Risk factors of persistent diarrhea in children below 5 years of age

M Baidya[1], S Mahmud[2], U K Ghosh[3], D Begum[4], S S Ahmed[5]

Abstract

Background: Persistent diarrhea is a known cause of mortality, morbidity, and malnutrition in developing countries. With recent improvement of rehydration therapy death due to acute diarrhea has been reduced. Though persistent diarrhea accounts for 2-20% of total diarrhea cases, it accounts for 23-62% of all diarrhea related deaths.

Objective: The study was done to identify the risk factors associated with persistent diarrhea in children below 5 years of age.

Methods: This prospective observational study was conducted in the department of Pediatric Gastroenterology, Hepatology and Nutrition of Dhaka Shishu hospital from July 2019 to June 2020. It included 50 children with persistent diarrhea age between 1 month to < 5 years. Detailed history, examination and appropriate investigations were done for all children. Crude odd ratio was calculated for each risk factor by univariate analysis and adjusted odds ratio was calculated by multivariate logistic regression.

Results: Most of the children (52%) were under the age of 6 months to 1 year. Male (84%) were more affected than female (16%). Acute malnutrition was observed in 44% cases; among them severe acute malnutrition was in 40% cases. Unsafe drinking water, severe acute malnutrition, diarrhea within past 2 months, bottle feeding, persistent of dehydration more than 24 hours, feeding of cow's milk, lack of exclusive breast feeding, prior antibiotic used, UTI, LRTI were statistically significant risk factors by univariate analysis. Unsafe drinking water (OR-1.6; 95% CI- 0.27-2.78), severe acute malnutrition (OR-1.92; 95% CI-0.64 - 5.72), Feeding of cow's milk (OR-3.90; 95% CI- 1.21-12.49), lack of exclusive breastfeeding (OR-5.77; 95% CI- 1.44- 23.10), irrational use of antibiotics (OR-3.37; 95% CI-1.01- 11.38), LRTI (OR-1.16; 95% CI- 0.49- 1.53) were found to be independent risk factors by multivariate logistic regression analysis.

Conclusions: The results of this study concluded that use of unsafe drinking water, severe acute malnutrition, feeding of cow's milk, lack of exclusive breastfeeding, irrational use of antibiotics are significant risk factors for the incidence of diarrhea in the present study population.

Key words: Persistent diarrhea, risk factors, children under 5 years of age

[1] Dr. Madhabi Baidya
Assistant Professor
Dept. of Pediatric Gastroenterology
Hepatology and Nutrition
Dhaka Shishu Hospital

[2] Dr. Salauddin Mahmud
Associate Professor

[3] Dr. Uzzal Kumar Ghosh
Assistant Professor
Dept. of Pediatrics
Khwaja Younus Ali Medical
College and Hospital

[4] Dr. Dilruba Begum
Professor & Head
Dept. of Physiology
Dhaka Medical College

[5] Dr. Syed Shafi Ahmed
Professor and Head

2, 5
Dept. of Pediatric Gastroenterology
Hepatology and Nutrition
Dhaka Shishu Hospital

Correspondence
Dr. Madhabi Baidya
Assistant Professor
Dhaka Shishu Hospital
Email: madhabibaidya018@gmail.com

Introduction

Diarrhea is still an important cause of death in the world. Globally, more than 10 million children die each year, of which about 1.5milion die from diarrhea.[1] With recent improvement of rehydration therapy death due to acute diarrhea has been reduced. Though persistent diarrhea accounts for 2-20% of total diarrhea cases, it accounts for 23-62% of all diarrhea related deaths.[2,3] Persistent diarrhea is a commonly observed heath problem both in Bangladesh and all over the developing countries. It is a known cause of childhood mortality, morbidity, and malnutrition in developing countries.[4] About 3% to 20% of acute diarrhea persists and lasts for

more than 14 days and remain as persistent diarrhea. The case fatality rate for persistent diarrhea is 14% compared to 1% for acute diarrhea.[5]

Many risk factors are associated with the incidence of persistent diarrhea. They include age of the children, nutritional status, immunological status, previous infections such as acute diarrhea, non-enteric infections, and use of antibiotics, introduction of animal/artificial milk, lactose intolerance and bacterial infections.[5,6] The management of persistent diarrhea includes dietary manipulation, therapy coexisting deficiency states, dehydration, and electrolytes imbalance if present and

antimicrobial treatment if incidence was due to microbes.

Therefore, this study was conducted to study the clinical profile and risk factors associated with persistent diarrhea.

