



ORIGINAL ARTICLE

AETIOLOGICAL FACTORS OF GRADE-III PROTEIN-CALORIE MALNUTRITION AMONG ADMITTED CHILDREN IN A TERTIARY CARE HOSPITAL

Saima Gillani, Tahniat Shakeel, Darakhshanda Nawaz, Muhammad Ali Raza,
Saad Hussain*, Muhammad Sohail Khan

Department of Paediatrics, Ayub Medical College, Abbottabad, *Department of Medicine, Fauji Foundation Hospital, Mansehra, Pakistan

Background: Aetiological factors of Protein-Calorie-Malnutrition (PCM) in underdeveloped countries are an established fact. An increase in number of children with grade-III PCM secondary to myriad of reasons has been noted recently. This study aimed to recognize the aetiological factors of grade-III PCM among admitted patients of grade-III PCM in Ayub teaching hospital Abbottabad. **Methods:** Severe acutely malnourished (SAM) children 6–60 months of age were selected following non probability random sampling technique. The chosen patients were selected according to WHO criteria of PCM grade-III. Primary data was collected from patients admitted to inpatient facility, on a questionnaire from patients whose anthropometric measurements fell under the criteria of severe acute malnutrition (SAM) by WHO during their hospital stay. **Results:** Higher number of SAM children was due to reversible aetiological factors like inaccessible food, inadequate breast-feeding and weaning practices, and improper food choices for weaning, illiteracy, ignorance, poor sanitation and large family sizes that led to SAM. From 100 patients (52 males), primary malnutrition was the most common cause for grade -III PCM present in 45 patients (23 females). **Conclusion:** Primary malnutrition was the main aetiological factor for grade-III PCM, more common among females, perhaps due to cultural issues in our region. It was also the main contributing cause in the toddler age group.

Keywords: Grade-III PCM, Severe acute malnutrition, SAM, primary PCM

Pak J Physiol 2023;19(4):39-41

INTRODUCTION

WHO reported 47 million children <5 years of age who are wasted. Of these, 13.6 million children suffer from severe wasting, this being the cause of 1 in 5 deaths in age group <5 years hence making it one of a top threat to child survival.¹ Data from Pakistan reports that within the age group <5 years, 4 out of 10 children are stunted and 17.7% suffer wasting. Approximately 1 of 3 children were reported underweight (28.9%). Malnourished children, especially those with severe acute malnutrition (SAM) face higher death risk from ordinary childhood illnesses such as diarrhoea, pneumonia and malaria. Severely wasted child is at 11 times more risk as compared to a healthy child to die of common childhood illnesses such as pneumonia. PCM related factors contribute to about 45% of deaths in children <5 years of age.¹⁻³ PCM also called protein-energy malnutrition or PEM occurs when a child doesn't eat enough protein and energy (measured by calories) to meet nutritional needs. PCM most often occurs when both a child's calorie and protein intake are inadequate and sometime becomes potentially life-threatening disorder. Malnutrition in developed countries is unfortunately still more common in situations of poverty, social isolation and substance misuse. Poverty, family instability, poor environmental sanitation, faulty weaning practices, illiteracy, ignorance, large family size and preventable infections

are the main factors responsible for malnutrition.⁴⁻⁶ This study aimed to recognize the aetiological factors of grade-III PCM among admitted patients of grade-III PCM in Ayub teaching hospital Abbottabad.

MATERIAL AND METHODS

This study was conducted in Paediatric B Ward of Ayub Teaching Hospital, Abbottabad from October 2021 to September 2022. After approval of the study from Institutional Review Board of Ayub Teaching Hospital, data was gathered on self-designed proforma after informed written consent from parent/attendant of each participant. One hundred of severe acutely malnourished children between 6 and 60 months of age were included following non-probability random sampling technique. The chosen patients were selected according to WHO criteria of PCM grade-III. Data was collected from patients admitted to inpatient facility on a questionnaire to collect information from patients who were under 60 months old and whose anthropometric measurements fell under the criteria of severe acute malnutrition by WHO¹ during their hospital stay.

Anthropometric measurements included weight (Kg), Height/Length (Cm). Children with Weight for Height (z score <-3SD), and mid upper arm circumference (MUAC) less than 11.5 Cm were included. History was taken from parent/guardian regarding age, gender, birth weight, birth order, age at

the time of weaning, number of meals offered, cause of malnutrition, previous hospitalizations and their underlying cause. History regarding primary caretaker and their socioeconomic status was also included.

Causes of malnutrition were further classified into 7 broad categories including primary malnutrition, low socioeconomic status, and chronic diseases like celiac disease, metabolic disorders, cerebral palsy, syndromes and others. Effect of malnutrition in the form of recurrent infections and compromise on quality of life was also recorded.

Data were analysed using SPSS-19. Percentages and frequencies were calculated. Cross-tabulation was used for correlation between variables, and $p < 0.05$ was considered as statistically significant.

