

Epidemiology and Clinical Characteristics of Children with Persistent Diarrhoea

RR ROY^a, E ROY^b, S SULTANA^c, CA KAWSER^d

Summary

Background: Despite the widespread use of oral rehydration therapy, a substantial number of acute diarrhoeal episodes last for more than 14 days (persistent diarrhoea) is still a problem in developing countries. Early and appropriate management of acute diarrhoeal episodes can decrease persistent diarrhoea (PD). **Objective:** To study the epidemiology and clinical characteristics of persistent diarrhoea in referral cases at a tertiary level hospital. **Methodology:** The study subjects were 53 children between 3-36 months of age who were consecutively admitted, then to the Institute of Postgraduate Medicine and Research (IPGM&R), presently Bangabandhu Sheikh Mujib Medical University (BSMMU), with diarrhoea lasting for >14 days, during June 1988 to December 1989. Data on clinical characteristics on admission and during hospital stay, anthropometry, dietary habit, stool characteristics, duration of hospital stay, socioeconomic status and potential risk factors for persistent diarrhoea and the

management given were collected and documented in structured forms. Bivariate analysis was done using SPSS 10. **Results:** The mean (\pm SD) age was 10.72 (\pm 7.93) months and male:female ratio 2.1:1 ($P<0.05$). Significantly higher number of subjects had inappropriate weaning history (77.4%), second and third degree malnutrition (86%) and came from family size with ≥ 5 members (75%) and monthly income \leq Tk.2000 (70%). Stool character was watery ($P<0.05$), noninvasive ($P<0.01$) and reducing substances present ($P<0.01$) in a significantly higher number of subjects. **Conclusion:** This study has identified important clinical characteristics and risk variables of PD. Early and appropriate management of acute diarrhoeal episodes can decrease (episodes) of PD as well as referral.

Key words: Persistent diarrhoea in children, epidemiology and clinical characteristics, referral cases.

(J Bangladesh Coll Phys Surg 2006; 24 : 105-109)

Introduction:

In the developing countries, diarrhoea still remains a major cause of death in under five children even with widespread use of oral rehydration therapy (ORT)¹. A vast majority of diarrhoeal episodes are acute and self limiting. However, about 320% of acute diarrhoea lasts for more than 14 days and is called persistent diarrhoea (PD)². In comparison to 1% fatality in acute diarrhoea, case fatality rate for PD ranges from 14% to 60%^{1,3}. Malnutrition, immunosuppression, young age, and an increase in the preceding diarrhoea burdens are epidemiologic and clinical characteristics for development of PD. The objective of this study was to identify the epidemiology and clinical characteristics of

PD in referral cases at a tertiary level hospital. Early and appropriate management of a diarrhoeal episode can decrease duration, progression to PD and decrease mortality from the disease.

Methods:

A prospective study was carried out at the Institute of Postgraduate Medicine and Research (IPGM&R), presently Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbagh, Dhaka, from June 1988 to December 1989. This is a tertiary care teaching hospital, well equipped for management of common childhood illnesses referred from all over the country.

This study included 53 consecutively admitted patients with diarrhoea lasting for 14 or more days (WHO definition of PD)² with an acute onset. Detailed history and clinical examinations were done on admission. Data on 24 hr stool frequency, stool characteristics, hydration status and other associated systemic disease conditions were assessed. Anthropometry measurements were done in all subjects, and were categorized as 1st, 2nd or 3rd degree malnutrition following Gomez and Welcome classification⁴. Information on variables thought to be potentially associated with risk of PD was collected.

- a. Dr. Ranjit Ranjan Roy, MBBS, FCPS (Paed), Senior Consultant (Paediatrics), OSD, DGHS
- b. Dr. Eliza Roy, MBBS, DCH, Assistant Scientist, Public Health Division, ICDDR,B
- c. Dr. Sabina Sultana, MBBS, MD (Paed), MD (Paed Neph), DCH, MCPS, Consultant (Nephrology), Bangladesh Medical College
- d. Prof. Chowdhury Ali Kawser, MBBS, FCPS, PhD (UK), Professor of Paediatrics, BSMMU

Address of Correspondence: Dr. Ranjit Ranjan Roy, Email: dder@bangla.net Phone: 0171 5004 079.

These included age and sex of child, household size, monthly family income, housing structure, source of water supply, etc. In addition, data on age at weaning, feeding history during episode of illness, change from normal feeding habits to inappropriate food habits during diarrhoea, and 24 hr calorie intake were also collected. Stool microscopic examination was done in all patients, and culture sensitivity was done in every 4th child. Blood count, culture, electrolyte and chest radiography were done whenever indicated. All findings were recorded in structured forms. Bivariate analysis was done using SPSS 10.