Methods

This prospective observational study was conducted in the department of Pediatric Gastroenterology, Hepatology, and Nutrition of Dhaka Shishu Hospital from July 2019 to June 2020. It included 50 children with persistent diarrhea age between 1 month to <5 years. Diarrhea lasting in a child for more than 14 days was considered persistent diarrhea. A detailed history regarding the duration of diarrhea, nature of stools, irrational use of antibiotics, previous history of immunodeficiency state like measles, feeding practices, use of ORS, lack of exclusive breastfeeding, use of unsafe drinking water, immunization status was elicited and documented in a proforma. Anthropometric measurements including height, weight, mid upper arm circumference was also recoded. Z score for 'weight for length/ height' was calculated based on NCHS growth chart. The

children were subjected to detailed clinical examination to assess dehydration, malnutrition, ?? enteral infections, and nutritional status. Stools were examined for all children. Associated illnesses like septicemia, pneumonia, and Urinary Tract Infection (UTI) were confirmed by blood culture, chest radiograph and urine culture respectively. Other investigations were done whenever indicated. All cases were treated with appropriate fluids, antibiotics, and diet.

Risk factors were analyzed in two stages. Crude odds ratio was calculated for each risk factors by univariate analysis using chi square or Fishers exact tests and adjusted odds ratio was calculated by multivariate logistic regression using SPSS program. A p value less than 0.05 was considered statistically significant.

Results

A total of 50 children aged 1month to below 5 years with persistent diarrhea were included in the study. General characteristics of the patients were given in Table I.

Table I. General Characteristics of Children with Persistent Diarrhea

General characteristics		Persistent diarrhea n=50
Age	1month -	0 (0%)
	2months - <4 months	4 (8%)
	4months -<6 months	10 (20%)
	6months - 1 year	26 (52%)
	> 1 year – 2 years	6 (12%)
	>2 years – < 5 years	4 (8%)
Sex	Male	42 (84%)
	Female	8 (16%)
Birthweight	Normal	44 (88%)
	LBW	6 (12%)
Nutrition Status	Normal	28 (56%)
	Severe Acute Malnutrition (SAM)	20 (40%)
	Moderate Acute Malnutrition (MAM)	2 (4%)
Type of feeding	Mother's milk	12 (24%)
	Cows' milk	20 (40%)
	Infant milk substitute	16 (32%)
	Animal milk and Infant substitute	2 (4%)
Age of introduction of animal /artificial milk	< 2 months	16 (38%)
	>2 months - 4 months	10 (24%)
	>4 months - d" 6 months	16 (38%)
Immunization history	Present	50 (100%)
	Absent	

Most of the children (52%) were under the age of 6 months to one year. Male (84%) were more affected than female (16%) children.Acute malnutrition was observed in 22 (44%) of the cases. Of them 20 (40%)having severe acute malnutrition and 2(4%) having moderate acute malnutrition. Out of 50 pt. 20 (40%) were fed with cow's milk which is predominant than mother's milk.

Age and sex wise observation of nutrition status in children is given in Table 2. Malnutritionwas common in children between 1 year to 2 years' age (67%). Among males, 43% were malnourished and among females, 50% were malnourished.

Table II : Age and Sex wise distribution of Nutritional Status

		No of cases	No of cases under nutrition	Percentage
Age	<2 months	0	0	0%
	2- < 4 months	4	2	50%
	4 - <6 months	10	8	80%
	6 months - 1 year	26	8	31%
	1 year – 2 years	6	4	67%
	>2 years – < 5 years	4	2	50%
Sex	Male	42	18	43%
	Female	8	4	50%

Age and sex wise observation of previous episodes of diarrhea in children is given in Table III. Previous episodes of diarrhea were common in children in 1 year to 2 years' age group (67%). Female (50%) were more affected than male children (43%).

Table III : Age and Sex wise distribution of previous episode diarrhea inchildren

		No of cases	No of cases with previous episodes	Percentage
Age	<2 months	0	0	0%
	2- < 4 months	4	1	25%
	4 - <6 months	10	5	50%
	6months - 1 year	26	11	43%
	1 year – 2 years	6	2	33%
	>2 years – < 5 years	4	4	100%
Sex	Male	42	18	43%
	Female	8	4	50%

The major risk factors noticed for theincidence of persistent diarrhea in children is shown in Figure 1. Lactose intolerance 28 (58%), Septicemia 14 (29%), Pneumonia 4 (8%) and UTI 2 (4%) were noticed as major risk factors in the study population.
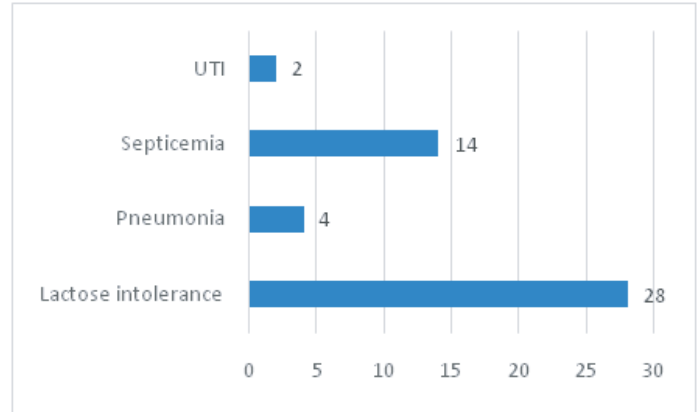