RESULTS

A total of 100 patients (52 males and 48 females) were enrolled in this study. The patients were grouped in age range 6–12, 13–36, and 37–60 months, and they numbered to be 27%, 57% and 16% respectively. Most

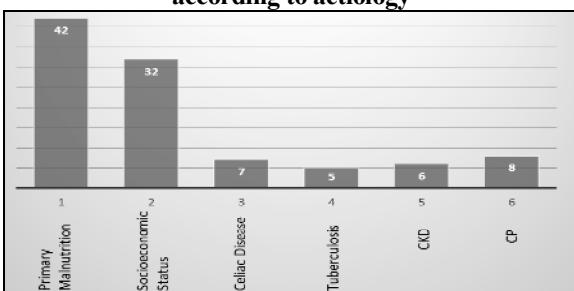
(75%) of the patients enrolled in study had normal birth weight and 68% belonged to good socioeconomic status. In 96% of children, mother was the primary caretaker, however only 46% of the children were exclusively breast-fed. Those on formula feed and pre lacteal feed were 31% and 27% respectively. Weaning was not properly started after 6 month of age in 48% of the children, 78% patients in total had insufficient caloric intake to meet their daily energy requirements. Eighty-seven percent patients had past history of recurrent infections while 63% of them also had history of previous hospitalizations. The correlation between the demographics and causes of PCM are shown in Table-1.

The most prevalent causes were primary malnutrition (42%) followed in frequency by low socioeconomic status (32%). Less prevalent causes included systemic illnesses like celiac disease (7%), tuberculosis (5%), chronic kidney disease (6%) and cerebral palsy (8%). (Figure-1).

Table-1: Demographics and correlation of causes of PCM in the study group of children[n (%)]

Variables		Primary Malnutrition	Low Socio-economic Status	Celiac Disease	TB	CKD	CP	p
Gender	Male	19 (36.5)	16 (30.8)	4 (7.7)	3 (5.8)	4 (7.7)	6 (11.5)	0.664
	Female	23 (47.9)	16 (33.3)	3 (6.3)	2 (4.2)	2 (4.2)	2 (4.2)	
Age	6 months to 1 year	12 (44.4)	9 (33.3)	2 (7.4)	1 (3.7)	1 (3.7)	2 (7.4)	0.481
	1–3 years	23 (40.3)	19 (33.3)	4 (7.01)	2 (3.5)	5 (8.77)	4 (7.01)	
	3–5 years	7 (43.75)	4 (25)	1 (6.25)	2 (12.5)	0 (0)	2 (12.5)	
Birth Weight	Low	14 (56)	9 (36)	1 (4)	0 (0.0)	1 (4)	0 (0)	0.243
	Normal	28 (37.3)	23 (30.7)	6 (8)	5 (6.7)	5 (6.7)	8 (10.7)	
Meals offered	Sufficient	5 (22.7)	3 (13.6)	5 (22.7)	2 (9.1)	4 (18.2)	3 (13.6)	0.000
	Insufficient	37 (47.4)	29 (37.2)	2 (6.5)	3 (3.8)	2 (2.6)	5 (6.4)	
Weaning	Proper	19 (34.5)	21 (38.1)	4 (7.27)	4 (7.27)	4 (7.27)	3 (5.45)	0.162
	Improper	23 (51.1)	11 (24.4)	3 (6.7)	1 (2.2)	2 (4.4)	5 (11.1)	

Figure-1: Number of patients with Grade-III PCM according to aetiology



DISCUSSION

We investigated the aetiological factors contributing toward grade-III malnutrition in children admitted to our hospital in the age group of 6 to 60 months. The results of this study were in favour of the fact that the age, frequency of complementary/dietary intake per day, socioeconomic status, meals offered were significantly associated with SAM among children under five and it

can further contribute toward community and hospital burden.

There was no statistically significant gender-based differences. Most of the cases of SAM were in age group from 12 to 36 months which made up to 57% of total enrolled patients. This is most probably due to smaller stomach size compared to the older children, and younger children are in transition from milk based-diet to complementary feeding. This is an agreement to the studies done in Nepal⁷ and India⁸. For younger children, the frequency of milk feeds whether breastfeeding or complementary may be increased to reach optimal caloric intake. Though this is easier choice especially if mother-fed when compared to the older children for reaching optimal caloric intake, but it requires counselling for both birth spacing and encouraging breast feeding by lady health workers.⁹ But the practice of optimal feeding are not adequate as only 48% of the patients were started on weaning and only 22% of the patient had adequate caloric intake.

Breast milk is rich source of carbohydrates, proteins (including immunologic components), fats,

vitamins and various immune protective ingredients required for a growing child, thus not only supplying nutrition but also providing resistance to infections in the first 6 months of life¹⁰ but only 46% of our patients were exclusively breastfed up to 6 month of age and that can be a contributing factor towards SAM, recurrent infections, and hospitalizations.

