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Original Research Article

Clinical profile and risk factors for persistent diarrhoea in children under five years of age in an urban referral centre

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ABSTRACT

Background: Persistent diarrhoea is a known cause of childhood mortality, morbidity and malnutrition in developing countries. The present study was conducted with the aim to study the clinical profile of persistent diarrhoea in children under 5 years of age and to find the possible host and environmental risk factors associated with persistent diarrhoea.
Methods: The present descriptive study was conducted on 70 children with persistent diarrhoea, between age of 1 month and 5 years who admitted to DTTU, ICH and HC, Chennai during the period from February 2005 to September 2006. Detailed history was elicited from the parents usually mother regarding illness and risk factors were noted. The children were subjected to detailed clinical examination to assess dehydration, malnutrition, parenteral infections, and nutritional status. Univariable and multivariable logistic regression analyses were used to find risk factors associated with the incidence of diarrhoea.
Results: Most of the children (35.71%) were under the age of 6 months to one year. Male (55.71%) children are more affected than female (44.29%) children. Undernutrition was observed in 85.71% of cases. Parenteral infection (44.28%) was noticed as major risk factor among children. *E. coli* was the organism isolated from stool culture in about 73.91% of cases with gut infection. The total fatality rate in the study population was 10%. Multivariable regression revealed significant associations between persistent diarrhoeal disease in children and protein energy malnutrition (OR- 1.812; 95% CI- 1.406-2.335), irrational antibiotic use (OR- 2.414; 95% CI- 1.195-4.877), parenteral infection (OR- 2.275; 95% CI-1.165-4.443) and use of unsafe drinking water (OR- 2.738; 95% CI- 1.221-6.143) and were found to be independent risk factors. Other factors found to be insignificant.
Conclusions: The results of the study conclude that protein energy malnutrition, irrational antibiotic use, use of unsafe drinking water and parenteral infections are the significant risk factors for the incidence of diarrhea in the present study population. Hence, it is important to increase the awareness in parents regarding nutrition and safe drinking water use for children. Prompt diagnosis and appropriate treatment by the doctors can decrease the fatality rates.

Keywords: Children under 5 years of age, Persistent diarrhea, Risk factors

INTRODUCTION

Persistent diarrhea is a known cause of childhood mortality, morbidity and malnutrition in developing countries. About 3% to 20% of acute diarrhea persists and lasts for more than 14 days and remains as persistent diarrhea. The case fatality rate for persistent diarrhea is 14% compared to 1% for acute diarrhoea.[1]

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, use of antibiotics, introduction of animal/artificial milk, lactose intolerance and bacterial infections.[2,3]

The management of persistent diarrhea includes dietary manipulation, therapy of coexisting deficiency states, dehydration and electrolyte imbalance, if present and antimicrobial treatment if incidence was due to microbes.[4]

This descriptive study was conducted with the objective to study the clinical profile of persistent diarrhea in children under 5 years of age and to find the possible host and environmental risk factors associated with persistent diarrhea.

METHODS

This descriptive study was conducted on 70 children with persistent diarrhea, between age of 1 month and 5 years who admitted to DTTU, ICH and HC, Chennai during the period from February 2005 to September 2006.

Detailed history was elicited from the parents usually mother regarding illness and risk factors were noted. The risk factors taken into consideration were protein energy malnutrition, irrational antibiotic use, lack of exclusive breast feeding, container used for feeding, use of unsafe drinking water, parenteral infections, dysenteric stools, persistence of dehydration >24 hours, diarrhea within past 2 months, measles within past 2 months and incomplete immunization.

The children were subjected to detailed clinical examination to assess dehydration, malnutrition, parenteral infections, and nutritional status.

Stools were examined for all children. Parenteral infections such as septicemia, pneumonia, urinary tract infection and HIV infection were confirmed by blood culture, chest X-ray, urine culture and ELISA respectively. Other investigations were done whenever indicated. All the cases were treated with appropriate fluids, antibiotics and diet.

Statistical analysis

Eleven probable risk factors for persistent diarrhea were considered and contribution of each of these was analysed in two stages. Crude odd's ratio was calculated for each risk factor by univariate analysis using Chi square or Fisher's exact test and adjusted odd's ratio was assessed by logistic regression analysis, using SPSS program.

