sugar baby', Barley baby, etc.

The health workers and caregivers should know about these changing presentations of severe PEM particularly of oedematous malnutrition in infants. As such these infants with severe PEM will be picked up, early diagnosed and treated accordingly, leading to reduction in morbidity and mortality. The delay of early diagnosis for misleading clinical features of severe PEM results in increasing morbidity & mortality. If our recent clinical observations about these changing presentations of edematous malnutrition (kwashiorkor and marasmic kwashiorkor) are scientifically proved, we will be able to create awareness and knowledge of children in developing countries like Bangladesh.

#### Materials and methods

**Study design:** It is a cross sectional study.

**Place of study:** The study was carried out in the pediatric unit of Chittagong Medical College Hospital.

**Period of study:** From June 2008 to May 2009.

**Study population:** Study population were selected from severe protein energy malnutrition (PEM) patients including both kwashiorkor and marasmic kwashiorkor patients admitted in the pediatric unit of Chittagong Medical College Hospital.

**Sampling technique:** Sample was selected by non-probability convenience sampling technique.

**Research instrument:** Case record form.

**Sample size :** Sample size was 50 in number.

**Inclusion criteria:**

1. Oedematous malnourished cases with WHO defined criteria like-

(a) Wt/Ht -, <70%(-3SD) of NCHS median

(b) Ht/Age -<85%(-3SD) of NCHS median

(c) Bilateral pedal oedema.

2. Age- 0 to 1 year of either sex.

**Exclusion criteria:**

1. Patients with secondary malnutrition.

2. Patients with oedema due to other disease like CCF, nephrotic syndrome, cirrhosis of liver etc.

#### Data collection procedure

Infants with severe PEM as per WHO classification, were studied among the admitted patients consecutively between June 2008 to May 2009 in the pediatric unit and nutrition block of Chittagong Medical College Hospital. A semi-structured questionnaire was prepared which included age, sex, nutritional status, immunization history, medical, familial, socio-economic, feeding histories. These histories were taken by interview with the mother. A written consent was taken from the parents. A thorough physical examination and anthropometry was done. Weight was measured with Misaki baby weighing scale with precision of 50 gm and length was measured with locally constructed wooden board (infantometer).

Reference standard was taken as 50th centile of national center for health statistics (NCHS). Clinical varieties were noted according to WHO classification<sup>8</sup>. Immunization history was noted according to EPI schedule. Information was taken about rejection of clostrum, duration of breast feeding, exclusive breast feeding, weaning time & type of weaning diet. Parents occupation, monthly income, single parent condition, death of parent, family disharmony were also noted. Only those skin lesions characteristics of malnutrition flaky paint, crazy pavement, ulcer and fissures were considered as dermatosis of malnutrition.

Other skin problems like scabies, impetigo etc were not be included in characteristics skin change.

Previous status of health of the patient was known from the mother with great care.

Statistical analysis: Data was presented as the percentage of total number of observations. SPSS version-15.0 was used for the analysis of data and appropriate tests were used for statistical significance. The value was considered significant if the P value is < 0.05.

**Results**

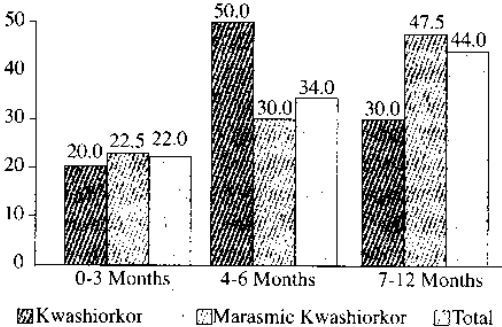
Fifty hospitalized oedematous malnutrition patients were studied. All of them were infant. They were divided into three groups. Group 1 included patients from 0 to 3 months. Group 2 included patients from 4 months to 6 months. Group 3 included patients from 7 months to 12 months. Among them 10 were kwashiorkor and 40 were marasmic kwashiorkor cases.

