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To Study The Outcome Of Diarrhoea In Severe Acute Malnutrition Children.

Dr. Mahesh Shinde[1], Dr. Abhijeet Shinde[2],Sushruta Kumar[2] ,Dr. Sunil Natha Mhaske[3],Dr.Suresh Waydande[4]

[1]*Junior Resident, Department of Paediatrics, DVVPF's Medical College, Ahmednagar.*
[2]*Assistant Professor, Department of Paediatrics, DVVPF's Medical College, Ahmednagar*
[3]*Professor & Dean, Department of Paediatrics, DVVPF's Medical College, Ahmednagar.*
[4]*Professor & Head, Department of Paediatrics, DVVPF's Medical College, Ahmednagar..*

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ABSTRACT

Aim: To assess predictors of diarrhoea and dehydration among children with complicated severe acute malnutrition. Severe acute malnutrition (SAM) is a critical public health issue that is a major cause of under-five fatalities. Children with medical difficulties have a considerably lower risk of dying when managed according to protocol.

Methods: When children with SAM who met the definition of the SAM and had diarrhoea were admitted, their outcomes were compared to those of children with SAM who had medical issues other than diarrhoea (group A) (group B). Both groups were handled in accordance with generally accepted standards, and they had 12 weeks of monitoring and follow-up after discharge.

Results: Both groups saw comparable rates of average weight increase, defaulter rate, primary failure, subsequent relapse, and readmission. Three more days were added to the length of stay in group A (p-value = 0.039). The total success rate for discharge was 68%, and 50% of the children had weights or heights that were more than two standard deviations at the 12-week follow-up.

Conclusion: Children with SAM who have diarrhoea can be managed using the present management approach. Children with recurrent diarrhoea who follow the management regimen for managing dehydration and promptly modify their therapeutic meals and gain weight satisfactorily. To reduce mortality, better management of diarrhoea and prevention of hospital-acquired diarrhoea is essential.

I. INTRODUCTION

One of the main causes of illness and mortality in children in underdeveloped nations is severe acute malnutrition (SAM), which also significantly contributes to fatalities in children under the age of five from preventable causes [1]. In India, the National Family Health Survey-4 found that more than 7.5% of children under five had SAM and that 21% of them were underweight (low weight for height) [2].

More than 1.5 million children worldwide die from diarrhoea every year, or around 10 million [3]. The most prevalent disease in SAM children is diarrhoea, and there is a bidirectional link between malnutrition and diarrhoea. The duration of diarrhoea and malnutrition are both made worse by malnutrition, which makes diarrhoea more likely to occur.

Malnutrition and diarrhoea are mutually exclusive. Enteric (and other) infections are more likely to occur when immune system function is compromised due to malnutrition. In turn, enteric infections alter the way the intestinal barrier works and reduce nutrient absorption, which can cause malnutrition or make it worse. Multiple gastrointestinal infections can restrict growth and even impair cognitive development over time. Last but not least, diarrhoea and malnutrition act together to raise the mortality risk of both illnesses.

The case fatality rate can be significantly decreased from above 30% to 5%-10% by using a standardised World Health Organization (WHO) case management procedure and nutritional therapy in hospitals [1]. Guidelines for the facility-based care of children with SAM have been released by the Ministry of Health & Family Welfare (MoHFW), Government of India (GOI). The immediate risk from diarrhoea comes from the loss of body fluids, which can lead to electrolyte imbalance, dehydration, and finally shock and death. Children with diarrhoea are treated with rehydration solution in accordance with established protocols to avoid this. The WHO recommends community-based care with ready-to-use therapeutic meals for children with SAM who are older than six months old and do not have any medical conditions.

Special therapeutic meals (F-75/F-100) are advised for the stabilisation and rehabilitation of SAM-affected children in an inpatient environment. Rehydration Solution for Malnutrition (ReSoMal), which has lower sodium levels and greater glucose and potassium levels, is also advised by the WHO for treating severe, acute malnutrition in children. However, the MoHFW guidelines advise using locally prepared starter and catch-up foods as well as low osmolality oral rehydration solution (ORS) with additional potassium for rehydrating children with SAM if F-75/F-100 and ReSoMal are not available [1].