A 'p' value less than 0.05 was considered statistically significant.

RESULTS

A total of 70 children of age under five with persistent diarrhea were included in the study. Socio-demographic characteristics of the patients are given in Table 1. Most of the children (35.71%) were under the age of 6 months to one year. Male (55.71%) children were more affected than female (44.29%) children. Under nutrition was observed in 85.71% of cases. Of them 18 (25.71%) of children were under Grade III protein energy malnutrition (PEM). Out of 70, 38 (54.28%) children were fed with animal/artificial milk before 6 months of age. Dairy milk was the predominant milk provided other than breast milk before 6 months of age (47.37%). 14 (36.84%) of infants were started on animal / artificial milk before 2 months of age.

Table 1: Socio-demographic characteristics of the study population.

Characteristics	No. of cases (n=70)	%
Age		
1-≤6 months	23	32.86
>6months - ≤1 year	25	35.71
>1year - ≤2 years	16	22.86
>2year - <5 years	6	8.57
Sex		
Male	39	55.71
Female	31	44.29
Nutritional status		
Normal	10	14.29
Grade I PEM	14	20.00
Grade II PEM	16	22.86
Grade III PEM	18	25.71
Grade IV PEM	12	17.14
Type of feeding		
Mothers milk	32	45.7
Cow's milk	8	21.05
Infant milk substitute	10	26.32
Dairy milk	18	47.37
Animal milk and infant milk substitute	2	5.26
Age of introduction of animal/artificial milk		
≤2months	14	36.84
>2-≤4months	8	21.05
>4-≤6months	16	42.11

Age and sex wise observation of under nutrition status in children is given in Table 2. Under nutrition were common in children between 6 months and 1 year of age (96%). Among males, 87.18% were undernourished and among females, 83.87% were undernourished.

Out of 70, 26 children (37.14%) suffered from at least one episode of acute watery diarrhea in the past 2 months and 2 children (2.86%) suffered from at least one episode of persistent diarrhea as shown in Figure 1.

Table 2: Age and sex wise distribution of under nutrition in children.

	No. of cases	No. of cases with under nutrition	%
Age			
1-<6months	23	20	86.96
>6months-≤1year	25	24	96.00
>1year-≤2years	16	11	68.75
>2year-<5years	6	5	83.33
Sex			
Male	39	34	87.18
Female	31	26	83.87

Age and sex wise observation of previous episodes of diarrhea in study population is given in Table 3. Previous episodes of diarrhea were common in children under 1 year of age (43.75%). Male children (46.15%) were affected than female children (32.26%).

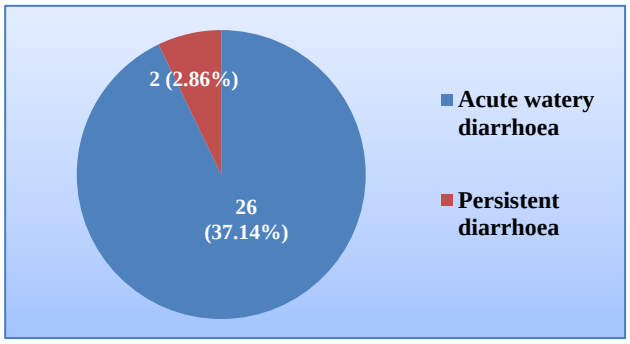

Figure 1: Previous episodes of diarrhea in study population (n=28).

Table 3: Age and sex wise observation of previous episodes of diarrhea in children.

	No. of cases	No. of cases with previous episodes of diarrhea	%
Age			
1-≤6 months	23	9	39.13
>6 months - ≤1 year	25	12	48
>1 year - ≤2 years	16	5	31.25
>2 year - <5 years	6	2	33.33
Sex			
Male	39	18	46.15
Female	31	10	32.26

The major risk factors noticed for the incidence of persistent diarrhea in children is depicted in Figure 2. Secondary lactose intolerance (25.71%), parenteral infection (44.28%), persistent guts infection (32.86%), and HIV infection (5.71%) were noticed as major risk factors in the study population.

