

A HOSPITAL BASED OBSERVATIONAL STUDY TO IDENTIFY THE HOST AND ENVIRONMENTAL RISK FACTORS ASSOCIATED WITH PERSISTENT DIARRHEA IN CHILDREN LESS THAN FIVE YEARS OF AGE IN A TERTIARY CARE CENTER

Fauzia Arif¹, Priyanka Singh¹, Hemangi Koul²

Received : 22/11/2023
Received in revised form : 19/12/2023
Accepted : 07/01/2024

Keywords:

Persistent Diarrhea, Children, Acute Watery Diarrhea, Risk Factors.

Corresponding Author:

Dr. Hemangi Koul,
Email: hemangikoul@gmail.com

DOI: 10.47009/jamp.2024.6.1.274

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (1); 1373-1376



¹Associate Professor, Department of Paediatrics, Jaipur National University Institute for Medical Sciences & Research Center (JNUIMSRC), Jaipur, Rajasthan, India.

²Assistant Professor, Department of Paediatrics, Jaipur National University Institute for Medical Sciences & Research Center (JNUIMSRC), Jaipur, Rajasthan, India.

Abstract

Background: Persistent diarrhoea is an important cause of illness and death in children in developing countries. The risk factors for the development of persistent diarrhoea may be preventable. Therefore, this descriptive / case control study was conducted 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. **Materials and Methods:** A hospital based observational study done on all the children between 1 month to 5 years of age with persistent diarrhoea admitted in JNUIMSRC, Jaipur during one year period. Children between 1 month and 5 years of age with acute watery diarrhoea who had recovered within 7 days and willing to adhere to the study protocol were enrolled as controls. The controls were matched for age and sex with ratio of cases Vs control as 1:3. The total number of cases and controls recruited were 30 and 90 respectively. They were followed up for 14 days from the onset of diarrhoea. The children were subjected to detailed clinical examination to assess dehydration, malnutrition, parenteral infections, and nutritional status. Crude odd's ratio was calculated for each risk factor by univariate analysis using χ^2 or Fisher's exact test and adjusted odd's ratio was assessed by logistic regression analysis, using SPSS program. **Result:** In our study persistent diarrhoea was common in children of age between 1 month and 1 year (66.66%). Statistically significant risk factors for persistent diarrhoea 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. Other risk factors which were not found to be significant by univariate analysis were containers used for feeding [OR (95%CI); 1.32 (0.67 -2.65)] dysenteric stool [OR (95%CI); 1.86 (0.89-3.81)], diarrhoea within the past 2 months [OR(95%CI); 1.32 (0.78-2.34)], measles within the past 2 months [OR (95%CI); 2.33 (0.52-10.59)] and, immunization inappropriate for age [OR (95% CI); 1.45 (0.55-3.72)]. **Conclusion:** We concluded that significant independent risk factors for persistent diarrhoea in multivariate analysis were use of unsafe drinking water, irrational use of antibiotics, parenteral infections and protein energy malnutrition.

INTRODUCTION

Persistent diarrhoea is an important cause of illness and death in children in developing countries. Moreover, as acute diarrhoea is more widely and successfully treated with oral rehydration therapy, the proportion of diarrhoeal deaths associated with persistent diarrhoea have increased. Although there is no consensus on the definition of persistent diarrhoea, most investigators use a working

definition of diarrhoea that lasts for more than two weeks. It is essential to understand different terminologies which have been used in connection with diarrhoeal episodes of longer than 2 weeks duration.

WHO defined simple persistent diarrhoea as episodes of acute diarrhoea lasting more than 14 days duration.^[1] This is the most accepted field definition, and it is estimated that about 3-20% of acute diarrhoeal episodes may become persistent when the

definition of 'passage of 3 or more stools for 14 days or more' is applied. However, field studies indicate that most of these episodes are benign in nature and not affecting general wellbeing and nutrition of the child concerned.^[2]

The reported incidence of persistent diarrhoea varies widely in different regions. In Indian infants 31 episodes per 100 child – years have been reported. In northern India 15% of children aged 0-35 months experienced persistent diarrhoea during one year of surveillance.¹ The peak incidence of persistent diarrhoea occurred in infants less than 1 year of age.^[1,3] Late age peaks have been observed in other countries, but in all studies most episodes occur during the first 3 years of life. No appreciable differences in incidence have been noted between the sexes, but higher rates have been described for either males or females in some settings, presumably reflecting sex-related differences in child – care practices. The seasonal incidence of persistent diarrhoea has not been well defined, but it appears to be greatest during periods when acute diarrhoea occurs most frequently.

