

# Study of clinical profile, complications and outcome of protein energy malnutrition in children between 6 months to 5 years of age

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## ABSTRACT:

**BACKGROUND:** Malnutrition, in all its forms, includes undernutrition (wasting, stunting, underweight), inadequate vitamins or minerals, overweight, obesity, and resulting diet-related noncommunicable diseases. Globally in 2020, 149 million children under 5 were estimated to be stunted (too short for age), 45 million were estimated to be wasted (too thin for height).

**METHODOLOGY:** It was a prospective observational study conducted in Pediatric outpatient and inpatient department. Pediatric patients in the age range of 6 months to 5 years were included in the study. Detailed history was taken including onset, duration, and progress of the chief complaints. Data was analysed in IBM SPSSv26.

**RESULTS:** Most common affected age group was between 1 to 3 years. Majority cases had wasting. Most common type of PEM according to Wellcome trust classification was marasmus. Survival rate was 86%.

**KEYWORDS:** Protein energy Malnutrition, clinical profile, complications, Survival

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## I. Introduction:

Protein-energy malnutrition is a nutritional deficiency resulting from either inadequate energy (caloric) or protein intake and manifesting in either marasmus or kwashiorkor. <sup>[1]</sup> Marasmus is characterized by wasting of body tissues, particularly muscles and subcutaneous fat, and is usually a result of severe restrictions in energy intake. <sup>[1,2]</sup> Kwashiorkor affects mainly children, is characterized by edema (particularly ascites), and is usually the result of severe restrictions in protein intake. However, both types can be present simultaneously (marasmic-kwashiorkor) and mask malnutrition due to the presence of edema. <sup>[3]</sup>

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”. <sup>[4]</sup> It is a major public health problem in India. It affects particularly the preschool children (<6 years) with its dire consequences ranging from physical to cognitive growth and susceptibility to infection. This affects the child at the most crucial period of time of development which can lead to permanent impairment in later life. <sup>[5]</sup> PEM contributes to 1 million child deaths every year. According to the recent data for NFHS-V, under-nutrition, wasting and stunting is that there are about 132 million under-five children and amongst them 8.1 million are suffering from severe malnutrition. <sup>[6]</sup>

The prevention of malnutrition is must. Investing in prevention is critical. <sup>[7]</sup> Severe acute malnutrition occurs mainly in families that have limited access to nutritious food and are living in unhygienic conditions, which increase the risk of repeated infections. <sup>[8]</sup> Preventive interventions can include: improving access to high-quality foods and to health care; improving nutrition and health knowledge and practices; effectively promoting exclusive breastfeeding for the first six months of a child's life where appropriate; promoting improved complementary feeding practices for all children aged 6–24 months — with a focus on ensuring access to age-appropriate complementary foods (where possible using locally available foods); and improving water and sanitation systems and hygiene practices to protect children against communicable diseases. <sup>[9-15]</sup> Our study has aimed to aid in developing a preventive intervention to improve protein energy malnutrition conditions in India.

## II. Materials And Methods

It was a prospective observational study conducted in Pediatric outpatient and inpatient department in Government Medical College and Hospital, from December 2019 to November 2021. Institutional ethics

committee approval was acquired before starting the study. Pediatric patients in the age range of 6 months to 5 years with protein energy malnutrition (PEM) as per WHO criteria were included in the study. Children with age more than 5 years and patients with chronic diseases like congenital heart disease (CHD), chronic kidney disease (CKD), Chronic Hepatitis, etc. were excluded from the study.

Detailed history was taken including onset, duration, and progress of the chief complaints. Patient's calorie and protein requirement and deficit was calculated. Demographic details of the patients like socio economic status according to modified Kuppuswamy's scale, education of mother was taken. Birth history, breast-feeding history, weaning history, and birth order of the child. Anthropometric measures including weight, height, mid-upper arm circumference, head circumference, Chest circumference, Upper segment/ Lower segment ratio, Weight for height, Height for age were recorded. The patients were assessed accordingly and the type of PEM was diagnosed as per WHO classification. Clinical examination was done in all patients and recorded on a case report form. The complications of protein energy malnutrition were noted.