However, the rehydration of malnourished children is much more challenging than rehydration of well-nourished children. Children who are undernourished frequently have high total body sodium levels, which raises the danger of fluid overload and heart failure[12,14] In addition, dehydration is difficult to identify in malnourished children owing to overlapping signs of dehydration and malnutrition, such as sunken eyes and reduced skin turgor.[11] With limited resources, appropriate treatment of these children may, therefore, be difficult to achieve.

Children who are severely malnourished and have diarrhoea may also experience osmotic diarrhoea as a result of carbohydrate intolerance brought on by villous atrophy. These kids' diarrhoea may get worse because of increased fluid losses from the intestines brought on by the carbohydrates (including glucose) in their diets and rehydration fluids [4]. Therefore, there is a chance that therapeutic meals will make diarrhoea worse, and these kids may require further care or dietary changes.

It is unknown at this time if the management regimen that is now advised is as successful for the care of kids with SAM who also have diarrhoea or other medical issues. The outcomes of these youngsters treated according to the established WHO procedure are highlighted in this research paper.

II. MATERIALS AND METHOD

Children between the ages of 2 and 59 months who met the case definition for SAM (for infants under 6 months: weight for height 3SD and/or edema of both feet) were included in the study and split into two groups. For children >6 months: weight for height 3SD and/or mid-upper arm circumference [MUAC] 11.5 cm. Children with SAM who had diarrhoea were in Group A, and SAM children who had additional medical issues were in Group B. A pre-structured form was used to record the physical examination results and a thorough history. Human immunodeficiency virus (HIV), tuberculosis, gastroesophageal reflux disease, chronic liver disease, chronic kidney disease, congenital heart disease, neurological impairments, suspected cases of inborn errors of metabolism, dysmorphologies, congenital malformations, and any surgical cause of diarrhoea were excluded from the study. Children who were in shock, had severe respiratory distress, a significant handicap, a congenital or malignant condition, or weighed less than 4.0 kg upon entry were not included in the study.

The Nutritional Rehabilitation Centre (NRC) hospital performed baseline analyses, including blood sugar, complete blood counts, serum electrolytes, chest X-rays, Mantoux tests, routine and microscopic urinalyses, and stool culture sensitivities. All children were treated in accordance with the established protocol [1]. When a child is admitted with medical issues other than diarrhoea, an appetite test is performed to determine the type of feeding that should be used for initial management.

According to the WHO definition, diarrhoea is defined as 3 or more loose or watery stools every 24 hours. Diarrhea was deemed to have finished when the child passed no more than 3 loose or watery stools per day for a minimum of 48 hours. The number of days with diarrhoea was only counted on days with 3 or more loose or watery stools; days with diarrhoea that returned in less than 48 hours were still considered to be a part of the same episode.

According to the WHO standard, low osmolality ORS with potassium supplements (20 mEq/L) was used to treat dehydration, and all patients received age-appropriate amounts of multivitamins and minerals. During the rehabilitation stage, iron was introduced. The risks of hypoglycemia, hypothermia, shock, dehydration, and congestive heart failure were closely monitored in all of the kids. Daily weight growth (gm/kg/day), 24-hour nutritional intake, the disappearance of edema, weekly length/height, and MUAC measurements were used to track each child's development.

A milk-based, non-cereal beginning diet was introduced to all children who had diarrhoea, and an algorithmic method was employed to design their diets. Initially, 2-hourly starter therapeutic feedings (F-75) were given to children with SAM who had acute diarrhoea; however, if the number of stools per day remained high (>10), along with weight loss, even after 48 hours of starter diet, the starter diet was changed to a cereal-based starter

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diet or curd feed. All kids whose bodies didn't respond to this diet were put on a lactose-free diet. To exclude out concomitant conditions such pneumonia, urinary tract infections, HIV, and tuberculosis, all kids with recurrent diarrhoea were investigated. Children who tested positive for HIV or tuberculosis were not included in the trial but were nevertheless treated at the NRC in accordance with protocol. All of the kids who had ongoing diarrhoea were treated according to the unit protocol. They were given three feedings of semi-solid foods such as bananas, curd-rice, and other locally accessible meals once the catch-up diets were well-tolerated, medical issues were treated, and acceptable weight gain (i.e., more than 5 gm/kg/day) was attained. When the kids satisfied the requirements for discharge from the hospital, they were deemed fit [1].