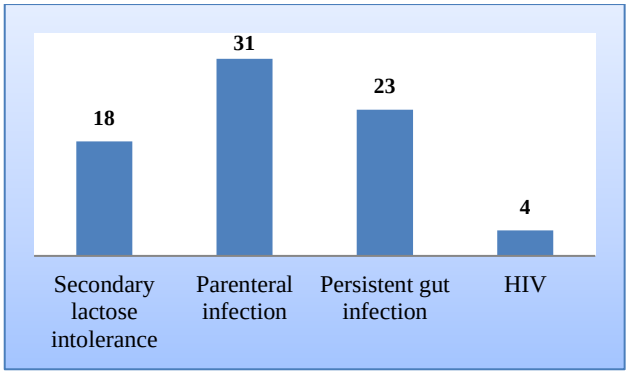

Figure 2: Etiologic factors of persistent diarrhea in study population (n=70).

Etiologic factors of persistent diarrhea in children of different age group in study population are given in Table 4. In children <6 months of age, parenteral infection was found to be responsible for persistent diarrhea in 65.22% cases. Persistent gut infection was present in 48% of cases and secondary lactose intolerance in 40% of cases in children under the age group of >6 months to ≤1 year. HIV infection was present in 12.5% cases of persistent diarrhea in children of age group >1 year to ≤2 years and parenteral infection was present in 31.25% of cases. In children of >2 years to <5 years age group, parenteral infection was present in 66.67% of cases.

Table 4: Etiologic factors of persistent diarrhea in children of different age group in study population.

Etiological factors for different age groups	No. of cases	%
1-≤6 months		
Secondary lactose intolerance	6	26.07
Parenteral infection	15	65.22
Persistent gut infection	4	17.39
HIV	0	0
>6-≤1 year		
Secondary lactose intolerance	10	40
Parenteral infection	7	28
Persistent gut infection	12	4
HIV	0	0
>1 year-≤2 years		
Secondary lactose intolerance	2	12.5
Parenteral infection	5	31.25
Persistent gut infection	5	31.25
HIV	2	12.5
>2-<5 years		
Secondary lactose intolerance	0	0
Parenteral infection	4	66.67
Persistent gut infection	2	33.33
HIV	2	33.33

In male children parenteral infection was found to be responsible for persistent diarrhea in 58.97% of cases whereas in female population persistent gut infection

(29.03%) was noted as the major risk factor for persistent diarrhea as shown in Table 5.

Table 5: major risk factor for persistent diarrhea.

Etiological factors	Males		Females	
	No. of cases, n=39	%	No. of cases, n=31	%
Secondary lactose intolerance	11	28.21	7	22.58
Parenteral infection	23	58.97	8	25.81
Persistent gut infection	14	35.9	9	29.03
HIV	1	2.56	3	9.68

UTI, septicemia, pneumonia and CSOM were the different types of parenteral infections observed in 15.71%, 14.29%, 7.14% and 5.71% of cases of persistent diarrhea. A single case of pyogenic meningitis with persistent diarrhea was observed in the study population (Figure 3).

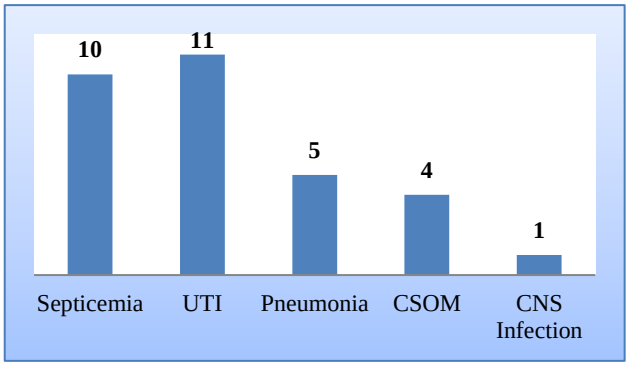

Figure 3: Parenteral infection observed in study population (n=31).

Age and sex wise observation of parenteral infection in study population was given in Table 6.

Table 6: Age and sex wise observation of parenteral infection in study population.