The risk of developing persistent diarrhoea was nearly fourfold greater when at least six liquid stools were passed per 24 hours during the initial phase of illness than when the disease was less severe. Two to three fold increased risk of development of persistent diarrhoea when stools during the acute phase contained leukocytes, mucus or visible blood.^[1]

Enteroadhesive E. coli, and Enteroaggregative E.coli. are consistently associated with persistent diarrhoea.^[4] They adhere to the mucosa with a definite pattern of adhesion (Enteroadhesive E.coli). Many of these E.coli. trend to aggregate to each other. The mechanisms of these enteropathogens causing persistent diarrhoea are not known.

Lebenthal et al. considered jejunal mucosal damage as the final common pathway of persistent diarrhoea.^[5] This may be due to accompanying nutritional deficiencies and secondary bacterial environment in the gut or even immune mediated mucosal injury.^[3]

Systemic infection has been shown to be associated with increased gut permeability and the causal relation of systemic infection in persistent diarrhoea is not clear.^[6] Systemic infections present in about 25-33% of these children. Common infections are pneumonia, UTI, Septicemia and even meningitis.

Parasites like G. lamblia and Cryptosporidium have been associated with persistent diarrhoea. Children with depressed immunity, particularly those with AIDS, have higher predilection to persistent diarrhoea. In India, 36-56% of all diarrhoea related deaths among children are related to episodes of persistent diarrhoea.^[1] Viewed another way, the study in northern India showed that although only 5% of all diarrhoeal episodes lasted longer than 14 days, the case fatality rate for such episodes was 14% compared with 0.7% for shorter episodes.^[7-10]

During diarrhoea, growth can slow or stop, especially when food is restricted, and weight loss may occur, unless food intake is increased, there may be little or

no catch-up growth after recovery. This effect is especially marked during persistent diarrhoea, when weight loss may be substantial. Certainly, persistent diarrhoea is an important contributor to protein energy malnutrition; marasmus (and less frequently kwashiorkor) may develop rapidly during such episodes. For surviving children, however, the long-term effect on growth is likely to be stunting, rather than wasting.^[1,8] The risk factors for the development of persistent diarrhoea may be preventable. Therefore, this descriptive / case control study was conducted 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.

MATERIALS AND METHODS

A hospital based observational study done on all the children between 1 month to 5 years of age with persistent diarrhoea admitted in JNUIMSRC, Jaipur during one year period and willing to adhere to the study protocol were enrolled in the study as cases.

Cases: Children with persistent diarrhoea, between age of 1 month and 5 years.

Controls: Children with acute watery diarrhoea who had recovered within 7 days.

Methods: Detailed history was elicited from the parents usually mother regarding illness and risk factors as listed in the proforma. 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, diarrhoea 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.

Children between 1 month and 5 years of age with acute watery diarrhoea who had recovered within 7 days and willing to adhere the study protocol were enrolled as controls. The controls were matched for age and sex with ratio of cases Vs control as 1:3. The total number cases and controls recruited were 30 and 90 respectively. They were followed up for 14 days from the onset of diarrhoea.

If the controls become cases either during hospital stay or follow up or who do not turn up for follow up were excluded from the study and fresh control were recruited.

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 and controls were treated with appropriate fluids, antibiotics and diet.

WHO has defined PEM as a range of pathological conditions arising from coincident lack in varying

proportion of proteins and calories occurring most frequently in infants and young children commonly associated with infections.

Statistical Analysis: Crude odd's ratio was calculated for each risk factor by univariate analysis using χ^2 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

Protein energy malnutrition was present in higher proportion in children with persistent diarrhea (26/30, 86.6%) when compared to children with acute watery diarrhea (53/90, 58.88%). Persistent diarrhoea cases were 4 times more likely to be with protein energy malnutrition when compared to children with acute watery diarrhea.