**Table I(a) :** Age distribution of the study subjects (n = 50)

Age groups	Clinical diagnosis					
	Kwashiorkor		Marasmic Kwashiorkor		Total	
	n	%	n	%	n	%
0 to 3 Months	02	20.0	09	22.5	11	22.0
4 to 6 Months	05	50.0	12	30.0	17	34.0
7 to 12 Months	03	30.0	19	47.5	22	44.0
Total	10	100.0	40	100.0	50	100.0

**Table I (b) :** Age distribution of the study groups (with t-test significance)

Study Groups	n	Range (months)	Mean ± SD (months)	Sign
Kwashiorkor	10	1.5-12	5.95 ± 3.17	P > 0.05
Marasmic Kwashiorkor	40	1.5-12	6.72 ± 3.14	
Total	50	1.5-12	6.57 ± 3.13	NS



**Fig 1 :** Distribution of age in the study groups

Table I & Fig 1 show the age distribution of studied patients. These show that Kwashiorkor developed within 0 to 3 months in 02 (20%) cases, within 4 to

6 months in 05 (50%) cases, within 7 to 12 months in 03 (30%) cases. Marasmic Kwashiorkor developed within 0 to 3 months in 09 (22.5%) cases, within 4 to 6 months in 12 (30%) cases, within 7 to 12 months in 19 (47.5%) cases. This table shows that 21(52.5%) out of 40 marasmic kwashiorkor patients and 07 (70%) out of 10 kwashiorkor patients developed oedema before 6 months., although the classical view is that oedematous malnutrition prevails late in infancy 1 to 3 years. It is not statistically significant (p>.05). It shows that there is no significant age specificity for the development of marasmic kwashiorkor and kwashiorkor.

**Table II :** Sex distribution of the study subjects (n=50)

Sex	Clinical diagnosis					
	Kwashiorkor		Marasmic Kwashiorkor		Total	
	n	%	n	%	n	%
Male	06	60.0	26	65.0	32	64.0
Female	04	40.0	14	35.0	18	36.0
Total	10	100.0	40	100.0	50	100.0

Table II shows the sex distribution of studied patients. The patients were selected from either sex. These show that of the marasmic kwashiorkor 26 (65%) were male, 14(35%) were female, of the kwashiorkor patients 06 (60%) were male, 04 (40%) were female. The study shows that in the oedematous group, patients are predominantly male.

**Table III :** Statistics of breast-feeding history among the study groups (with t-test significance)

Duration of Exclusive Breast Feeding	Study Groups	n	Range (months)	Mean ± SD (months)	Sign
	Kwashiorkor	10	1-6	2.65 ± 1.83	P > 0.05
Marasmic Kwashiorkor	40	1-6	1.55 ± 1.70		
Total	50	1-6	1.77 ± 1.76	NS	

Total Duration of Breast Feeding	Study Groups	n	Range (months)	Mean ± SD (months)	Sign
	Kwashiorkor	10	1-6	2.95 ± 1.95	P > 0.05
Marasmic Kwashiorkor	40	1-12	3.70 ± 3.49		
Total	50	1-12	3.55 ± 3.24	NS	

Table III shows that the duration of breast-feeding among the studied cases. It is shown that only 11(23.9%) babies got breast milk for 4-6 months duration. Breast-feeding was beyond 6 months in 07(15.2%) cases and discontinued by 4 months in 28(60.9%) cases.

**Table IV:** Age of introduction of complimentary feeding in the study subjects (n = 50)

Introduction of complimentary feeding	Clinical diagnosis				Total	
	Kwashiorkor		Marasmic Kwashiorkor		n	%
	n	%	n	%		
Within 3 Months	06	60.0	34	85.0	40	80.0
4 to 6 Months	03	30.0	04	10.0	07	14.0
Beyond 6 Months	01	10.0	02	5.0	03	6.0
Total	10	100.0	40	100.0	50	100.0

Table IV shows age of introduction of complimentary feeding in studied severe PEM cases. These show that weaning was introduced within 3 months in 40(80%) cases, within 4 to 6 months in 07(14%) cases, and beyond 6 months in 03(6%) cases.