Most of our patients had normal birth weight, however, they later developed malnutrition as most common cause of SAM was primary malnutrition which was directly linked to nutritional status and childcare practices observed. Second most prevalent factor contributing toward SAM was poor socioeconomic conditions. Most of the patients had birth order of 3 or more. Higher family sizes can lead to poor *per capita* income¹² and may compromise intra-house food allocation and optimal caring that each child is expected to get from parents, putting them at higher risk of being undernourished⁹.

Our study is congruent to initial hypothesis made for the aetiological factors of grade-III malnutrition. However, there were some minor contributing factors toward SAM which due to secondary malnutrition like celiac disease, cerebral palsy, tuberculosis and chronic kidney disease made up to 26% of total cases. Severity and duration of disease seems to affect more on nutritional status in such patients, especially considering that special needs formulae are expensive and out of reach in Pakistan for low socioeconomic groups.¹²

CONCLUSION

Primary malnutrition was the main aetiological factor for grade-III PCM and can be attributed to poverty and ignorance. It was more common among females, perhaps due to cultural issues. It was also the main contributing cause in the toddler age group. These findings can't be generalized as they are limited to only one hospital. Larger studies are suggested to include other regions.

RECOMMENDATIONS

There is need to encourage the mothers the value of breastfeeding and adequate dietary consumption for

their children. Mass education to raise awareness among community by utilizing community workers and social media to impart knowledge about preparation of homemade affordable meals with balanced macronutrients can be executed. This will help to decrease the burden on health system by preventing the complications with which grade-III PCM children are admitted and will give the children a chance to achieve their full potential in life.

REFERENCES

1. World Health Organization (WHO). Malnutrition. <https://www.who.int/news-room/fact-sheetworldwide/s/detail/malnutrition>.
2. De Onis M, Blössner M. WHO global database on child growth and malnutrition. Geneva: WHO; 1997.p 1–67. Available from: <https://citeseerx.ist.psu.edu/pdf/97232c7bba5bef3ac970bf82966a8ea97cb4fa14>
3. UNICEF. National nutrition survey 2018 –KFR. Available from: <https://www.unicef.org/pakistan/national-nutrition-survey-2018>
4. Casadei K, Kiel J. Anthropometric Measurement. 2022 Sep 26. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan. PMID: 30726000.
5. Saunders J, Smith T. Malnutrition: causes and consequences. Clin Med (Lon) 2010;10(6):624–7.
6. Abera SF, Kantelhardt EJ, Bezabih AM, Gebru AA, Ejeta G, Lauvai J, et al. Nutrition specific and sensitive drivers of poor child nutrition in Kilte Awlaelo-Health and Demographic Surveillance Site, Tigray, Northern Ethiopia: implications for public health nutrition in resource-poor settings. Glob Health Action 2019;12(1):1556572.
7. Hossain A, Niroula B, Duwal S, Ahmed S, Kibria MG. Maternal profiles and social determinants of severe acute malnutrition among children under-five years of age: a case-control study in Nepal. Heliyon 2020;6(5):e03849.
8. Jena P, Rath S, Nayak MK, Satapathy D. Study of social and demographic determinants of severe acute malnutrition in children aged 6–59 months in a tertiary care centre of Odisha, India. Int J Contemp Pediatr 2019;6(1):46–51.
9. Anato A. Severe acute malnutrition and associated factors among children under-five years: A community based-cross sectional study in Ethiopia. Heliyon 2022;8(10):e10791
10. Kim SY, Yi DY. Components of human breast milk: From macronutrient to microbiome and microRNA. Clin Exp Pediatr 2020;63(8):301–9.
11. Gamit VD, Gohil JR, Nikhileshwar AB, Vagh TP. Etiological factors of severe acute malnutrition and impact of nutrition rehabilitation centre: a prospective observational study from Bhavnagar. Int J Contemp Pediatr 2021;8(4):652–8.
12. Iyengar A, Raj JM, Vasudevan A. Protein energy wasting in children with chronic kidney disease and end-stage kidney disease: an observational study. J Ren Nutr 2021;31(3):270–7.

Address for Correspondence:

Dr Muhammad Ali Raza, Assistant Professor, Department of Paediatric, Ayub Medical College Abbottabad, Pakistan.

Cell: +92-331-5719164

Email: mohammad_aliraza@hotmail.com

Received: 1 Jul 2023

Reviewed: 6 Nov 2023

Accepted: 6 Nov 2023

Contribution of Authors:

SG: Conceptualization, drafting, analysis and proofreading

DN: Data collection, write-up, literature search, data analysis

SH: Data collection, data analysis

TS: Data collection, write-up, literature search, data analysis

MAR: Literature search, proof reading, data analysis

MSL: Data collection, write-up

Conflict of Interest: None to declare, **Funding:** None