	No. of cases	Septicemia	UTI	Pneumonia	CNS infection	CSOM
Age						
1-≤6 months	23	7 (30.43%)	2 (8.69%)	4 (17.39%)	1 (4.35%)	1 (4.35%)
>6 months-≤1 year	25	2 (8%)	4 (16%)	1 (4%)	0	0
>1 year- ≤2 years	16	0	3 (18.75%)	0	0	2 (12.5%)
>2 year-<5 years	6	1 (16.66%)	2 (33.33%)	0	0	1 (16.66%)
Sex						
Male	39	8 (20.51%)	8 (20.51%)	3 (7.69%)	1 (2.56%)	3 (7.69%)
Female	31	2 (6.45%)	3 (9.68%)	2 (6.45%)	0	1 (2.56%)

In children with age <6 months septicemia and pneumonia were observed in 34.3% and 17.39% cases respectively. In children between 6 months and 1 year of age UTI (16%) and septicemia (8%) were common parenteral infections observed. In children between 1 year and 2 years, UTI and CSOM were present in 18.75% and 12.5% of cases respectively and in children between 2 years and 5 years of age, UTI was present in 33.33% of cases. Among male children, septicemia (20.51%) and UTI (20.51%) were commonly observed whereas in female children, UTI (9.68%) was commonly observed.

Table 7 presents the microorganisms responsible for parenteral infection in study population. *Escherichia coli*, *Klebsiella* and *Pseudomonas* were isolated from urine culture in 63.64%, 27.27%, and 9.09% of cases with UTI respectively. *Klebsiella* was isolated from blood culture in 50% of cases with septicemia. *E. coli* was the organism isolated from stool culture in about 73.91% of cases with gut infection.

Table 7: Microorganisms responsible for parenteral infection in study population.

Microorganisms in different type of parenteral infections	No. of cases (N)	%
UTI	N=11	
Escherichia coli	7	63.64
Klebsiella	3	27.27
Pseudomonas	1	9.09
Septicemia	N=10	
Klebsiella	5	50
Staphylococcus aureus	2	20
Escherichia coli	2	20
Pseudomonas	1	10
Persistent gut infection	N=23	
Escherichia coli	17	73.91
Klebsiella	1	4.35
Candida albicans	2	8.7
Giardia lamblia	3	13.04

Age and sex wise distribution of cases with dehydration and shock in persistent diarrhea cases is given in Table 8. Dehydration was not observed in about 32 (45.71%) cases. Some and severe dehydration was constituted to about 25.71% and 20% of persistent diarrhea cases respectively. Shock was noticed in about 6 cases.

Table 8: Age and sex wise distribution of cases with dehydration and shock.

	No dehydration		Some dehydration		Severe dehydration		Shock	
Age	**Cases**	**%**	**Cases**	**%**	**Cases**	**%**	**Cases**	**%**
1-≤6 months (23)	8	34.78	6	26.09	6	26.09	3	13.04
>6months-≤1 year (25)	13	52	7	28	4	16	1	4
>1year-≤2 years (16)	8	50	4	25	3	18.75	1	6.25
>2year-<5 years (6)	3	50	1	16.67	1	16.67	1	16.67
Sex								
Male (39)	18	46.15	10	25.64	6	15.39	5	12.82
Female (31)	14	45.16	8	25.81	8	25.81	1	3.22

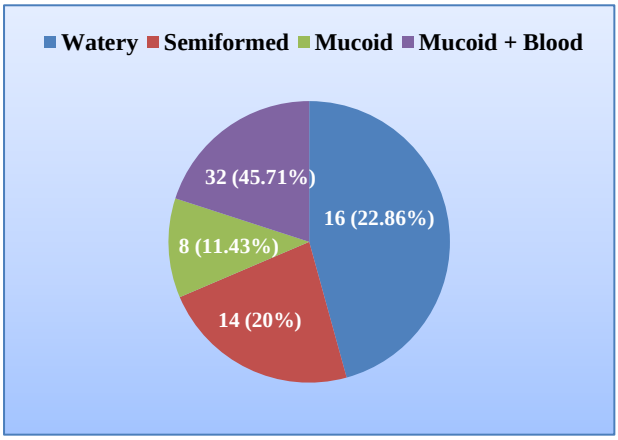

Figure 4: Characteristics of stool in study population (n=70).

Characteristics of stool were observed in all 7 cases. Of them dysenteric and watery stool were observed in 20% and 45.71% of cases respectively as in Figure 4.