**Table V:** Distribution of mental status among study subjects (n = 50)

Mental status	Clinical diagnosis				Total	
	Kwashiorkor		Marasmic Kwashiorkor		n	%
	n	%	n	%		
Normal	05	50.0	18	45.0	23	46.0
Apathy	03	30.0	13	32.5	16	32.0
Irritable	02	20.0	09	22.5	11	22.0
Total	10	100.0	40	100.0	50	100.0

Table V shows that 13(32.5%) & 03(30%) of marasmic kwashiorkor & kwashiorkor patients respectively developed apathy; 09(22.5%) & 02(20%) marasmic kwashiorkor & kwashiorkor patients respectively developed irritability; 18(45%) & 05 (50%) of marasmic kwashiorkor & kwashiorkor patients respectively had normal appearance rather than the classical appearance of oedematous malnutrition like apathy, fretfulness, misery etc. It was not statistically significant ( $p>.05$ ). The study reveals that traditional view of apathetic / fretful mental state of oedematous malnourished patients is not inevitable.

**Table VI:** Distribution of skin changes among study subjects (n = 50)

Skin change	Clinical diagnosis				Total	
	Kwashiorkor		Marasmic Kwashiorkor		n	%
	n	%	n	%		
Present	03	30.0	07	17.5	10	20.0
Absent	07	70.0	33	82.5	40	80.0
Total	10	100.0	40	100.0	50	100.0

Table VI show that 07 (17%) of 40 marasmic kwashiorkor & 03(30%) of 10 kwashiorkor patients developed skin changes. It was not statistically significant ( $p>.05$ ). The study shows that only a few (20%) of the severely malnourished infants developed characteristic skin change.

**Table VII:** Distribution of hair changes among study subjects (n = 50)

Hair change	Clinical diagnosis				Total	
	Kwashiorkor		Marasmic Kwashiorkor		n	%
	n	%	n	%		
Present	03	30.0	08	20.0	11	22.0
Absent	07	70.0	32	80.0	39	78.0

Table VII shows that 08(20%) of marasmic kwashiorkor patients and 03(30%) of kwashiorkor patients developed hair change. The result is not statistically significant ( $p>.05$ ). The study shows that only a few (22%) of the severely malnourished infants developed typical hair change.

## Discussion

Severe malnutrition is the most important child health problem of the developing world<sup>1</sup>. Bangladesh has one of the highest rates of malnutrition in the world. Sixty eight percent of Bangladeshi children suffer from different grades of malnutrition.<sup>6</sup> Forty five percent of the children under five years of age suffer from chronic malnutrition while 10.5% are acutely malnourished<sup>14</sup>. Malnutrition contributes to half of the childhood deaths<sup>15</sup>. Eight million or 48% of Bangladeshi children of the under five age group are under weight<sup>15</sup>.

Fifty infants who were suffering from severe malnutrition & admitted in the pediatric unit of Chittagong Medical College Hospital during the period of June 2008 to May 2009 were studied. In this study group 11 patients (22%) presented with oedema before 3 months of age and 28 patients (56%) developed oedema by 6 months (Table no.Ia). Although the classical view is that oedematous malnutrition develops between 1 to 3 years of life, the study revealed that there was no age specificity regarding development of severe PEM. Kwashiorkor is a weanling disease and its age of onset depends on the local pattern of breast-feeding, time of introduction of non-milk diet and cessation of lactation<sup>11</sup>. It was observed from previous studies that age is one of the most significant determinants

of child nutrition. The younger children had significantly higher rates of development of severe malnutrition than the children aged 2 years or older<sup>16</sup>. In kwashiorkor mortality tends to increase as the age of onset comes down<sup>17</sup>. Infants aged less than 6 months are an unique group due to their particular feeding needs (exclusive breast feeding is the norm), physiological and developmental differences from older children, vulnerability to a different group of pathologic conditions and increased mortality risk compared to older children. All infants less than 6 months are not the same; a 1 month old is very different from a 5 months old. The first 6 months age is part of a larger, critical period within which the impact of malnutrition has both immediate and long-term adverse consequences<sup>18</sup>.

More males were found among the severely malnourished admitted children in this study. It might be due to the fact that parents were more concerned about their male children and brought them to hospital more frequently. It was observed from other study that a higher proportion of female children suffered from severe malnutrition<sup>16</sup>.

Our study revealed that among the oedematous malnutrition patients (no-50) a good number 23 (46%) had normal appearance rather than the classical appearance of oedematous malnutrition like apathy, fretfulness, misery etc. In our study we observed that a few 11(22%) of severely malnourished infants had typical hair change. It is a changing trend in the clinical presentation of severe PEM in comparison with the classical discussions.