Treatment was given according to WHO protocol as per the patient's need. The treatment was instituted as early as possible. Intravenous fluids and oxygen support were given as per requirement. We also treated hypoglycemia and hypothermia. Hydration status was assessed and dehydration was corrected. Associated electrolyte imbalance was treated and antibiotics were given as per the need. Micronutrient deficiencies like vitamin and iron deficiencies were treated. After stabilizing the child, we started cautious intra gastric or 'vati-spoon' feeding. We treated all types of malnutrition as per WHO classification. For all patients we gave sensory stimulation and emotional support. All complications were noted in all the patients and treated accordingly. Outcome was reported as death or discharge

### III. Results:

A total 154 patients were included in the study. Most common affected age group was between 1 to 3 years- 97 patients (62.99%), followed by 3 to 5 years- 43 patients (27.92%), followed by 6 months to 1 years- 14 patients (9.09%). There was a male preponderance with 82 (53.24%) patients being male in our study group and 72 (46.63%) were female, with male to female ratio- 1.14:1. Majority of patients, 73 (47.4%) had not completed their immunization, 36 patients (23.37%) were completely immunized and 45 patients (29.22%) were unimmunized. Majority of patients had fever, in 82 cases (53.25%), followed by diarrhoea in 71 cases (46.10%), respiratory distress in 68 cases (44.16%). Pallor was seen in 142 cases (92.21%), followed by hair changes in 126 cases (81.82%), and knuckle pigmentation in 67 cases (43.51%). [Table 1]

**Table 1: Demographic and clinical profile of the patients**

PARAMETERS	Total no. of patients (N)	Percentage (%)
<b>AGE (in months)</b>		
6 months to 1 year	14	9.09
1 to 3 years	97	62.99
3 to 5 years	43	27.92
<b>GENDER</b>		
Male	82	53.24
Female	72	46.75
<b>IMMUNISATION</b>		
Complete	36	23.37
Incomplete	73	47.40
Unimmunised	45	29.22
<b>SYMPTOMS</b>		
Fever	82	53.25%
Cough/ Cold	54	35.06%
Respiratory Distress	68	44.16%
Diarrhoea	71	46.10%
Vomiting	28	18.18
Lethargy	18	11.69
Dysuria	52	33.77
<b>SIGNS</b>		
Pallor	142	92.21
Hair Changes	126	81.82
Visible wasting	66	42.86
Bitots Spot	50	32.47
Angular Cheilitis/ Stomatitis	47	30.52
Features Of Rickets	42	27.77
Knuckle Pigmentation	67	43.51
Skin Changes	42	27.27
Nail Changes	41	26.62
Edema	30	19.48
Skin Infections	19	12.34
Signs Of Dehydration	41	26.62

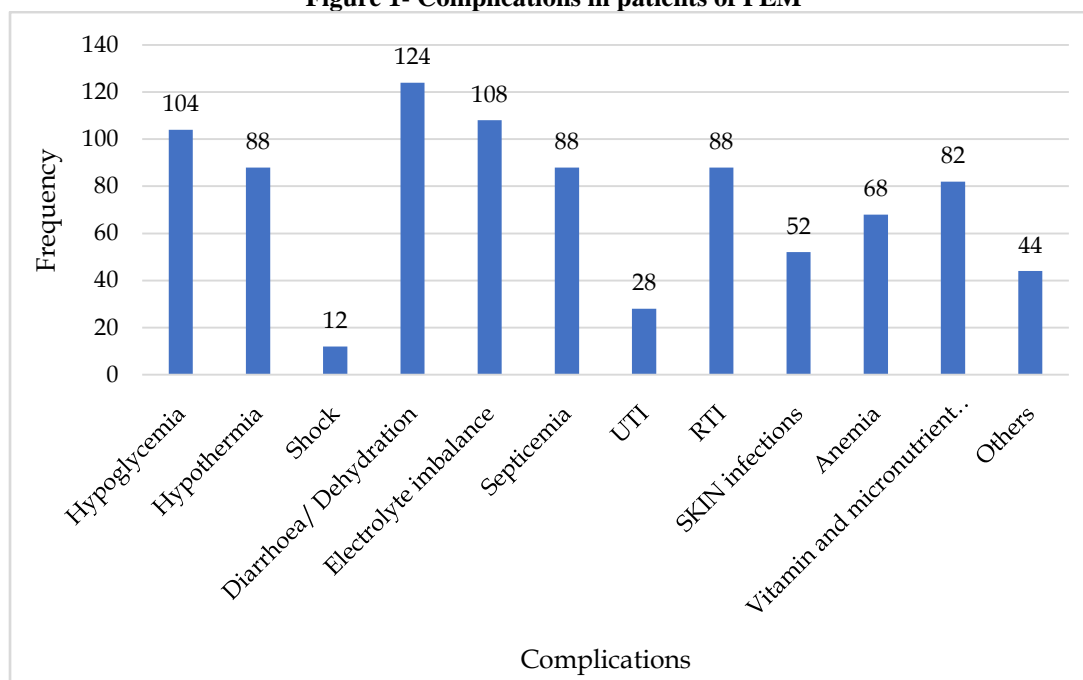
Pallor	142	92.21
Hair Changes	126	81.82
Visible wasting	66	42.86