Study definitions

Following definitions were followed at the time of this study:

Diarrhoea was defined as 3 or more liquid stool per 24 hr with or without blood or mucus. Persistent diarrhoea was defined as diarrhoea lasting longer than 14 days. A new diarrhoeal episode was defined as 48 hr diarrhoea free interval between two episodes. More than 20 loose motions per 24 hr irrespective of volume of stool were considered as 'high' purging rate. Presence of red blood cell (RBC), pus cell and macrophage in stool in microscopic examination was considered invasive diarrhoea.

Weight and height for age were calculated as percentile of medial of National Center for Health Statistics (NCHS) standard. Malnutrition in subjects was classified using Gomez and Welcome classification⁴.

Pneumonia was defined as cough, fast breathing, crepitation in lungs with or without radiological evidence. A child was clinically suspected to have septicaemia when the child was lethargic, unable to feed with or without fever. It was confirmed by blood culture. Oral thrush and sclerema were diagnosed by clinical examination of mouth cavity and palpation of skin, respectively.

Weaning started at completion of 5 months and beginning of 6th month was considered appropriate. Consumption of 100-110 kCal/kg/day was considered adequate. Stopping milk feeds, introducing diluted feeding, changing breastfeeding to cow's milk, introduction of sagu, barley at any point from the start of the illness were considered as 'changed' feeding practice.

Family income less than Tk.2000/month was defined as low socioeconomic status/insolvent. Handwashing with soap and water before feeding the child was considered as satisfactory. A family size was considered large when 5 or more members were present.

Results:

Table I shows that 70% subjects belonged to families with low socioeconomic status/insolvent. About 75% subjects belonged to families with household size >5 members. Floor of house was made of mud in 54% families and brick in 46%. Unsatisfactory handwashing pattern was predominant (64.2%).

Table-I

Sociodemographic characteristics (n=53)

Parameters	No.	(%)	P value (Z test)
Members in a family			
<5	13	(24.5)	<0.001***
>5	40	(75.5)	
Socioeconomic status			
Solvent	15	(28.3)	<0.01**
Insolvent/low socioeconomic status	38	(71.7)	
Housing			
Brick walled	24	(45.2)	>0.50 ^{ns}
Other than brick	29	(54.7)	
Source of drinking water			
Municipality	29	(54.7)	>0.50 ^{ns}
Tubewell	24	(45.3)	
Handwashing habit			
Satisfactory	19	(35.8)	>0.50 ^{ns}
Unsatisfactory	34	(64.2)	

The mean (\pm SD) age at referral was 10.72 (\pm 7.93) months (range 3-36 months). Sex distribution showed a male preponderance with male:female ratio of 2.1:1 (Table II). Eighty six percent of the subjects suffered from second and third degree malnutrition. Table II also shows associated illness like pneumonia, septicaemia, sclerema, exophthalmia and oral thrush in admitted cases.

Table-II*Clinical parameters (n=53, unless otherwise mentioned)*

Parameters	No.	(%)	P value (Z test)
Age			
Mean (\pm SD)	10.72 \pm 7.93 months		
Range	3-36 months		
Sex			
Male	36	(67.9)	<0.05*
Female	17	(32.1)	
Degree of malnutrition (n=52)			
First	7	(13.6)	<0.001***
Second/Third	45	(86.5)	
Thrush (oral)			
Present	27	(50.9)	>0.50 ^{ns}
Absent	26	(49.1)	
Sclerema			
Present	9	(17.0)	<0.001***
Absent	44	(83.0)	
Xerophthalmia			
Present	7	(13.2)	<0.001***
Absent	46	(86.8)	
Septicaemia			
Present	18	(34.0)	<0.05*
Absent	35	(66.0)	
Pneumonia			
Present	33	(37.7)	>0.50 ^{ns}
Absent	18	(62.3)	

Watery stool (66%) was more common than dysentery in the studied group. High purging rate was present in 75.5% of the subjects. Reducing substance in stool was present in 71% of the stools. Culture was done in 14 cases; among these, 5 tested positive for bacteria (*Escherichia coli* 4, *Aeromonas sobria* 1) (Table III).

