

Clinicoetiological Profile & Outcome of Acute and Persistent Diarrhoea in Under-5 Children with Special Reference to Severe Acute Malnutrition**Jyoti Ranjan Behera¹, Samir Sethi², Sanjaya Kumar Jena³, Debi Prasad Jena⁴, Saroj Kumar Satpathy⁵**^{1,2,3}Assistant Professor, Department of Pediatrics, MKCG Medical College and Hospital, Berhampur, Ganjam, Odisha, India, 760004⁴Assistant Professor, Department of Pediatrics SCB and SVPPGIP SCB Medical College and Hospital, Cuttack, Odisha, India, 753007⁵Professor and HOD, Department of Pediatrics, SCB and SVPPGIP SCB Medical College and Hospital, Cuttack, Odisha, India, 753007

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Corresponding author: Dr. Debi Prasad Jena

Conflict of interest: Nil

Abstract:

Introduction: In children under five, diarrhoea continues to be the second most common cause of mortality worldwide. With between 3 and 5 billion cases and about 2 million deaths annually, diarrhoea is a major worldwide health burden. It is responsible for more than 20% of all paediatric fatalities. In India in 2005, diarrhoea was the cause of 0.3 million of the 2.3 million child fatalities recorded between the ages of one and fifty-nine months. The mortality rate was greater in girls than in boys. Three quarters of all childhood fatalities globally among children under five are caused by diarrhoea, and India leads the list of 15 nations. In India, acute diarrheal illnesses cause 13% of mortality in children under five; in 2009, there were around 11.2 million cases and 1,762 deaths from these illnesses.

Material and Methods: A standardized questionnaire was used to gather data on the residents' address, sex, age and birthdate, socioeconomic situation, prenatal history, and eating habits. In addition to the kind, frequency, and duration of the diarrhoea, additional complaints such as fever and cough were also received. The frequent diseases and co-morbid disorders linked to malnutrition, such as AIDS, TB, malaria, septicemia, pneumonia, and urinary tract infections, were evaluated in the enrolled children. Additionally, a history of chronic illnesses including TB and HIV/AIDS was asked about. Every piece of evidence and conclusion is documented in pre-established Performa, and statistical analysis was done on the data.

Results: A total of 310 SAM patients enrolled in the study between 45 days to 60 month of age during this period of 2years(December 2015 to November 2017). Out of these 90 patients were excluded as per exclusion criteria and 15 patients got LAMA (left against medical advice) during study period. So from the remaining 205 patients 112 cases are presented with diarrhoea, which constitute the study population.

Conclusion: Diarrhoea is one of the leading causes of childhood mortality in India and its association with severe acute malnutrition can contribute mortality and morbidity to the under-fives children. Young age, impaired immunity, poor socio-economic status, lack proper breast feeding and unhygienic feeding practice are the risk factors for a SAM child to develop infectious diarrhoea. Moreover, these factors when associated with malnutrition, the chances of developing chronicity and persistent diarrhoea increases. Acute respiratory tract infection, septicaemia and UTI are common infections encountered in SAM population other than diarrhoea. Acute diarrhoea mostly bacterial and viral in nature & persistent diarrhoea are mostly bacterial and parasitic in nature and it worsens the severity of malnutrition and is a high risk for mortality. This study is a hospital based study and does not truly reflect the burden of disease in the community.

Keywords: Persistent, Diarrhoea, Malnutrition.

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Introduction

Diarrhoea remains the second leading cause of death among children under 5 globally [1]. The global annual burden of diarrhoea is huge, involving 3-5 billion cases and approximately 2 million deaths a year. It accounts for over 20% of all deaths in under-5 children [2]. Diarrhoea

accounted for 0.3 million of over 2.3 million deaths of children between 1 and 59 month of age reported in India in 2005, with higher mortality rates in girls than boys(3). Fifteen countries contribute three quarters of childhood deaths due to diarrhoea in children under five years of age worldwide out of

which India ranks first [4]. In India acute diarrhoeal diseases lead to 13% deaths in under five age group, during the year 2009, about 11.2 million cases with 1,762 deaths were reported [5]. Malnutrition is a major public health problem with socio-economic consequences.