Age and sex wise distribution of clinical types of persistent diarrhea in study population was given in Table 9. Severe form of persistent diarrhea constituted about 54.28% of cases. In under 6 months of age, severe form of persistent diarrhea constituted about 65.22% of cases. In children >6 months – 1 year, 1 to 2 years and more than 2 years of age, severe form of persistent diarrhea were present in 48%, 50% and 50% of cases respectively.

Among male children severe form of persistent diarrhea was observed in 53.85% of cases and in female children severe form was observed in 54.84% of cases.

Table 9: Age and sex wise distribution of clinical types of persistent diarrhea in study population.

	Mild		Moderate		Severe	
	Cases	**%**	**Cases**	**%**	**Cases**	**%**
Age						
1-≤6 months (23)	5	21.74	3	13.04	15	65.22
>6 months-≤1 year (25)	3	12	10	40	12	48
>1 year-≤2 years (16)	6	37.5	2	12.5	8	50
>2 year-<5 years (6)	2	33.33	1	16.67	3	50
Sex						
Male (39)	7	17.95	11	28.20	21	53.85
Female (31)	9	29.03	5	16.13	17	54.84

Out of 70 cases, 58 children with persistent diarrhea of age group more than 4 months were given planned diets as shown in Figure 5. Of them 48.27% of cases were managed with Diet A (low milk diet). 36.21% of cases with Diet B (no milk, low starch diet). 15.52% of cases with Diet C (no milk, no starch, no disaccharide diet) and 14.28% of cases had taken partial parenteral nutrition.

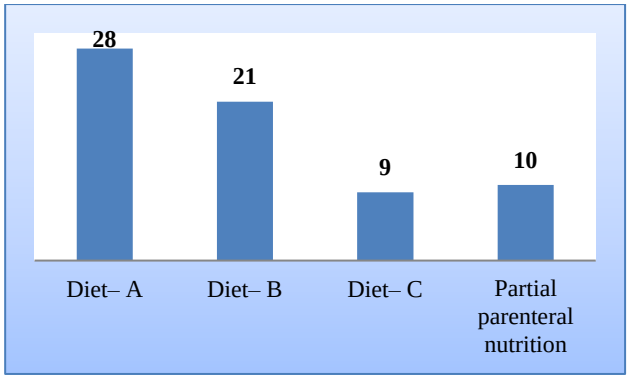

Figure 5: Dietary management of persistent diarrhea in children >4months of age in study population.

Out of 70 Cases, 7 deaths (Male-5, Female-2) were observed. In case with <6 months and 2-5 years of age, fatality rate was about 21.74% and 16.67% respectively. The total fatality rate in the study population was 10% (Table 10).

Table 10: Mortality rate in study population.

Age	No. of deaths		CFR (%)
	Male	Female	
1-≤6 months (23)	4	1	21.74
>6 months-≤1year (25)	0	1	4
>1 year-≤2 year (16)	0	0	0
>2 years-<5 years (6)	1	0	16.67
Total	5	2	10

Table 11: Risk factors for persistent diarrhea in children under 5 years of age– univariate analysis.

Risk factor	Cases		Controls		P value	Odds ratio (95% CI)
	n	%	n	%		
Nutritional status						
Normal	10	14.3	86	41	<0.001	4.16 (2.01-8.58)
PEM	60	85.7	124	59		
Irrational antibiotic use						
Present	56	80.0	117	55.7	<0.001	3.18 (1.67-6.06)
Absent	14	20.0	93	44.3		
Exclusive breast feeding						
Present	32	45.7	137	65.2	<0.01	2.23 (1.29-3.86)
Absent	38	54.3	73	34.8		
Parenteral infection*						
Present	31	44.3	44	21.0	<0.001	2.99 (1.68-5.34)
Absent	39	55.7	166	79.0		
Use of unsafe drinking water						
Present	60	85.7	151	71.9	<0.05	2.34 (1.23-4.88)
Absent	10	14.3	59	28.1		
Container used for feeding**						
Cup and spoon (or) 'Paladai'	25	44.6	65	52	0.451	1.34 (0.68-2.66)
Bottle	31	55.4	60	48		
Dysenteric stool						
Present	14	20.0	65	45.5	0.110	1.85 (0.90-3.79)
Absent	56	80.0	78	54.5		
Persistence of dehydration >24 hours						
Present	14	20.0	15	7.1	<0.001	3.25 (1.48-7.14)
Absent	56	80.0	195	92.9		
Diarrhea within the past 2 months						
Present	28	40.0	70	33.3	0.315	1.33 (0.76-2.33)
Absent	42	60.0	140	66.7		
Measles within the past 2 months						
Present	3	4.3	4	1.9	0.372	2.31 (0.50-10.57)
Absent	67	95.7	206	98.1		
Immunisation appropriate for age						
Present	63	90.0	195	92.9	0.447	1.44 (0.56-3.70)
Absent	7	10.0	15	7.1		

* Septicemia, pneumonia, UTI, CSOM; **Analysis done only for subjects with complete data.

