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Original Research Paper

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PROFILE OF BACTERIAL INFECTION IN HOSPITALIZED CHILDREN WITH SEVERE ACUTE MALNUTRITION

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ABSTRACT

Background: Severe acute malnutrition suppresses every component of the immune system leading to increased susceptibility and severity to infection. However, symptoms and signs of infections are often unapparent making prompt clinical diagnosis and early treatment very difficult. This study describes culture confirmed bacterial infections and antibiotic susceptibility.

Aim: To determine the profile of bacterial infections among children admitted with severe acute malnutrition.

Methodology: This study was done in Assam Medical College and Hospital, Dibrugarh, Assam, in Department of Paediatrics, period from June 2020 to May 2021. Children with Severe Acute Malnutrition with 6-59 months of age were included in the hospital based cross sectional study.

Results: Out of 60 patients enrolled, 30 were bacterial pathogens of which 17(56.66%) were Gram negative, 13(43.33%) were Gram positive and 2 (6.66%) were Fungal pathogens. E.coli is the leading gram negative constitute 8 (47.05%), followed by citrobacter species 3(17.64%). In gram positive, staphylococcus aureus is 5(38.46%) followed by CONS 4(30.76%). Higher susceptibility among gram negative is to cotrimaxazole 8(16%), doxycyline 6(12%) and amoxyclav 6(12%). Then gram positive is ciprofloxacin 5(15.15%), linezolide 5(15.15%), gentamicin 4(12.12%). Resistances was found maximum among gram positive to azithromycin 2(33.33%) and gram negative to amoxyclav 3(30%).

Conclusion: Bacteraemia is highly common among severe acute malnutrition, and the commonest isolate is E. coli followed by Staph. Aureus which is most sensitive to cotrimoxazole and ciprofloxacin.

KEYWORDS : Bacteraemia, severe acute malnutrition, antimicrobial susceptibility, Assam Medical College and Hospital.

INTRODUCTION:

Malnutrition is the most serious health problem affecting children globally[1]. Around 45% of deaths among children under 5 years of age are linked to undernutrition[2]. The WHO defines Severe acute malnutrition(SAM) as presence of any of the following: Weight for height/length Z-score below -3 standard deviation or visible severe wasting or presence of bipedal nutritional oedema or mid upper arm circumference below 11.5 cm in the age group of 6 to 59 months[3].

SAM affects both acquired and innate host defense mechanisms. This leads to increased susceptibility to infection more frequent and prolonged episodes and increased severity of the disease. In addition, severe acute malnutrition often masks symptoms and signs of infectious diseases making prompt clinical diagnosis and early treatment very difficult. This in turn, increases the morbidity and mortality[4]. However, the contribution of bacteremia to the morbidity and mortality among severely malnourished children is poorly investigated.

The high prevalence of infections such as urinary tract infections, diarrhea, and pneumonia among children with severe malnutrition coupled with an atypical clinical presentation of sepsis justifies the routine use of empirical antibiotic treatment in the initial phase of inpatient management as recommended by WHO[5]. However, the choice of antibiotics has to be guided by locally prevalent of pathogens and their antibiotic susceptibility patterns. Hence with this background this particular topic is chosen.

MATERIALS AND METHODS:

Study Place:

Department of Paediatrics, Assam Medical College & Hospital, Dibrugarh.

Study Design: Hospital based cross-sectional study.

Study Period: One Year from June 2020 to May 2021.

Sample Size: All children fulfilling the inclusion criteria of severe acute malnutrition admitted consecutively in the Department of Paediatrics, Assam Medical College and Hospital Dibrugarh during the study period.

Selection of Study Population: Children diagnosed with Severe Acute Malnutrition, admitted in the Department of Paediatrics, Assam Medical College and Hospital, Dibrugarh.

Selection Of Cases:

Inclusion Criteria:

Children with Severe Acute Malnutrition with age group 6-59 months admitted in the Department of Paediatrics, Assam Medical College Hospital, Dibrugarh during the study period.