It is one of the leading causes of morbidity and mortality in children globally. Severe acute malnutrition is a major cause of death in children under 5, and its prevention and treatment are critical to child survival and development. It is estimated that severe acute malnutrition accounts for 2 million deaths annually [6]. Globally, 35% of death among children under -5 is related to malnutrition [7]. Severe acute malnutrition & diarrhoea are major causes of morbidity and mortality among children in developing world [8]. When SAM and diarrhoea are coincident, they place the child at increased risk of death and disability. A mutually causative interaction between them has been proposed in which diarrhoea is believed to precipitate and exacerbate malnutrition while malnutrition predisposes to diarrhoea. Observation suggest that poor socioeconomic and unsatisfactory environmental conditions and socio-cultural factors that are associated with poverty might be responsible for the observed higher incidence and severity of infectious diseases in malnourished children whose susceptibility to infection, diseases is per se increased by altered host resistance mechanism. Diarrhoea remains the major cause of hospitalisation (67.3%) among severe acute malnourished child [9]. Children with severe acute malnutrition have a higher prevalence of gut barrier dysfunction and a higher mortality rate from invasive infection than well-nourished children.

The case fatality rate is highest among children aged 6-12 months because at this age the immune system is not yet fully mature, maternal antibodies are waning, and the foods introduced to complement breastfeeding may be contaminated. Around 16% of all diarrhoeal cases in severe acute malnutrition are reported to be persistent [10].

Risk factors that were associated with persistent diarrhoea and malnutrition included low family income, low education of mothers, unhygienic conditions, absence of exclusive breastfeeding, child eating food from floor, not feeding recommended weaning foods, and lack of knowledge by mother.

Materials & Methods

This study conducted as prospective observational study of patients with acute severe malnutrition admitted to the department of Paediatric in S.C.B medical college & Hospital and SVPPGIP Cuttack during the period of December 2015 to November 2017.

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Study Area: The study was conducted at SCB Medical College and SVPPGIP which is one of the referral hospitals in Odisha. It serves as a zonal referral, research and teaching hospital, located in the Central part of Odisha. Being a tertiary care hospital, it caters all the districts of the state of Odisha.

Study Period: December 2015 to November 2017.

Study Population: During the study period (December 2015 to November 2017) children aged 45 days to 59 months presented with diarrhea, admitted in pediatric ward at SCB Medical College and SVPPGIP, were screened for their nutritional status and those found to have severe acute malnutrition were included in this study.

Inclusion Criteria:

Children from 45 days to 59month of age with acute and persistent diarrhea with severe acute malnutrition satisfying following criteria were included.

- Weight-for-height less than -3 SD(WHO/NCHS median height)
- and/or
- Visible severe wasting and/or
- Mid arm circumference (MUAC) < 11.5 cm and/or
- Bilateral pedal edema

Exclusion Criteria:

- Children <45days and >60month
- Critically sick children who needs admission in ICU or HDU.
- Children with congenital malformation.
- Children with secondary malnutrition due to cardiac, respiratory, neurological, hepatic, mental retardation, cerebral palsy, metabolic or genetic disorders.

Sampling Technique: The sampling technique used was a sampling without replacement, which by definition, refers to inclusion of all the sample elements only once.

Sampling Procedure: All children aged 45 days to 59 months presented with acute and persistent diarrhea admitted, were screened in order to determine their nutritional status. Those patients having severe acute malnutrition were screened. For children who met the inclusion criteria and none of the exclusion criteria, their parents/caretaker were given a written informed consent and enrolled in the study. Convenient serial sampling method was used to enroll in admitted children.

Demographic Details and Clinical Information:

A detailed history of all cases was taken giving due importance to the nutritional history, duration and frequency of motion, socioeconomic status of

parents, history of contact with TB, past history of diarrhea and other infectious diseases. A detailed history of birth, family order, duration of breast feeding, immunization, weaning and duration of illness were taken. In all cases a thorough general examination and systemic examination was carried out along with different anthropometric measurements expressed in standard deviation from the median of the reference population standards (NCHS). In all cases attention was given to search for clinical evidence of associated infections.

Information regarding the place of residence, sex, age and date of birth, socio economic status, perinatal history, feeding practice was collected using a structured questionnaire. Diarrhea in terms of nature, frequencies and duration were considered, other complains like fever and cough were also reported. Enrolled children were screened for the common illnesses and co-morbid conditions associated with malnutrition which included; Urinary tract infection, pneumonia, septicemia, TB, malaria and AIDS were assessed. History of chronic diseases such as HIV/AIDS and TB was also enquired. All the evidences and

finding are recorded in predefined Performa and data were analyzed statistically.