**Table 2: Distribution of patients according to classification**

CLASSIFICATION	Total no. of patients (N)	Percentage (%)
<b>WHO CLASSIFICATION OF MALNUTRITION (&lt; -2 S.D.)</b>		
Stunting (Height-for-age)	48	31.16
Wasting (Weight-for-height)	142	92.20
<b>WELLCOME TRUST CLASSIFICATION OF PEM</b>		
Marasmus	66	42.86
Kwashiorkor	20	12.99
Marasmic-kwashiorkor	30	19.48
Undernutrition	38	24.68

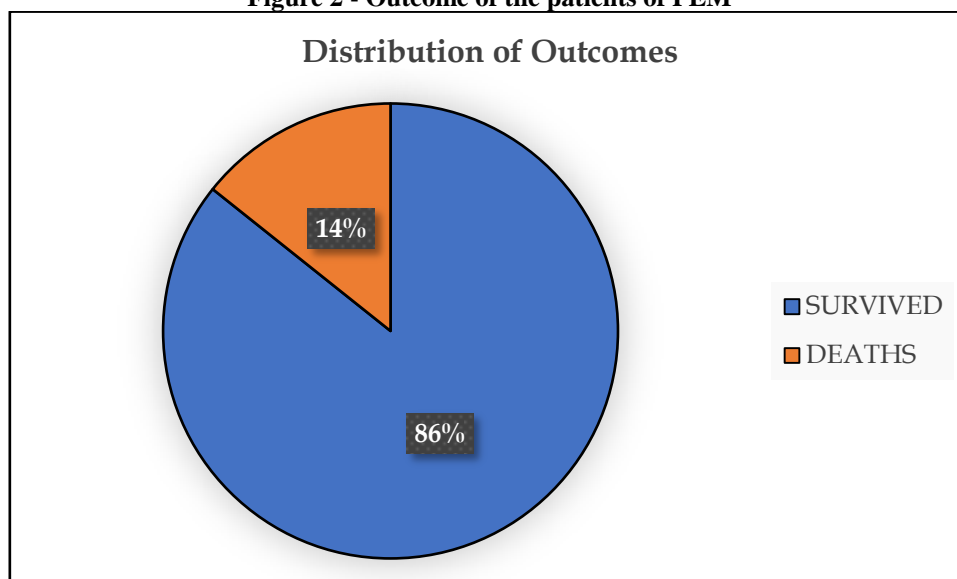
In this study, majority cases had wasting (weight-for-height) in 142 cases (92.2%) and stunting (Height-for-age) was seen in 48 cases (31.16%). Most common type of PEM according to Wellcome trust classification was marasmus in 66 cases (42.86%) followed by undernutrition in 38 cases (24.68%), marasmic-kwashiorkor in 30 cases (19.48%), and Kwashiorkor in 20 cases (12.99%). [Table 2]

**Figure 1- Complications in patients of PEM**



In the present study, majority of patients had diarrhoea and dehydration, noted in 124 cases (80.52%), followed by electrolyte imbalance in 108 cases (70.13%), followed by hypoglycemia in 104 cases (67.53%).

**Figure 2 - Outcome of the patients of PEM**



In this study, majority patients survived, 132 cases (85.71%), and 22 patients (14.29%) died due to PEM and its complications