Figure 1 : The major risk factors of persistent diarrhe

Etiologic factors of persistent diarrhea in children of different age group in study population are given in Table IV. In children <6 months of age, 6 months to 1-year lactose intolerance found to be most common. Whereas, septicemia, UTI were common in the age group of 6 months to 1-year age group.

Table IV. Etiological factors of persistent diarrhea in children of different age group in study population

Age	Etiological factors (in Numbers)			
	Lactose intolerance	Pneumonia	Septicemia	UTI
<2 months	0	1	0	0
2-<4 months	4	1	2	0
4 - <6 months	6	2	8	0
6months- d"1 year	10	1	2	2
e"1 year – d"2 years	6	0	0	0
>2 years – < 5 years	2	0	2	0

Characteristic of stool were observed in all 50 cases. Of them watery stool (36%) was most common in persistent cases. Stool characteristics of Mucoid and blood was found in 34 % of the cases.
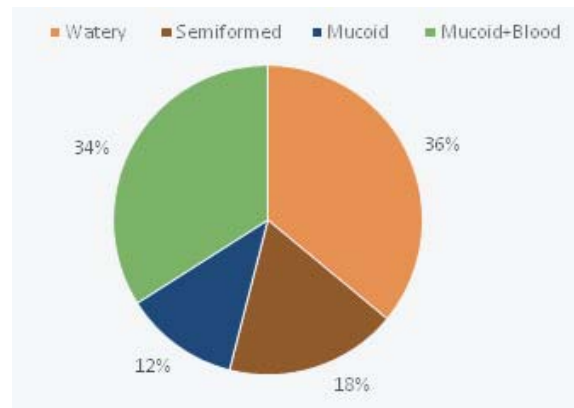

Figure 2 : Characteristics of stool in study population (n=50)

The results from the univariate are presented in Table V. After adjustment for potential confounders, diarrhea among children under 5 years of age group was significantly associated with unsafe drinking water (OR-2.37; 95% CI- 1.03- 5.44), Nutritional status (OR-2.49; 95% CI-1.10 - 5.62), Diarrhea within past 2 months (OR-1.98; 95% CI- 1.12- 3.98), Container used for feeding (OR-1.61; 95% CI- 1.01- 4.76), Persistent dehydration more than 24 hours (OR-1.93; 95% CI- 1.09- 5.31) feeding of cow's milk (OR-2.96; 95% CI- 1.30- 6.76), Exclusive breastfeeding (OR-2.48; 95% CI- 1.05- 5.85), irrational use of antibiotics (OR-2.62; 95% CI- 1.13- 6.09), UTI (OR-4.50; 95% CI- 1.36- 14.87), LRTI (OR-1.92; 95% CI- 1.01- 3.67).

Table V : Univariate Analysis of Risk Factors for Persistent Diarrhea

Risk factors		Persistent diarrhea n=50	P value	Odds ratio (95% CI)
Unsafe drinking water	Yes	26 (52%)	0.041*	2.37 (1.03 -5.44)
	No	24 (48%)		
Nutrition al status	Normal	28 (56%)	0.028*	2.49 (1.10 -5.62)
	SAM	20 (40%)		
	MAM	2 (4%)		
Diarrhea within past 2 months	Yes	22 (44%)	0.017*	1.98 (1.12 -3.98)
	No	28 (46%)		
Container used for feeding	Cup & Spoon	8 (17%)	0.043*	1.61 (1.01 -4.76)
	Bottle	38 (83%)		
Persistent dehydration more than 24 hours	Present	8 (16%)	0.019*	1.93 (1.09 -5.31)
	Absent	42 (84%)		
Feeding of Cow's milk	Yes	20 (40%)	0.010*	2.96 (1.30 -6.76)
	No	30 (60%)		
Lack of Exclusive breastfeeding	Yes	12 (24%)	0.037*	2.48 (1.05 -5.85)
	No	38 (76%)		
Irrational use of antibiotic	Yes	34 (68%)	0.024*	2.62 (1.13 -6.09)
	No	16 (32%)		
UTI	Present	9 (18%)	0.014*	4.50 (1.36 -14.87)
	Absent	41 (82%)		
LRTI	Present	9 (18%)	0.009*	1.92 (1.01 - 3.67)
	Absent	9 (18%)		
Measles within the past 2 months	Present	2 (4%)	0.193	0.78 (0.35 -2.98)
	Absent	48 (96%)		