Clinical Examination: Thorough general and systemic examination was done, and vital signs were taken. Assessment of nutritional status, degree of dehydration, presence of shock, acidosis and other associated systemic illnesses done by systemic examination. Diagnosis of under-nutrition was based on weight/height or length, presence of oedema, visible severe wasting and MUAC as explained below.

Results

A total of 310 SAM patients enrolled in the study between 45 days to 60 month of age during this period of 2years(December 2015 to November 2017). Out of these 90 patients were excluded as per exclusion criteria and 15 patients got LAMA (left against medical advice) during study period.

So from the remaining 205 patients 112 cases are presented with diarrhoea, which constitute the study population.

Table 1: Prevalence of Diarrhoea in the Sam Children

Total no of SAM Population included	No of SAM Patients With Diarrhoea	SAM Patients without Diarrhoea
205	112(54.6%)	93(45.3%)

Out of total 205 studies population admitted within 2 year of study period, 112 SAM patients having clinical features of diarrhoea, which is 54.6% of total study population.

Table 2: Sex Distribution of Study Population

Sex	Frequency	Percentage	P Value
Male	62	55.3	>0.05
Female	50	44.6	
Total	112		

In this study male child constituted 55.3% and female child constituted 44.6% with male to female ratio is 1.24 .

Table 3: Age Variation of Study Population

Age group in years	Frequency	Percentage
< 1	52	46.4
1-3	34	30.3
3-5	26	23.2
Total	112	100.00

In this study children aged 6 less than 1 year were 46.4% of total study population, children aged more than 1 year to to 3 year 30.3% and children aged more than 3 year to 5 year constituted 23.2% of total study population. The median age of presentation was 12 month.

Table 4: Socioeconomic Variation in the Study Population

Type	Upper	Upper Middle	Lower Middle	Upper Lower	Lower
Frequency	2	4	15	63	28
Percentages	1.7%	3.5%	14.2%	56.2%	25%

In this study population of 112 SAM patient, most were from upper lower class 56.2% followed by lower class 25%, which is followed by lower middle class 14.2%. children from both upper middle and upper class are very low which is 3.5% and 1.7% respectively.

Table 5: Distribution of the Study Population as Per Place Living

Place	Frequency	Percentage	P value <0.05
Rural	89	79.4	
Suburban	16	14.2	
Urban	7	6.2	
Total	112		

In this study most of the patients were from rural areas i.e., 79.4% and only a small proportion of the study population were from suburban and urban i.e., 14.2% and 6.2% respectively.

Table 6: Distribution of the Study Population as Per Immunisation Status

Immunization Status	Frequency	Percentage
Complete	16	14.2
Incomplete	29	25.8
Unimmunized	67	59.8

In this study population only 14.2% of population had completed their immunisation schedule as per age and 25.8% of the study population incompletely immunised as per age and rest 59.8% of the study population were unimmunised.

Table 7: Duration of Exclusive Breast Feeding in the Study Population

Duration	Frequency	Percentage	P Value <0.05
Up To 2month	59	52.6	
Up To 6 Month	43	38.9	
More Than 6 Month	10	8.9	

Only 38.9% patients had exclusive breast feeding up to 6 months of age and nearly 52.6% children were exclusively breast fed up to two months of age. Only 8.9% of the study population had breast fed more than 6 month.

Discussion

Diarrhoeal disease is the leading cause of morbidity and mortality in children in developing countries. Diarrhea is the third most common cause of death in under-five children, responsible for 13% deaths in this age-group, killing an estimated 300,000 children in India each year (106). There exists a vicious cycle between diarrhoea and malnutrition. Early exposure to enteropathogens has been associated with malnutrition in children in low-resource settings.

Malnutrition predisposes to diarrhoea through impaired immune defence and diarrhoea worsens the severity of malnutrition. Taking this fact into consideration, our study was conducted on children between 45 days to 59 months who were admitted for diarrhoea having features of severe acute malnutrition with special emphasis on etiology of acute and persistent diarrhoea and their outcome. In this study, total 205 SAM children were included in study population. Table 1 indicated that 112 (54.6%) SAM children are suffering from diarrhoea. Out of which 95 cases (84.8%) were acute diarrhoea and 17 cases (15.1%) were persistent diarrhoea. A similar study carried out by Opintan et al., in 2008, in their study they observed out of 274 malnourished children 170 patients (62%) were having diarrhoea and acute and persistent diarrhoea occurred in 85.3% and 7.6% of total cases, respectively (47). Nzioki et al., in their study in Kenyatta National Hospital on severe