Irrational antibiotic use was present in higher proportion in children with persistent diarrhoea (24/30, 80%) when compared to children with acute watery diarrhoea (50/90, 55.55%).

Lack of exclusive breast feeding was present in higher proportion in children with persistent

diarrhoea (16/30, 53.33%) when compared to children with acute watery diarrhoea (31/90, 34.44%).

Parenteral infection was present in higher proportion in children with persistent diarrhoea (13/30, 43.33%) when compared to children with acute watery diarrhea (19/90, 21.11%).

Use of unsafe drinking water was present in higher proportion in children with persistent diarrhoea (26/30, 86.66%) when compared to children with acute watery diarrhoea. (65/90, 72.22%).

Persistence of dehydration was present in higher proportion in children with persistent diarrhoea (6/30, 20%) when compared to children with acute watery diarrhoea (6/90, 6.66%).

Other risk factors which were not found to be significant by univariate analysis were containers used for feeding [OR (95%CI); 1.32 (0.67 -2.65)] dysenteric stool [OR (95%CI); 1.86 (0.89-3.81)], diarrhoea within the past 2 months [OR(95%CI); 1.32 (0.78-2.34)], measles within the past 2 months [OR (95%CI); 2.33 (0.52-10.59)] and, immunization inappropriate for age [OR (95% CI); 1.45 (0.55-3.72)] [Table 1].

Table 1: Risk factors for persistent diarrhea in children under 5 years of age—univariate analysis

Risk factor	Cases (N=30)		Controls (N=90)		p - value
	n	%	n	%	
1. Nutritional status					
Normal	4	13.3	37	41.11	<0.001
PEM	26	86.6	53	58.88	
2. Irrational Antibiotic use					
Present	24	80.0	50	55.55	<0.001
Absent	6	20.0	40	44.44	
3. Exclusive breast feeding					
Present	14	46.66	59	65.55	<0.01
Absent	16	53.33	31	34.44	
4. Parenteral infection*					
Present	13	43.33	19	21.11	<0.001
Absent	17	56.66	71	78.88	
5. Use of unsafe Drinking water					
Present	26	86.66	65	72.22	<0.05
Absent	4	13.33	25	27.77	
6. Container used for feeding**					
Cup and Spoon (or) 'Paladai'	13	43.33	47	52.22	>0.05
Bottle	17	56.66	43	47.77	
7. Dysenteric stool					
Present	6	20.0	41	45.5	>0.05
Absent	24	80.0	49	54.44	
8. Persistence of dehydration >24 hours					
Present	6	20.0	6	6.66	<0.001
Absent	24	80.0	84	93.33	
9. Diarrhoea within the past 2 months					
Present	12	40.0	30	33.3	>0.05
Absent	18	60.0	60	66.66	
10. Measles with in the past 2 months					
Present	1	3.33	2	2.22	>0.05
Absent	29	96.66	88	97.77	
11. Immunization appropriate for age					
Present	27	90.0	84	93.33	>0.05
Absent	3	10.0	6	6.66	

DISCUSSION

The total number of children under five years of age with persistent diarrhoea was 30 during the study

period. In our study persistent diarrhoea was common in children of age between 1 month and 1 year (66.66%). Observation in the present study was in favour of the WHO report that persistent diarrhoea

commonly involved children aged less than 1 year. P Dutta et al in their study also concluded that children aged between 7 and 18 months had increased incidence of persistent diarrhea.^[9]

SK Mittal in his work, observed that about one third cases of persistent diarrhoea recovered with normal diet and another one third recovered with low lactose foods. About 20-30% of children required complete withdrawal of milk and milk products. Those children were managed with diet like rice pulse oil diet or comminuted chicken diet.^[3]

Bhan MK 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.^[10]

Statistically significant risk factors for persistent diarrhoea 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. In the present study, protein energy malnutrition (OR: 1.813) as an independent risk factor correlated with studies done by Deivanayagam N et al,^[11] (OR:2.9), Alam S et al,^[12] (OR: 3.08), and Karim AS et al^[13](OR: 7.5).