Exclusion Criteria:

Children with Immunodeficiency like Primary Immunodeficiency Disorder, HIV etc. Children with prior intake of antibiotics before admission. Congenital neurometabolic diseases (genetic disorder) /cerebral palsy etc. Refusal to give consent

METHOD OF DATA COLLECTION:

The study was started after getting ethical clearance from the Institutional Committee (H) of Assam Medical College and Hospital. Patient's clinical history, particularly the nutritional history, anthropometry and thorough systemic examination was done. Sample collection was done at the time of admission and before starting antibiotics. Blood culture was sent for all patients whereas urine, CSF, sputum/gastric lavage, skin cultures was sent wherever applicable. Blood was obtained for culture by venipuncture after the skin was

cleansed with 70% ethyl alcohol. The choice of method for urine sample collection depends on the age of the child. Under aseptic precautions the urine was collected using mid-stream clean catch technique in children more than 3 years and by catheterization in children less than 3 years of age. Additional samples taken for cultures include wound swabs, CSF, Gastric lavage.

The diagnosis was made based on the standard clinical examinations and laboratory examinations protocols. Antimicrobial susceptibility assessment was performed on all bacterial isolates using Kirby-Bauer disk diffusion method for locally available antibiotics. The susceptibility testing was done based on the standards published by the clinical laboratory standard institute.

Consent:
Informed written consent was taken from the parents or guardians of the patients after explaining about the purpose of the study.

Statistical Analysis:
Data were presented as frequency and percentages. Pictorial presentation was also done using bar diagram and pie diagram. Analysis were performed using Microsoft excel 2019.

RESULTS:
During this period, 60 cases were enrolled. Majority of the children were seen between 6-12 months of age with (31.76%), followed by 13-24 months with (21.66%), then the age of 25-36 months with (20%) of cases. Female preponderance is seen with (53%) and males were (47 %) of the total cases.

Tables And Figures:

Table. 1 Number Of Sample Collected In The Study

CULTURE SAMPLE	NUMBER	POSITIVE
Blood	60	17
Urine	60	13
CSF	9	0
Gastric lavage	13	1
Skin(swab)	3	1

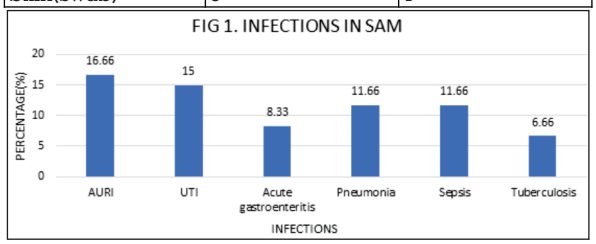

Table .2 Pattern Of Bacterial Isolates

Gram reaction	Type of bacteria	Number	Percentage
Gram positive (n=13)	MRSA	3	23.07
	Staphylococcus Aureus	5	38.46
	Enterococcus faecalis	1	7.69
	CONS	4	30.76
Gram Negative (n=17)	Escherichia coli	8	47.05
	Klebsiella pneumoniae	2	11.76
	Acinetobacter species	2	11.76
	Citrobacter species	3	17.64
	Pseudomonas species	1	5.88
	Proteus mirabilis	1	5.88
Candida (n=2)			

Infections:
The most common infection was acute upper respiratory tract infection 10(16.66%) followed by urinary tract infection 9(15 %), then pneumonia and sepsis with 7(11.66 %) each respectively, acute gastroenterities 5(8.33%) and tuberculosis 4(6.66 %).The most common comorbidity was anaemia 15(25%) followed by congenital heart diseases 6 (10%), seizure disorder and surgical disorder with 3(5%) each.

Bacterial Isolates :
Out of 60 patient, 30 were bacterial pathogens isolated of which 17 were Gram negative and 13 were Gram positive organisms and 2 were Fungal pathogens. 17 cultures were isolated from blood culture, 13 cultures isolated from urine culture, 1 from skin culture and 1 from gastric lavage culture.Table 1

Among the Gram negative organisms isolated *Escherichia coli* 8(47.05 %) was the most predominant followed by *Citrobacter species* 3(17.64%), *Klebsiella pneumoniae*, *Acinetobacter species* 2(11.76%) each *Pseudoescherichia vulgaries* and *Proteus mirablis* 1(5.88%) each respectively .

