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Original Article

The Morbidity Patterns of Children with Severe Malnutrition

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ABSTRACT

Malnutrition is a widespread problem worldwide **Objective:** To identify the morbidity patterns of children with severe acute malnutrition **Methods:** A cross-sectional study was conducted in the Pediatric Unit-II of Abbasi Shaheed Hospital for a six-month duration from July 2021 to December 2021. Children aged 1 to 60 months with severe acute malnutrition (WHZ score <-3 SD) were selected. All patients were assessed for clinical symptoms, various disease states such as metabolic abnormalities, infections, congenital/hereditary anomalies, and outcomes such as left against medical advice (LAMA), stabilization, or death on discharge. Data was analyzed and collected using descriptive statistics in SPSS version 17. **Results:** A total of 150 children were admitted according to the admission criteria. The number of males was 85 (56.7%) and females 65 (43.3%), and the male to female ratio was 1.4: 1. 120 (80%) had severe wasting without edema and 30 (20%) had malnutrition with edema. The average length of stay was 10 + 3.6 days. The main incidence in children with MAS are diarrhea (46.7%), pneumonia (18.7%), sepsis (15.3%), and other diseases such as meningitis 5(3.3 %), severe skin infections, 7(4.7%), urinary tract infections 9(6%), and eye lesions due to vitamin A deficiency 2(1.3%). 13 (8.7%) patients had measles with diarrhea and pneumonia. Acute watery diarrhea was observed in 68(45.3%) of diarrhea cases. 21 (14%) children had congenital or hereditary defects. 9 (6%) had central nervous system disorders. **Conclusions:** The spectrum of incidence in hospitalized children with severe malnutrition includes both congenital or hereditary defects and infections. The sepsis and diarrhea with metabolic disturbances mainly contributed to the mortality.

INTRODUCTION

Malnutrition is a widespread problem worldwide and 2 billion children worldwide suffer from acute malnutrition (SAM), with the greatest burden in sub-Saharan Africa and South Asia [1,2]. In Southeast Asia, the mortality rate varies from 6% to 40%, and some series of complicated MAS have a mortality rate of more than 32%, even with the treatment suggested by the WHO. In developing countries such as Pakistan, this is often the result of socio-economic, political, environmental or natural disasters [3]. A significant proportion of sick children admitted to hospital also have MAS. Associated disease may further contribute to malnutrition with worse outcomes. Inpatient malnourished children have a higher complication rate, higher mortality, longer hospital stays, and higher hospitalization costs [4,5]. The lack of infrastructure to monitor growth and regular institutional assessments is responsible for the persistence and late detection of malnutrition in these children [6,7]. Better nutritional status is associated with better survival and better outcomes. After clinical recovery, aggressive nutritional management is the cornerstone of caring for these children and a more promising strategy for improving outcomes [8,9]. This prospective study was conducted using WHO guidelines and basic principles of management of severe acute malnutrition. We plan to identify the morbidity patterns of children with MAS. This test may be helpful in screening for and early detection of complications requiring hospitalization to prevent

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mortality from these complications. This study aims to identify the morbidity patterns of children with severe acute malnutrition.

METHODS

This cross-sectional study was conducted at the Abbasi Shaheed Hospital for a six-month duration from July 2021 to December 2021. The study included children aged 1 to 59 months with MAS defined as Z-score (WHZ) <-3 SD), with or without bilateral pitting edema, and with any of the following symptoms: anorexia, severe anemia, severe dehydration, systemic infection, and high fever. Children over 60 months of age with severe birth defects or severe neurological disorders or medical and surgical conditions that make feeding through the mouth or nose difficult were not included. All children were done with a detailed laboratory and clinical evaluation by a general practitioner, with specific stress on their comorbidities and nutritional status. The demographic profile, including gender, age, weight, height, WHZ score and length of stay, discomforts related to the presentation, and an appropriate physical examination were recorded on a pre-designed form. Patients were monitored and assessed daily during their hospital stay in order to identify various medical conditions and related congenital or hereditary disorders. The children were managed according to the WHO standard guidelines for the management of SAM. Nasogastric tube feeding was preferred for children who were too sick to be fed orally. All patients were given oral vitamin A on admission (200,000 IU for patients> 12 months or 100,000 IU if <12 months), additional doses were given on days 2 and 14 in patients with clinical symptoms of vitamin A deficiency. Children with diarrheal dehydration are managed with a rehydration solution. In the first phase of treatment (3-4 days), F-75 medicated milk (prepared from powdered milk in the hospital kitchen) was used, followed by F-100 or RUTF medicated milk (ready-to-use therapeutic food) as the case may be in the second phase. Infants less than 6 months of age used infant formula and diluted F-100. All children underwent blood glucose, complete blood count, urine tests, and serum electrolytes. Depending on the patient's clinical condition, additional laboratory tests were performed, such as chest X-ray, blood culture, urine culture and hypersensitivity, arterial blood gas analysis, and abdominal ultrasound. Almost all patients were treated with penicillin-gentamicin antibiotics, with the exception of 12 young children who received the combination of ceftriaxone and amikacin. The social science statistical package (SPSS) for Windows version 17 was used for data analysis. Quantitative variables were expressed as mean + standard deviation, and qualitative variables as frequency and percentage.