Table-III*Stool characteristics (n=53, unless otherwise mentioned)*

Parameters	No.	(%)	P value (Z test)
Clinical nature of diarrhea			
Watery	35	(66.0)	<0.05*
Dysenteric	18	(34.0)	
Frequency of loose motion (24 hr)			
High (>20)	40	(75.5)	<0.001***
Low (<20)	13	(24.5)	
Microscopic stool character			
Noninvasive	38	(71.7)	<0.01**
Invasive	15	(28.3)	
Reducing substance in stool			
Present	38	(71.7)	<0.01**
Absent	15	(28.3)	
Helminth			
Present	46	(86.8)	<0.001***
Absent	7	(13.2)	
Organism isolated (n=14)			
Yes	5	(35.7)	>0.10 ^{ns}
No	9	(64.3)	

Regarding dietary habit, majority (77.4%) of the cases showed inappropriate weaning practice, which included early and late introduction and addition of poor calorie dense additional food. Calorie intake was low in 86.8% cases, however, unhelpful feeding change was practiced in 34% cases. Dietary manipulation used as an intervention during management in the hospital had an excellent outcome in 96.2% cases (Table IV).

Table-IV*Dietary habits (n=53)*

Parameters	No.	(%)	P value (Z test)
Weaning age			
Appropriate	12	(22.6)	<0.001***
Inappropriate	41	(77.4)	
Calorie intake			
Normal/high	7	(13.2)	<0.001***
Low	46	(86.8)	
Feeding during illness			
Unchanged	35	(66.0)	<0.05*
Changed	18	(34.0)	
Dietary manipulation			
Not required	2	(3.8)	<0.001***
Required	51	(96.2)	

Discussion:

This study documents the clinical, sociodemographic and household characteristics of cases with PD. Majority of the cases came from poor, overcrowded families.

The mean age of cases was 10.7 months, which is similar to other studies^{5, 8}. However, a study from rural Bangladesh and another study on African children observed highest incidence of PD among children under 6 months of age^{9,10}. Higher chances of infection associated with introduction of supplementary food along with ability of child to put things in mouth in this age group may endanger them to a diarrhoeal episode.

The gender disparity with male preponderance in hospital admissions may be due to difference in healthcare seeking practice in poor communities and corroborates with findings of other studies^{10,11}.

Malnutrition, poverty and reduced calorie intake follow a vicious cycle as has been shown in many studies, which is similar to our finding^{5,11, 17}. Malnourished

subjects are immunocompromised and are at risk of infection^{17,19}. Although weaning age was appropriate in 23% subjects, due to lack of proper knowledge of weaning food, 86% subjects had 2nd or 3rd degree malnutrition. Inappropriate weaning habits and malnutrition both contribute to PD¹⁴.

Contaminated surface water, inappropriate handwashing practices are important risk factors for the development of PD^{11,18}. We found no differences between cases consuming water supply from tubewell or municipality. Studies in mid 1990s have shown that pollution of water after collection and during storage makes it unsafe for drinking¹. This could explain PD despite using water from municipal sources thought to be safe. Many of our study cases depended on water supply from common public places near to their residence. Although use of soap has been found to be useful in elimination of many foodborne diseases, we did not see significant difference in handwashing practice using soap or only water among caretakers of study cases.

Many studies have described dysenteric stool as predecessor of PD^{16,19}. In our study, most cases had watery stool but corroborates with a study that described watery diarrhoea as a predecessor for PD¹⁷. The noninvasive stool microscopic character correlates with physical character of watery stool. Studies have shown high frequency of loose motion as an important epidemiological and clinical characteristic^{16,17}. Majority of our study subjects (75%) had high frequency of loose stool (>20/24 hr). Presence of reducing substances is an important finding in stool of PD cases. Studies showed transient secondary disaccharide intolerance²⁰. Not all subjects require withdrawal of milk for management of PD. Change of dietary habit to lactose free diet helps in the management and is needed only in a selective number of cases with PD. Dietary manipulation with locally available food fulfilling recommended daily calorie requirement has been of tremendous success in this study with a very low case fatality (2%). Diet has shown beneficial outcome in other studies as well²¹⁻²⁶.

Conclusion:

We conclude that behavioural changes addressing the risk factors contributing to PD may help to prevent PD and also reduce referral to tertiary level hospitals. The risk factors observed in this study include malnutrition,

poverty, large family, inappropriate weaning practice, inadequate calorie intake, watery diarrhoea, high (>20/24 hr) purging rate and lactose intolerance (acquired, transient). Messages on appropriate weaning practice, use of locally available low cost but nutritious food can help mothers to improve nutritional status of babies and prevent malnutrition which has an important association in patients with PD in developing countries.