They were checked on after discharge after a week, then every 15 days for the next 12 weeks. For both groups, outcome parameters were calculated, including mean weight gain, length of stay (in days), death rate while receiving treatment or after discharge during follow-up, default rates, successful discharge rates, secondary relapse rates, and the proportion of failures (primary and secondary). All of the rates were established using the GOI's recommended standards. The number of children who defaulted during the reporting period divided by the total number of participants was used to calculate the default rate.The percentage of kids who met the criteria for discharge (weight gain of more than 5 g/kg/day for three days in a row and improvement in medical problems) was known as the successful discharge rate. The rate of subsequent relapse

was characterised as patients who had recently been released as cured but were once more qualified for admission. Primary failure was characterised as either the absence of edema or failing to gain at least 5 g/kg/day by day 10 or failing to regain appetite or begin losing edema by day four. Failure to gain at least 5 gm/kg/day for three straight days during the recovery phase was referred to as secondary failure.

At the 12-week follow-up, outcomes were also determined by the following criteria: the percentage of kids gaining 15% of their initial weight, the percentage of kids who meet the weight/height criteria by at least 2 SD, and the percentage of kids that grow to a MUAC of 12.5 cm.

III. RESULTS

A total of 163 kids admitted to the NRC and paediatric wards were screened between November 2015 and March 2017. Out of these 163, 85 children (group A) were hospitalised with diarrhoea and 78 others had medical issues unrelated to diarrhoea (group B). The flowchart for patient inclusion in the study is shown in **Fig. 1**.

Fig. 1. Flow chart of inclusion of patients in the study.
SAM: severe acute malnutrition, TORCH: toxoplasmosis, other (syphilis), rubella, cytomegalovirus, herpes simplex, GDD: Global developmental delay, GOI: Government of India.

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A total of 120 children (60 in each of groups A and B) were available for the study out of these 163 patients after 43 patients were eliminated (25 children in group A and 18 patients in group B). Diarrhoea (50%) pneumonia (40%) bronchiolitis (8.3%) and severe anaemia (8.3%) were the children's major morbidities (**Fig. 2)**.

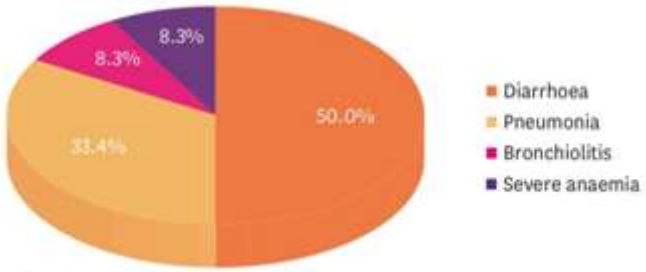

Fig. 2. Clinical profile of patients included in study.

Most of the patients in each group were 6 to 12 months old, with more males than females.

When children with diarrhoea were admitted, 71.1% of them had acute watery diarrhoea and 58.3% of them were dehydrated. 5% of the kids in group A had pneumonia as a co-morbidity, and a further 5% developed edoema. Children with acute diarrhoea needed to change their diets by starting on cereal-based or lactose-free diets in 46.6% of cases, while 62.5% of children with persistent diarrhoea needed to change their diets because of ongoing diarrhoea and the resulting weight loss in 62.5% of cases (**Fig. 3**). The majority of kids had poor eating habits. All infants between the ages of two and six months were either mixed-fed or top-fed, and bottle-feeding was typical in both groups.