Among Gram positive cultures *Staphylococcus aureus 5(38.46 %)* was the most predominant followed by *CONS 4*(30.76 %), *Methicillin Resistant Staphylococcus aureus* 3(23.07%) and *Enterococcus faecalis* 1(7.69 %).Table 2

Antimicrobial Susceptibility:
Bacterial isolates shows high level of susceptibility to cotrimoxazole 8(16%), ciprofloxacin and linezolid 5(15.15%) each, followed by gentamycin and tetracycline, doxycycline, amoxiclav and nitrofurantoin 6(12 %) each, amikacin 5(10%). However resistance were also seen to amoxiclav 3(30%), azithromycin 2(33.33%), followed by ciprofloxacin, ceftazidime, nitrofurantoin 2(20%) each respectively, ampicilin and gentamycin 1(10 %) each respectively. Low sensitivity was seen to ampicillin and cefotaxime 3(6 %), vancomycin 2(4 %) followed by clindamycin1(3%) respectively.

DISCUSSION:
We have studied bacterial isolates and antimicrobial sensitivity among 60 children with SAM. Infections and poor nutrition status are intimately linked. Commoness cause of mortality in this children were respiratory infection followed by diarrhoea. Anaemia was the most common associated comorbidity followed by congenital heart disease. The prevalence of bacteraemia is (53.33%) similar to the reported by Jeetendra Kumar Singh *et al* (28%) and across Sub-Saharan Africa in which the prevalence of bacteraemia ranged from (60-70%) in West Africa[6]. In our study Escherichia coli 8(47.05%) was the most predominant organism followed by Staphylococcus aureus 5(38.46 %), CONS 4(30.76%), Methicillin Resistant Staphylococcus aureus 3(23.07%), Klebsiella pneumoniae 2(11.76%), Acinetobacter species 2(11.76 %). Uduak A. Okomo *et al*, the most predominant among Gram negative organism was *Escherichia coli* (35 %)[5] . Alexander M Aiken *et al* E.coli (21%) followed by klebsiella pneumoniae (20 %), acinetobacter species (19 %)[7]. In a study done by Alem Abrha *et al* Staphylococcus species were the predominant cause of bacteraemia (28.6%), CONS species (22.9 %)[7].

Bacterial isolated showed high level susceptibility to cotrimoxazole 8(16%), ciprofloxacin and linezolid 5(15.15%) each. Similarly in study by Alem Abrha *et al,* Umma Abdullahi et al, ciprofloxacin (70%), cotrimoxazole (40 %) and nitrofurantoin (30 %)[7,8]. Resistance was seen to amoxiclav 3(30%), azithromycin 2(33.33%), followed by ciprofloxacin, nitrofurantoin 2(20%) respectively, ampicilin and gentamycin 1(10 %) respectively. In a study done by Alem Abrha *et al* ,Jyoti Sangwan *et al*, the resistance to Cotrimoxazole and Ciprofloxacin (10-30%)[6,9]. Franco Pau *et al* Bahati *et al* , prevalence of resistance (97%-100%) to ampicillin and co-trimoxazole[10,11].

CONCLUSION:
On the basis of this study we conclude that children with SAM

were more prone to infections with both Gram-positive and Gram-negative pathogens as well as fungal infections. Bacteremia was found in (53.33 %) of cases, with Gram negative bacteria being more predominant. The bacterial isolates were resistance to most of the commonly used antibiotics may be due easy accessibility, improper use and abuse in the community, so a current guideline on the choice of antibiotics would be helpful. As malnutrition leads to low immunity and makes the children more prone to infections, patients with SAM need to be properly investigated and treated in order to reduce the potential long-term consequences of poor growth and mortality.

Limitation Of Our St Udy:

- The study was done with a sample size of 60 (n=60), however a larger sample size would have yield more accurate results.
- Stool and sputum culture could not be done in our study.

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Competing Interest: There is no competing interest.

Authors Contribution: All authors in this study contributed to the data collection of the patients.

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