RESULTS

A total of 150 children were admitted according to the admission criteria. The number of males was 85 (56.7%) and females 65 (43.3%), and the male to female ratio was 1.4: 1. 120 (80%) had severe wasting without edema and 30 (20%) had malnutrition with edema. The average length of stay was 10± 3.6 days. Table 1 describes the main characteristics of children with MAS.

Characteristics	Overall n=150 (%)	1-6 months n=44	7-24 months n=71	25-59 months n=32
Gender				
Male	85(56.7)	25(29.4)	48(56.5)	12(14.1)
Female	65(43.3)	21(32.3)	23(35.4)	21(32.3)
WHZ Scores				
3 SD	58 (38.7)	15(25.9)	26(44.8)	17(29.3)
4 SD	92(61.3)	27(29.3)	49(53.3)	16(17.4)
Edema				
Yes	30 (20)	05(16.7)	17(56.7)	8(26.7)
No	120(80)	37(30.8)	58(48.3)	25(20.8)
Feeding at the time of admission:				
Breast Feeding	42 (28)	19(45.2)	21(50.0)	2(4.8)
Bottle Feeding	39 (26)	17(43.6)	19(48.7)	3(7.7)
Semi-solids only	31 (20.7)	0	11(35.5)	20(64.5)
Breast Feeding & Semi -Solids	38 (25.3	03(7.9)	20(52.6)	4(10.5)
Mean Height (cm)	66.8	54.6	65.0	79.5
Mean Weight (Kg)	5.3	3.01	5.21	7.37

Table 1: Baseline Features of Children with Severe Acute Malnutrition n=150

Table 2 shows the incidence pattern, and the main incidence in children with MAS are diarrhea (46.7%), pneumonia (18.7%), sepsis (15.3%), and other diseases such as meningitis 5(3.3 %), severe skin infections, 7(4.7%), urinary tract infections 9(6%), and eye lesions due to vitamin A deficiency 2(1.3%). 13 (8.7%) patients had measles with diarrhea and pneumonia. Four patients had tuberculosis (TB), three had pulmonary tuberculosis, and one had meningeal tuberculosis. Rickets was found in 11 (7.3%) children with biochemical and radiological changes. One patient had malaria (Table 2).

Morbidity	Number	Percentage
Diarrhea	70	46.7
Pneumonia	28	18.7
Sepsis	23	15.3
Measles	13	8.7
Rickets	11	7.3
Metabolic abnormalities		
Hyponatremia	30	2 0
Hypokalaemia	21	1 4
Hypoglycaemia	16	10.7

Table 2: Morbidity Pattern in Children with Severe Acute Malnutrition (n=150)

Acute watery diarrhea was observed in 68(45.3%) of diarrhea cases, while persistent diarrhea was observed in

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only four of them. 58 patients were severely dehydrated, while others were or were not dehydrated. The second most common type of morbidity was pneumonia, including secondary to measles and tuberculosis. Out of 23 (15.3%) patients with sepsis, 18 had leucocytosis and 5 had leukopenia as a marker of sepsis. Blood culture sensitivity was positive in 6 patients, Klebsiella pneumonia 3, Enterobacter 2 and Streptococcus pyogenes 1. Anemia occurred in 123 (82%) patients with severe malnutrition. The haemoglobin level was <4 g / dL in 12 patients, 4.1 to 7 g / dL in 35 patients, and 7.1 to 10 g / dL in 90 patients and remaining 12 have above 15 g / dL. 88 (58.7%) of the children had a fever during the presentation at temperatures between 100 ° F and 104 ° F. None of them were hypothermic (<95 ° F); only one child had a normal temperature of less than 97° F.