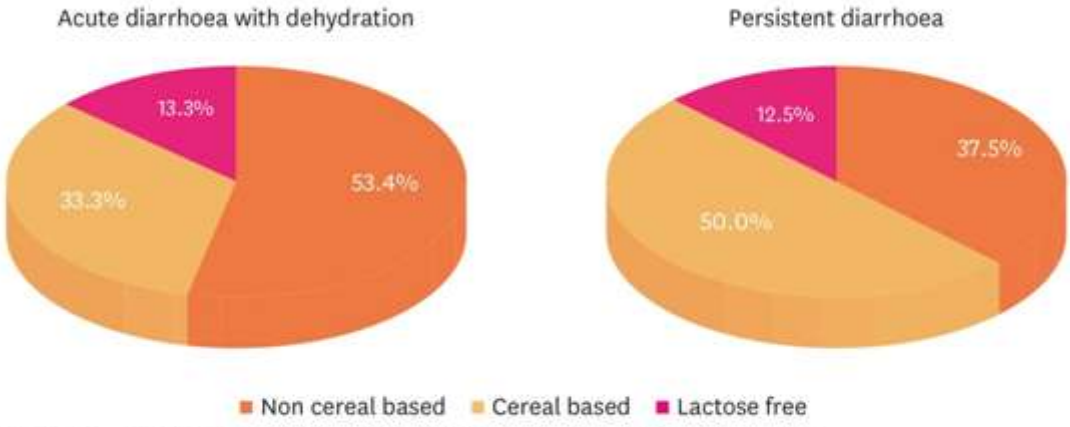

Fig. 3. Type of starter diet required during stabilization phase in group A: with diarrhea.

In total, 68% of the kids were successfully discharged, and 50% of them followed up with a weight/height > 2SD. Average weight increase, hospitalisation-related mortality, rates of successful release, default, primary failures, secondary relapses, and readmission were comparable between the two groups (**Table 1)**.

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Table 1. Outcome indicators of the study in children in both the study groups

Outcome indicator	SAM with diarrhea (n=60)	SAM with complications other than diarrhea (n=60)	*p*-value
Average weight gain (gm/kg/day)	10.35±6.65	10.39±6.27	0.782
Average length of stay	13.25±6.36	10.73±5.35	0.039
Death (during hospitalisation)	2 (3.3)	0 (0)	0.496
Defaulter	2 (3.4)	1 (1.7)	1.000
	(n=56)	(n=59)	
Successful discharge rate	37 (66.1)	42 (71.2)	0.838
Primary failure	20 (35.7)	16 (27.1)	0.320
Secondary failure	13 (23.2)	25 (42.4)	0.024
Secondary relapse rate	8 (14.3)	7 (11.9)	0.783
Readmission rate	4 (7.1)	2 (3.4)	0.783

Values are shown as mean±standard deviation or number (%).
SAM: severe acute malnutrition.

Patients with diarrhoea had an average duration of stay that was three days longer than patients with other problems (13.256.36 vs. 10.735.35 days), and this difference was statistically significant (p=0.039). Patients with complications other than diarrhoea had a greater secondary failure rate than patients without complications (25 [42.4%] vs. 13 [23.2%], p=0.024). Similar outcome parameters (weight gain >15% from admission, weight/height >2SD or higher, and MUAC >12.5 cm) were present in both groups at follow-up (**Table 2**).

Table 2. Follow-up indicators of the study in the two groups

Outcome indicator	SAM with diarrhea (n=53)	SAM with complications other than diarrhea (n=54)	*p*-value
Gaining 15% weight from admission weight	27 (51)	35 (64.8)	0.146
Weight/height –2SD or above	24 (45.3)	29 (53.7)	0.384
MUAC >12.5 cm	16 (30.2)	18 (33.3)	0.727

Values are shown as number (%). Number of patients who were loss to follow-up: group A, 2; group B, 5. Number of patients who expired in follow-up: group A, 1 (in first follow-up). Number of patients who completed 12 weeks follow-up: group A, 53; group B, 54.
SAM: severe acute malnutrition, SD: standard deviation, MUAC: mid-upper arm circumference.

In managing severe malnutrition, the WHO considers a case fatality rate of more over 20% to be unacceptable, 11–20% to be bad, 5–10% to be moderate, 1–4% to be good, and less than 1% to be excellent. When the case mortality rate is less than 10%, severe malnutrition care is effective by sphere criteria. Therefore, 5% of cases in our study were fatal, demonstrating the efficiency of the WHO procedure. In environments with limited resources, adhering to WHO recommendations is efficient and affordable. Patients may be discharged early with little risk of complications or fatality. (Fig. 4)