The study also had shown that typical skin change of malnutrition was present in a few that is 20% of severely malnourished patients. It is also a change in comparison to classical presentation of PEM where oedematous malnutrition patients present late in infancy with mental change like apathy, irritability, typical skin & hair changes.

The duration of breast-feeding up to 4 to 6 months was alarmingly low and was observed in only 11 cases (23.9%). In majority of cases (80%) the introduction of solid food was either too early or unduly delayed. Early introduction of solid food was mostly low energy density food like rice paste, barley, suji etc. which is associated with malnutrition.

The nutritional status of the studied patients were observed through objective assessment methods, the average weight for age was 51.92% of NCHS mean,

weight for length was 80.34% of NCHS mean, and length for age was 84.24% of NCHS mean. Thus the study shows that the patients were suffering from chronic severe malnutrition. Severe malnutrition is a life threatening condition requiring urgent treatment.

#### **Limitations of the study**

This was a limited study in a small population of cases with limited resources and time. Further multi-centered community based controlled trials will add to our knowledge regarding changing trend of presentation of oedematous malnutrition in infancy.

#### **Conclusion**

Our results suggest that oedematous malnutrition can occur in early infancy in a substantial number of cases with normal mental status and insignificant skin and hair change. In lieu of early views, this observation of changing pattern in the clinical presentation of oedematous malnutrition in infancy will help us to create awareness about the oedematous malnutrition, so that they can be diagnosed early. Thus appropriate measures can be taken to reduce the unchanged and unexpected high mortality of severe PEM in developing countries like Bangladesh.

#### **Disclosure**

All the authors declared no competing interests.

#### **References**

1. State of the world children 2008; UNICEF, New York NY 10017, USA
2. UNICEF .The Asian Enigma. The cycle of malnutrition: The determining factor for Bangladesh. The Hunger project, NY 10003, 2008
3. Siyan Y. Nine hundred children die of malnutrition per day in Bangladesh. News chinaview 2008; 14: 37
4. Nutrition improvement.com- malnutrition facts and figures. GAINS, 2006
5. Deaths of severely malnourished children. Science Daily 2006
6. Socioeconomic inequities in childhood malnutrition in Bangladesh. ICDDRB publication 2003; 1: 1-4
7. Malnutrition-programmers for mother and child nutrition-Health education to villages. A report card on nutrition India.gov. in 2008

8. World Health Organization: Management of severe malnutrition: A manual for physicians and other senior health care workers, Geneva, 1999
9. Heird WC. Food insecurity hunger and undernutrition. In Nelson Textbook of Pediatrics, 18th edn. Eds. Behrman Re, Kliegman RM, Jenson HM. Philadelphia, WB Saunders Co. 2007; 225-232
10. Ghai OP Nutrition and macronutrient disorder. Essential pediatrics, 6th edn, 2005, New Delhi, interprint. 105-107
11. Wharltton BA & Weaver LT. Nutrition, in Forfar & Arneil's Text book of paediatrics, 5th edition; Churchill livingstone 1998; 1192-1193
12. Gupta S. Protein energy malnutrition. The short textbook of pediatrics, 11th edn. Jaypee Bros. 2009; 129-154
13. WHO, UNICEF, Community based management of severe acute malnutrition. World Food Programme 2007
14. Rayhan Israt. Khan Sekander. Factors Causing Malnutrition Among Under Five Children in Bangladesh. Asian Network for Scientific Information, 2006
15. Child and women suffer severe malnutrition in Bangladesh. IRIN. 2008
16. Use of MUAC for evaluation of Nutritional status of Children and for Identification of High-risk Groups for malnutrition in Rural Bangladesh. 2000; 18: 171-180
17. Scheinfeld Noah. Protein Energy Malnutrition. New York, 2008
18. Management of Acute malnutrition In Infants (MAMI) Project. Summary report 2009
19. Waterlow JC. A note on the assessment and classification of protein energy malnutrition on children. Lancet 1973; 2: 87-89
20. Islam MN. Changing clinical presentation of severe protein energy malnutrition in infants, Bangladesh Institute of Child Health, Dhaka, 2000; 69