One or more metabolic abnormalities have been observed in patients with MAS on admission or during hospital stay. The most common metabolic abnormality in 45(30) % of children was hyponatraemia followed by hypokalaemia (18%). Hypoglycaemia was observed in 12.7% of cases, and 10 (6.7%) had hypernatremia (> 150 meq / l). 21 (14%) children had congenital or hereditary defects. 9 (6%) had central nervous system disorders such as hydrocephalus 2, cerebral cyst 2, leukodystrophy 1, and seizure disorders 4. Five had congenital heart disease, 2 had ventricular communication, and 3 had pulmonary hypertension. Of the 130 children who received first-line antibiotic therapy with intravenous penicillin and gentamicin, 93 recovered and 57 (38%) received cephalosporin and amikacin. 9 patients switched to other antibiotics such as ciproxin 5, vancomycin 2, and imipenem 2.

DISCUSSION

In our study, most children had significant weight loss (80%) and 20% had edema malnutrition. Similar numbers were reported in Asian studies where severe wasting occurred in 75% of cases and edema malnutrition occurred in 25% of cases [10-12]. Studies from Africa have shown higher rates (48.2% -70%) of edema malnutrition [13,14]. Several studies have shown that MAS is more common in boys than in girls. The explanation for the apparent male dominance is unknown [15]. According to our research, male dominance (56.7%) has been documented; but no reason could be attributed to it. In contrast, other Pakistani studies reported a female predominance [16]. Lack of breastfeeding, inadequate vaccinations, poor hygiene and sanitation, and MAS likely contribute to the high rate of these infections in the present study [17,18]. In severe cases of pneumonia, which may not be manifested by the usual clinical symptoms, the presence of MAS increases the risk of death, and in hospitalized children, a blood culture or chest X-ray may be necessary. Studies from Asia have found bacteremia and/or sepsis in 16% of cases. In our study, the majority of sepsis patients had leucocytosis (78.3%), which is similar to the study in Pakistan. Blood culture efficiency was positive in 6 patients, Klebsiella pneumonia 3, Enterobacter 2, and Streptococcus pyogenes 1. In contrast, research in Africa showed a high prevalence of gram-positive organisms (68.6-71%); A study in Uganda listed Staphylococcus aureus, streptococcus and H influenza as the most common bacterial causes of pneumonia [19,20]. Urine culture reports showed E. coli and Klebsiella species. In a study conducted in Gambia, E. coli was found in 55.6% of isolated urine cultures. Malnutrition remains very common in hospitalized children with chronic conditions such as chronic renal failure, heart failure, or neurological disorders [21]. We have seen MAS cases associated with congenital heart disease, urolithiasis, neurological, metabolic and chromosomal abnormalities but these abnormalities have been excluded in other studies. Micronutrient deficiencies, especially vitamin A, zinc, and iron, are important risk factors for high mortality in children with MAS and infections. Ejaz et al., Reported a high frequency of micronutrient deficiencies, with iron deficiency anemia the most frequent (80.3%), followed by vitamin D deficiency (rickets 35.7%) and vitamin A deficiency (18.7%) [21,22]. In addition, we found that the incidence of anemia (iron, folate, vitamin B12 deficiency) was high at 82%, but that the incidence of rickets (7.3%) and vitamin A deficiency (1.3%) was low. Blood transfusion, intravenous fluid infusion, hypokalaemia, and sepsis are major risk factors for mortality [23,24]. This high mortality rate indicates critical and advanced patient stages in tertiary hospitals. The strength of our study was a fairly good sample size with clinical, laboratory, and radiological evaluations of patients in Pakistan, which may have contributed to the local source of data on MAS, however as the study was limited to only one hospital, it cannot be estimated for the country's population.

CONCLUSION

The spectrum of incidence in hospitalized children with severe malnutrition includes both congenital or hereditary defects and infections. The sepsis and diarrhea with metabolic disturbances mainly contributed to the mortality. We recommend training in personal hygiene, hand washing, mother and baby nutrition, and immunization to prevent infections and malnutrition. Women's education, the provision of safe drinking water, sanitation, immunization through the implementation of integrated disease management programs for newborns

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and children, and environmental management of acute malnutrition in primary care are essential to prevent morbidity and mortality.

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