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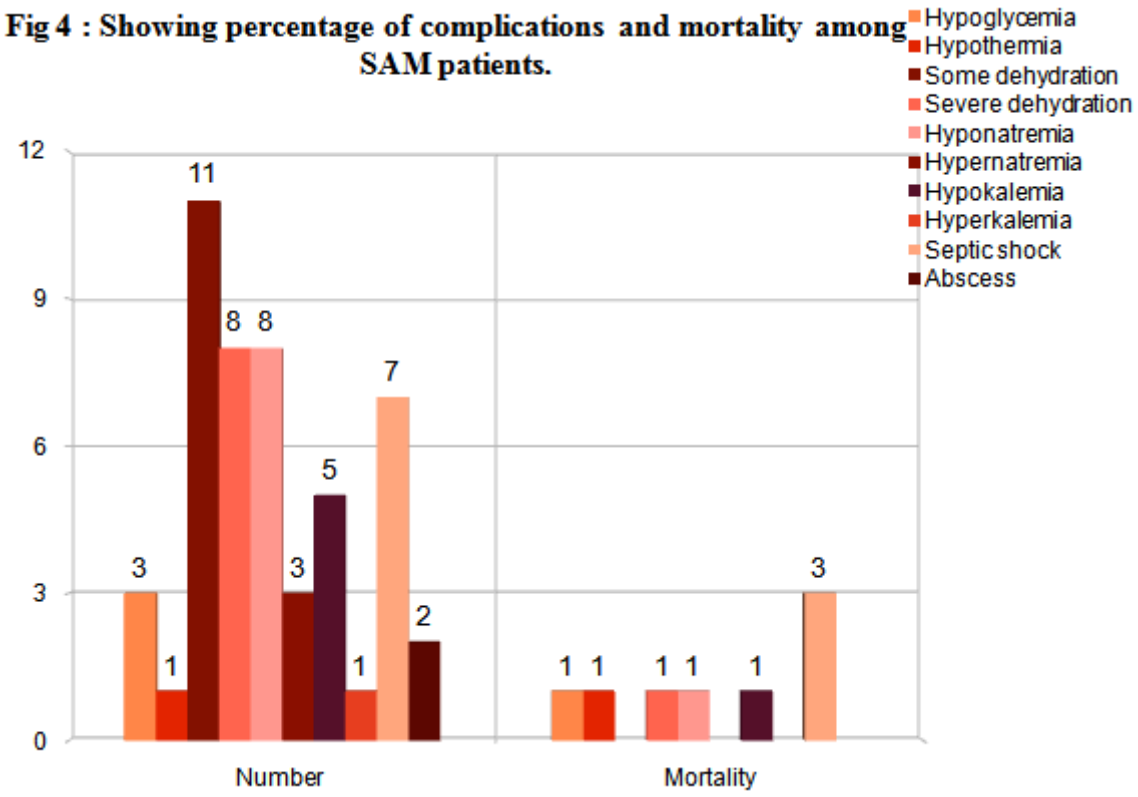

Fig 4 : Showing percentage of complications and mortality among SAM patients.

IV. DISCUSSION

The majority of the SAM patients in our study were under 24 months old, highlighting the greater susceptibility of this age group to malnutrition. All of the children had poor eating habits, which emphasises how crucial it is to nurse exclusively during the first six months of life in order to prevent malnutrition.

The average weight gain was similar between the two groups and was around 10.37 gm/kg/day, which met Sphere requirements (>8 gm/kg/day) [5] and was greater than the results of earlier studies conducted in India [6, 7]. As a result, the study demonstrated that protocol-based therapy could successfully achieve sufficient weight gain in kids who also had diarrhoea and SAM.

The majority of patients were stabilised and released from the hospital within two weeks, which is in accordance with national and international recommendations for minimum stay durations of one to four weeks [5]. Children with diarrhoea required longer times for stabilisation, as evidenced by the fact that the length of stay in SAM patients with diarrhoea was three days longer than it was for patients with other medical issues.

The total CFR of 2.5% was found in the current study, which was within Sphere guidelines for acceptable levels of care [5] and comparable to earlier studies from the NRC of India [6,8]. The difference in secondary causes in the study population, such as HIV, tuberculosis, and surgical causes that were not included in our analysis, may be the explanation of the decreased death rate in the current study. The present investigation, which was carried out at a tertiary care hospital, may also have contributed to the lower mortality rate due to the availability of resources and skilled employees around-the-clock.

The outcome variables were similarly comparable across the two groups, demonstrating that even children with SAM and diarrhoea might recover successfully if treated according to a procedure.

This study concluded by demonstrating that SAM in children with diarrhoea and SAM in children with other medical problems responded equally well to the present care approach. Both groups showed good weight gains. Children with SAM and diarrhoea, however, need more time in the hospital.

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