The factors which were found to be significant by univariate analysis were included for multivariate analysis which is shown in Table VI. Unsafe drinking water (OR-1.6; 95% CI- 0.27- 2.78), severe acute malnutrition (OR-1.92; 95% CI-0.64 - 5.72), Feeding of cow's milk (OR-3.90; 95% CI- 1.21- 12.49), lack of exclusive breastfeeding (OR-5.77; 95% CI- 1.44- 23.10), irrational use of antibiotics (OR-3.37; 95% CI- 1.01- 11.38), LRTI (OR-1.16; 95% CI- 0.49- 1.53) were found to be independent risk factors associated with persistent diarrhea in the children studied. Other's factor found to be insignificant were Diarrhea within past 2 months, Container used for feeding, Persistent dehydration more than 24 hours and UTI.

Table VI. Risk Factors for Persistent Diarrhea in children under 5 years of age multivariate analysis

Persistent Diarrhea	Adjusted odds ratio	P value	95% CI	
Unsafe drinking water	16	0.041*	0.27	2.78
Severe acute malnutrition	1.92	0.025*	0.64	5.72
Diarrhea within past 2 months	1.21	0.524	0.98	3.43
Container used for feeding	1.65	0.098	1.10	5.87
Persistent dehydration more than 24 hours	2.43	0.110	1.54	4.78
Lack of e xclusive breastfeeding	5.77	0.013*	1.44	23.10
Feeding of Cows milk	3.90	0.022*	1.21	12.49
Irrational use of antibiotic	3.37	0.049*	1.01	11.38
Measles within the past 2 months	2.54	0.423	0.40	5.61
UTI	1.29	0.755	0.25	6.63
LRTI	1.16	0.003*	0.49	1.53

Discussion

The total number of children under 5 years of age with persistent diarrhea was 50 in this study. Among them, 14(28%) were within 6 months of age and 26 (52%) were between 6 months to 1 years of age. According to WHO report- persistent diarrhea was common in children aged 1 years of age.[5] Durairaj et al also found their study children between 1 months to 1 years of age had increased incidence of persistent diarrhea.[6]

Persistent diarrhea was observed in male (84%) children and in female (16%) children with male predominance. This was similar to the study done by Durairaj et al.[7] Severe acute malnutrition was observed in (40%) of children whereas moderate acute malnutrition was observed in (4%) cases which was similar to the study of Dutta et al.[7]

In this study Out of 50, 20 (40%) were fed with cow's milk which is predominant than mother's milk. 16 (38%) of the infants started on cow's milk before 2 months of age. WHO reports and Mittal states that early introduction of

animal/artificial milk was a risk factor for persistent diarrhea.[5,8]

Previous episodes of diarrhea were common in children less than 1 years of age (46%) and more common in female child (50%). The observation in the present study goes with the WHO that following an episode of acute watery diarrhea and an episode of persistent diarrhea risk of developing in the forthcoming months increased 2 to 4 fold and 3 to 6 fold respectively.[5]

Mittal in his work, observed lactose intolerance in 23% of cases.[8] In the present study, it was 28% which was high. Lactose intolerance was more common in children less than 1 year of age.

In our study, parenteral infection was found in 41% of cases. Durairaj in his study observed parenteral infection in 44.28% which was almost similar to our study.[6] ARI (30%), UTI (19%) and ASOM (10%) were the main parenteral infections observed by Sibal et al, in their study.[9] Thankar et al, in their study observed UTI in 8% of cases.[10] Septicemia (29%), pneumonia (8%) and UTI (4%) were the main parenteral infection observed in this study.

In the present study some dehydration, severe dehydration and shock were present in 52%, 14% and 8% of cases respectively. In study conducted by Deivanayagam et al and Alam et al, found that persistence of dehydration more than 24 hours was a significant factor for persistent diarrhea.[11,12]

Statistically significant risk factors for persistent diarrhea in children under 5 years of age by multivariate analysis (logistic regression) were Unsafe drinking water, severe acute malnutrition, feeding of cow's milk, lack of exclusive breastfeeding, irrational use of antibiotics. All the above are the independent risk factors for persistent diarrhea that were correlated with studies done by Deivanayagam et al and Alam et al.[11,12]

Conclusion

Present study concluded that persistent diarrhea was common in children under 1 year of age. Risk factors that are strongly associated with persistent diarrhea are Unsafe drinking water, severe acute malnutrition, feeding of cow's milk, lack of exclusive breastfeeding, irrational use of antibiotics.

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