The results from the univariable are presented in Table 11. After adjustment for potential confounders, diarrhoea among children under the age of five was significantly associated with nutritional status (OR- 4.16; 95% CI- 2.01-8.58), irrational antibiotic use (OR- 3.18; 95% CI- 1.67-6.06), exclusive breast feeding (OR- 2.23; 95% CI- 21.29-3.86), parenteral infection (OR- 2.99; 95% CI- 1.68-5.34), use of unsafe drinking water (OR- 2.34; 95% CI- 1.23-4.88) and persistent dehydration for more than 24 hours (OR- 3.25; 95% CI- 1.48-7.14).

Table 12: Risk factors for persistent diarrhea in children under 5 years of age-multivariate analysis.

Risk factor	SE	df	P value	Adjusted OR	95% CI	
					Lower	Upper
Protein energy malnutrition	0.129	1	0.000	1.812	1.406	2.335
Irrational antibiotic use	0.359	1	0.014	2.414	1.195	4.877
Lack of exclusive breast feeding	0.330	1	0.147	1.614	0.845	3.082
Parenteral infection	0.341	1	0.016	2.275	1.165	4.443
Use of unsafe drinking water	0.412	1	0.015	2.738	1.221	6.143
Persistence of dehydration >24 hours	0.493	1	0.057	2.551	0.971	6.704

The factors which were found to be significant by univariate analysis were included for multivariate analysis (Table 12). Protein energy malnutrition (OR- 1.812; 95% CI- 1.406-2.335), irrational antibiotic use (OR- 2.414; 95% CI- 1.195-4.877), parenteral infection (OR- 2.275; 95% CI-1.165-4.443) and use of unsafe drinking water (OR- 2.738; 95% CI- 1.221-6.143) were found to be independent risk factors associated with persistent diarrhea in the children studied. Other factors found to be insignificant were lack of exclusive breast feeding [OR- 1.614 95%; CI-0.845-3.082) and persistence of dehydration >24 hours (OR- 2.551; 95% CI- 0.971 – 6.704).

DISCUSSION

The total number of children under five years of age with persistent diarrhea was 70 during the study period. In present study, persistent diarrhea was common in children of age between 1 month and 1 year (68.57%). Observation in the present study was in favor of the WHO report that persistent diarrhea commonly involved children aged less than 1 year.[1] Dutta et al in their study also concluded that children aged between 7 and 18 months had increased incidence of persistent diarrhoea.[5]

Persistent diarrhoea was observed in 55.71% male children and 44.29% female children, with slight male preponderance. This was similar to the study done by Mbori-Ngacha et al.[6]

Under nutrition was observed in 85.71% of all cases of persistent diarrhea. Grade III protein energy malnutrition was presented in 25.71% of cases and was common in children of age between 6 months and 1 year (96%). In Dutta et al study, Grade II-IV was observed in 70.8% of all cases of persistent diarrhoea.[5] In present study, it was 65.71%. Under nutrition was common in male children (87.18%) when compared to female children (83.87%). This finding was in accordance with the studies of Mittal.[7]

In the present study, 54.28% of children were fed with animal/artificial milk before 6 months of age. Of these 36.84% of children were fed before 2 months and 42.11% fed at age between 4 and 6 months. Dairy milk was the predominant milk provided other than breast milk before 6 months of age (47.37%). WHO reports and study observations of Mittal states that early introduction of animal/artificial milk was a risk factor for persistent diarrhoea.[1,7]

Previous episodes of diarrhea were observed in 40 percent of cases. This was common in children of age under 1 year (43.75%) and was more common in male children (46.15%) than female children (32.26%). The observation in the present study goes with the WHO report that following an episode of acute watery diarrhea and an episode of persistent diarrhea, the risk of developing persistent diarrhea in the forth coming months increased 2 to 4 fold and 3 to 6 fold respectively.[1]

Mittal in his work, observed secondary lactose intolerance in 23% of cases.[7] In the present study, it was 25.71% which was high. Secondary lactose intolerance was observed predominantly in children of age less than 1 year. It was common in male children (28.2%) compared to female children (22.58%). HIV infection was observed in 5.71% of cases. HIV infection was common in female children (9.68%), when compared to male children (2.56%).