In the present study, irrational antibiotic use (OR:2.411) was an independent risk factor, which was similar to the studies done by Deivanayagam N et al,^[11] (OR:2.9), Alam S et al,^[12] (OR: 4.65) and Karim AS et al (OR:10.2).^[13]

Parenteral infections (OR: 2.235) was an independent risk factor for persistent diarrhoea in the present study which correlates with study done by Deivanayagam N et al (OR: 2.1).^[11] In contrast to this, study done by Alam S et al the parenteral infection was not a significant independent risk factor.^[12]

Use of unsafe drinking water (OR 4.2) was an independent risk factor for persistent diarrhoea in the study done by Karim AS et al which correlates with the present study (OR: 2.738).^[13]

In contrast to the present study, lack of exclusive breast feeding was an independent risk factor for persistent diarrhoea in study done by Karim AS et al,^[13] and it was a significant risk factor in univariate analysis but not significant in multivariate analysis in the present study. Lack of exclusive breast feeding was not found to be an independent risk factor in a study done by Alam S et al,^[12] which correlates with the present study.

Persistence of dehydration more than 24 hours was an independent risk factor for persistent diarrhoea in study done by Deivanayagam N et al,^[11] including

invasive diarrhoea and also in the study done by Alam S et al.^[12] In contrast to those studies, it was significant risk factor in univariate analysis and not an independent risk factor in Logistic regression analysis.

CONCLUSION

We concluded that significant independent risk factors for persistent diarrhoea in multivariate analysis were use of unsafe drinking water, irrational use of antibiotics, parenteral infections and protein energy malnutrition. Children should continue to be fed during acute diarrhoeal episodes to prevent protein energy malnutrition and risk of persistence of diarrhoea.

REFERENCES

1. World Health Organisation, Report of a WHO meeting: Persistent diarrhoea in children in developing countries. WHO/CDD/88.27 Geneva: World Health Organisation 1988. 2.
2. Bhan MK, Bhandari N, Sazawal S.etal. Descriptive Epidemiology of persistent diarrhoea in rural northern India. Bull WHO 1989; 67(3): 281-290.
3. S.K. Mittal, Chronic Diarrhoea in tropics: Supplement Indian Journal of Paediatrics 1999; 66: S4-S15.
4. Bhan MK, Khushoo V, Sommerfelt H, Entero-aggregative Escherichia coli and Salmonella associated with non dysenteric persistent diarrhoea. Ped Inf Dis J 1989;8: 499-502.
5. Leberthal E. Prolonged Small intestinal mucosal injury as a primary cause of intractable diarrhea of infancy. In: Leberthal E (ed). Chronic Diarrhea. Nestle Nutrition. Raven Press New York 1984; 5-30.
6. Roy SK, Heider R, Tomkins A.M., Effect of systemic infection on intestinal permeability in Bangladeshi children with persistent diarrhoea. In: Lifschitz CH and Nicholas B (eds). Malnutrition is Chronic Diet Associated Infantile Diarrhoea. Academic Press, N.Y. 1990; 385-389.
7. Bhandari N, Bhan MK, Sazawal S. Mortality associated with acute watery diarrhoea, dysentery and persistent diarrhoea in rural north India. Acta Paediatr Suppl. 1992: 381:3-6.
8. World Health Organisation. Diarrhoea management training course manual; guidelines for conducting clinical training courses at health centres and small hospitals, A manual for the treatment of diarrhoea: Geneva: WHO 1990.
9. P. Dutta, M. Lahiri, D. Sen and Sc Pal Prospective Hospital based study in persistent diarrhoea: Gut, vol. 32, 787-790.
10. Bhan MK, Arora NK, Singh K.D. Management of Persistent diarrhoea during infancy in clinical practice: Indian Journal of paediatrics 1991; 58: 769-774.
11. Deivanayagam N, Mala N, Ashok T P, Ratnam SR, Sankaranarayanan, VS. Risk factors for persistent diarrhoea among children under two years of age. Case control study. Indian paediatrics 1990; 36:177-185.
12. Alam S. Admed SH, Lamba LMS. Clinical profile of persistent diarrhoea in a DTTU. Indian Paediatrics 1997; 34: 631-635.
13. Karim AS, Akhter S, Rahman Ma, Nazir KF, Risk factors of persistent diarrhoea in children below five years of age. Indian J gastroenterol 2001 Mar-Apr; 20(2): 59-61.