malnourished children found 70.3% children were admitted due to diarrhoea. Japheth A. Opintan et al., (2000) in their study found incidence of acute and persistent diarrhea 85.3% (145/170) and 7.6% (13/170) of total cases, respectively in under-5 children with malnutrition. Table 2 indicates inequality between the sexes with a slight male predominance. Males were more than females (55.6% v/s 44.6%) with a ratio of 1.24. A study by Opintan et al in Ghana in 2008 on prevalence and etiology of diarrhoea in malnourished children aged below 5 years found more males (56.9%) than females. Study by Reddaiah et al., (1991) showed male being more commonly affected with M:F (1.23:1) and study by Shariff et al., (2003) shows male to female ratio is 2:1. In our study extent of diarrhoea in malnutrition were more in male was due to the fact that, this is a hospital based where male patients were more than female, which might be due to the fact that male children are brought to hospital early and are given more importance.

Moreover male child gets more medical attention than female and in rural area parents usually does not seek medical advice for female child. Ritual and social norms are also responsible for it. On analysing the age wise distribution of cases, Table 3 shows most of the cases (46.4%) are under 1 year of age, 30.3% children are in between 1-3 year of age followed by 23.2% in between 3-5 year. A study by Brussow et al., in 1620 Ecuadorian children aged less than five years old, concluded that prevalence of diarrhoea varied with the age of the children. 6 – 23 months old showed the highest prevalence.

Bhan MK et al., 1989 in a rural north India study reported highest incidence during infancy followed

by 12 to 23 months period. Deivanayagam N et al., (1993) in their study observed that the mean age of presentation of persistent diarrhoea was 10 months and the median age was 8 months. In a study by Abel H Irena et al., 2011 shows almost a quarter of the enrolled children (99/430) were 6 to 12 months old. The median (IQR) age of the cohort was 17 (12-22) months. KDHS 2008-2009 showed that Diarrhoea prevalence was noted to increase with age, peaking at 6-11 month 30%. Higher frequency of cases in infants may be due to exposure of the infant to infection when a completely a breast fed baby weaned, poor hygiene of feeding bottle and to some extent because of the organism prevalent. The gradual fall in incidence in the later age group is possible due to environment factors and protective immunity to common pathogens due to repeated exposure.

Table 4 shows the socioeconomic status of the study population. Although the cases were distributed into all socioeconomic classes, lower class accounted for greater than 70% of the cases. It is known that diarrhoea and dysentery have higher incidence in lower socioeconomic class which is shown by study in NFHS-2(1998-1999)-2001. Low socioeconomic status is a known risk factor for persistent diarrhoea.

UKM et al. recognised the role of socioeconomic status in persistent diarrhoea. Low income family, low level of education of mothers, unhygienic environment, lack of knowledge by mother about the causes of diarrhoea and foods that prevent malnutrition are inter-related and the net effect of their interaction is higher incidence of diarrhoea in lower socioeconomic status. Table 5 shows, in this study majority of the cases (79.4%) were from rural areas. Ashraf et al., in their study revealed that diarrhoea in malnutrition was more prevalent ($p < 0.01$) in children living in nonindustrial than industrial area (82.8% v/s 17.1%). Most of the children in our study were either unimmunised (59.8%) or partially immunised (25.8%). Shah (109) and Devdas et al. observed that better the socioeconomic and educational status of mothers; better was the immunisation status of children. It is due to the fact that most of the children in our study belonged to rural area and their mother's literacy and socioeconomic status was also low. A substantial proportion of rural parents are unaware of the protective value of immunisation.

Conclusion

- Diarrhoea is one of the leading cause of childhood mortality in India and its association with severe acute malnutrition can contribute mortality and morbidity to the under-fives children.
- Young age, impaired immunity, poor socio-economic status, lack proper breast feeding

and unhygienic feeding practice are the risk factors for a SAM child to develop infectious diarrhoea. Moreover, these factors when associated with malnutrition, the chances of developing chronicity and persistent diarrhoea increases.

- Acute respiratory tract infection, septicaemia and UTI are common infections encountered in SAM population other than diarrhoea.
- Acute diarrhoea mostly bacterial and viral in nature & persistent diarrhoea are mostly bacterial and parasitic in nature and it worsens the severity of malnutrition and is a high risk for mortality.
- This study is a hospital based study and does not truly reflect the burden of disease in the community.

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