#### IV. Discussion:

This study was a hospital based prospective observational study of 154 patients with malnutrition. In present study most common age group affected was between 1 to 3 years which was 97 (62.99%) patients followed by 3 to 5 years with 43 (27.92%) patients In contrast to our findings, a study done by Ansuya et al<sup>(95)</sup> (2018) (N=572) found that majority of the undernourished cases belongs to the age group of 3-4 years (45.8%).<sup>[16]</sup>In present study, we noted male preponderance with 82 (53.24%) patients being males and 72 (40.63%) were females with male to female ratio 1.14:1 Similar findings were reported by Gabre et al (2019) (N=486), among the children participated in this study, there was a male preponderance with 476 (56.7%) males and 364 (43.3%) females. In present study majority were found to be incompletely immunized for age which were 73 (47.4%) patients, followed by completely unimmunized for age which were 45 (29.22%) patients and immunized group of 36 (23.37%) patients. In a similar study done by Gabre et al (2019) (N=486), Syed Tariq et al<sup>(100)</sup> (2015), Mishra et al (2014), found that majority of severely malnourished children are incompletely immunized for age (62.3%) which was comparable with our present study.<sup>(18)</sup>

Most common symptom was fever 82 cases (53.25%), followed by diarrhoea in 71 cases (46.10%), respiratory distress in 68 cases (44.16%), followed by cough and cold in 54 cases (35.06%). In a study conducted by Rinki H et al<sup>(19)</sup> (2014) had similar findings that majority of patients presented with complaints of fever in 65%, followed by loose stools in 40%. In contrast, Study conducted by Bharti Bhandari et al<sup>(20)</sup> (2016) (N=140) noted that most common complaint among undernourished children were loose stools in 50.3%, followed by respiratory complaints in 6.5%. The higher prevalence of diarrheal diseases in their study can be attributed to the fact that study was conducted at rural hospital in Gorakhpur. In our study, most common sign was pallor in 142 cases (92.21%), followed by hair changes in 126 cases (81.82%), knuckle pigmentation in 67 cases (43.51%), Bitots spots in 50 cases (32.47%) and angular cheilitis / stomatitis in 47 cases (30.52%). Similar findings were reported by Hamer et al (2021) with pallor being the most common sign (42.2%). In contrast, a study by Musimwa et al (2016), reported that the clinical picture of malnourished children was dominated by cough and / or pneumonia in 42.50%. This difference might be due to different geographical area and population under the study.<sup>(21)</sup>

In our study majority cases had wasting (weight-for-height<-3 S.D.) in 142 cases (92.2%) and stunting (Height-for-age) was seen in 48 cases (31.16%). Similar findings were reported by Joshi et al (2011), majority of patients had moderate wasting (45.49%), followed by severe wasting (38.3%), followed by moderate stunting (14.86%) and severe stunting (1.35%). In contrast, study by Gabre et al (2019) (N=486), The analysis of the three anthropometric indices revealed that the prevalence of wasting, stunting, and underweight were 16.2%, 24.8%, and 43.1%, respectively.<sup>(16)</sup> Moreover, the prevalence of severe wasting, stunting, and underweight among the children was 5.7%, 16.7%, and 13.1%, respectively. The high prevalence of stunting more than wasting might be due to different geographical area, which was Ethiopia. In our study, most common type of PEM according to Wellcome trust classification was marasmus in 66 cases (42.86%). Similar findings were reported by Ibrahim et al (2020), there were 70 (56.9%) cases of marasmus.<sup>(22)</sup>

In present study, the most common complication was diarrhoea noted in 124 cases (80.52%). In a study done by Syed Tariq et al<sup>(23)</sup> (2015) had similar findings with most common complication being diarrhea with dehydration (30.1%). In contrast, study done by Alexandre et al<sup>(24)</sup>, reported that the most common complication was respiratory tract infections (36.6%) followed by diarrhea (31%). This might be due to the fact that the majority of patients with PEM belonged to age group of less than or equal to 6 months and it was conducted in 201 patients in Chile. In present study out of 154 patients 132 patients (85.71%) survived and 22 patients (14.29%) expired. In a similar study, Eman Ramadan Ghazawy et al<sup>(25)</sup> (2020) noted that survival rate was 91.4% and death rate during hospitalization among under nourished children was 8.6%. In contrast, Syed Tariq et al<sup>(26)</sup>, noted that the discharge rate was 75.3% and mortality rate was 24.7%. The higher death rate might be attributed to the inclusion of PEM patients with failure to thrive and other complications.

## V. Conclusion:

Majority of patients of protein energy malnutrition were seen in age group of 1-3 years, with a male preponderance. Majority patients were found to be incompletely immunized for age. Most common symptom was fever and most common sign was pallor. In these PEM case, majority of the patients had wasting. Most common complication was diarrhoea and dehydration. Survival rate was 86% and mortality rate was 14%.

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