Mittal in his study observed parenteral infection in 25.33% of cases.[7] It was high in the present study (44.28%). Parenteral infection was common in children of age less than 6 months and age more than 2 years. ARI (30%), UTI (19%) and ASOM (10%) were the main parenteral infections observed by Sibal et al, in their

study.[8] Thankar et al, in their study observed UTI in 8% of cases.[9] UTI (15.71%), septicemia (14.29%), CSOM (5.71%), pneumonia (7.14%) and CNS infection (1.43%) were the main parenteral infection observed in the present study. *E. coli* (63.64%) and *Klebisella* (50%) were commonly isolated from urine and blood culture of cases with UTI and septicemia respectively.

Jindal et al, in their study observed gut infection in 58.7% of cases4. This was high when compared to present study where we observed gut infection in 32.86% of cases.

Jindal et al also observed, that *E. coli* was responsible for gut infection in 21.4% of cases.[10] In the present study, *E. coli* was isolated from 73.91% of cases with gut infections.

In the present study dehydration was present in 54.29% of cases. Out of which some dehydration, severe dehydration and shock were present in 25.71%, 20% and 8.57% of cases respectively. In study conducted individually by Deivanayagam et al and Alam et al, found that persistence of dehydration more than 24 hours was a significant risk factor for persistent diarrhoea.[11,12]

In present study, dysenteric stool was observed in 20 percent of cases. Deivanayagam et al in their study found that dysenteric stool was a significant risk factor for persistent diarrhoea.[11]

In the present study, severe form of persistent diarrhea was observed in 54.28% of cases. Mild and moderate form of persistent diarrhea was observed in 22.86% of cases individually. Mittal in his work, observed that about one third cases of persistent diarrhea recovered with normal diet and another one third recovered with low lactose foods. About 20-30% children required complete withdrawal of milk and milk products. Those children's were managed with diet like rice pulse oil diet or comminuted chicken diet.[7]

Bhan et al in their study, found that diets providing modest amounts of milk mixed with cereals were well tolerated and in those who failed on such diets were provided carbohydrate as a mixture of cereals and glucose or sucrose which hastened recovery.[13] In the present study, 48.27% of cases were managed with Diet A (low milk diet), 36.21% of cases were managed with Diet B (no milk, low starch diet), 15.52% of cases were managed with Diet C (no milk, no starch, no disaccharide diet), and 14.28% of cases required partial parenteral nutrition.

Mbori–Ngacha et al in their study persistent diarrhea observed case fatality rate of 13.6%. In our study, case fatality rate was 10% in persistent diarrhea cases which was lesser than his study.

Statistically significant risk factors for persistent diarrhea in children under 5 years of age by multivariate analysis (logistic regression) were protein energy malnutrition, irrational antibiotic use, parenteral infection and use of unsafe drinking water. 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]

In contrast to the present study, lack of exclusive breast feeding was an independent risk factor for persistent diarrhea in study done by Karim et al and it was a significant risk factor in univariate analysis but not significant in multivariate analysis in the present study.[14] Lack of exclusive breast feeding was not found to be an independent risk factor in a study done by Alam et al, which correlates with the present study.[12]

CONCLUSION

Present study concluded that persistent diarrhea was common in children under 1 year of age. In parenteral infections, UTI and septicemia were commonly. In such cases, affected children should be managed with prompt and appropriate treatment. Severe form of persistent diarrhea and dehydration occurred in more than half of cases. More than half of persistent diarrhea cases were fed with animal/artificial milk before 6 months of age. The findings of the study indicates that all children should be provided with safe drinking water, exclusive breast feeding up to 6 months with appropriate complementary feeding after 6 months to prevent protein energy malnutrition and risk of persistence of diarrhea.

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