References:

1. Bhan MK, Bhandari N, Sazawal S, Clemens J, Levine MM, Kapper JB. Descriptive epidemiology of persistent diarrhoea among young children in rural northern India. *Bull WHO* 1989; 87:281-8.
2. World Health Organization. Persistent diarrhea in children in developing countries. Memorandum from WHO meeting. *Bull WHO* 1988; 66:709-17.
3. Ebrahim GJ. Persistent diarrhea. *J Trop Pediatr* 1990; 36:50-1.
4. Rockville Pike MD. NCHS Growth chart. United States. Public Service. Health Resources Administration. 1976; HRA 76 1120,25,3.
5. Fauveau V, Wojtnaik B, Chakraborty J, Sarder AM, Briend A. The effect of maternal and child health and family planning services on mortality: is prevention enough? *Br Med J* 1990; 301:103-7.
6. World Health Organization. WHO program for control of diarrheal diseases [abstract]. *Indian J Pediatr* 1989; 56:545-8.
7. Bhan MK, Arora NK, Ghai OP, Ramachandan K, Khoskoo V, Bhandari N. Major factors in diarrhea related mortality among rural children. *Indian J Med Res* 1986; 83:9-12.
8. Huttly SRA, Hoque BA, Aziz KMA, Hasan KA, Patwary MY, Rahman MM, *et al.* Persistent diarrhea in a rural area of Bangladesh: a community based longitudinal study. *Int J Epidemiol* 1989; 18:964-9.
9. Griffin PM, Ryan CA, Nyaphisi M, Hargett Bean N, Waldman RJ, Blake PA. Risk factors for fatal diarrhea: a case control study. *Am J Epidemiol* 1988; 128:1322-9.
10. Mitra AK, Rahman MM, Fuchs GJ. Risk factors and gender differentials for death among children hospitalized with diarrhea in Bangladesh. *J Health Popul Nutr* 2000; 18:151-6.
11. Ahmed M, Billoo AG, Murtuza G. Risk factors for persistent diarrhoea in children below five years of age. *J Pak Med Assoc* 1995; 45:290-2.
12. Karim AS, Akter S, Rahman SA, Nazir MF. Risk factors of persistent diarrhoea in children below five years of age. *J Pak Med Assoc* 1995; 45:290-2.
13. Pintoo EA, Barros Filhoade A, Barro MB. Risk factors for persistent diarrhoea in hospitalized children. *Agri Gastroenterol* 1998; 35:126-31.

14. Bhandari N, Bhan MK, Sazawal S, Clemens JD, Bhatnagar S, Khoshoo V. Association of antecedent malnutrition with persistent diarrhoea: a case control study. *Br Med J* 1989; 298:1284-7.
15. Han AM, Sleight A, Vince J, Danaya R, Ogle G. Persistent diarrhoea in children admitted to Port Moresby General Hospital PNG *Med J* 1995; 38:272-7.
16. Deivanayagam M, Mala N, Ashok TP, Ratnam SR, Sankaranarayanan VS. Risk factors for persistent diarrhoea among children under 2 years of age: case control study. *Indian Pediatr* 1993; 30:177-85.
17. Alam NH, Faruque AS, Dewan N, Sarker SA, Fuchs GJ. Characteristics of children hospitalized with severe dehydration and persistent diarrhoea in Bangladesh. *J Health Popul Nutr* 2001; 19:18-24.
18. Baqui AH, Sack RB, Black RE, Chowdhury HR, Yunus M, Siddique AK. Cell mediated immune deficiency and malnutrition are independent risk factors for persistent diarrhea in Bangladeshi children. *Am J Clin Nutr* 1993; 58:543-8.
19. Mahalanabis D, Alam NH, Rahman N, Hasnat A. Prognostic indicators and risk factors for increased duration of acute diarrhea and for persistent diarrhea in children. *Int J Epidemiol* 1991; 20:604-72.
20. Hamilton JR. The effect of malnutrition on gut structure function and healing after diarrhea and malnutrition. In: Walker, Smith and McNeish diarrhea and malnutrition. Kent: Butterworth, 1983: 197-84.
21. Azim T, Islam LN, Sarker MS, Ahmed SM, Hamadani JD, Faruque SM, *et al.* Immune response of Bangladeshi children with acute diarrhea who subsequently have persistent diarrhea. *J Pediatr Gastroenterol Nutr* 2000; 5:528-35.
22. Fauveau V, Henry FJ, Briend A, Yunus M, Chakraborty J. Persistent diarrhoea as a cause of childhood mortality in rural Bangladesh. *Acta Paediatr Suppl* 1992; 381:12-4.
23. Rabbani GH, Teka T, Zaman B, Majid N, Khatun M, Fuchs GJ. Clinical studies in persistent diarrhea: dietary management with green banana or pectin in Bangladeshi children. *Gastroenterology* 2001; 121:554-60.
24. International Working Group on Persistent Diarrhoea. Evaluation of an algorithm for the treatment of persistent diarrhoea: a multicentre study. *Bull WHO* 1996; 74:479-89.
25. Ochoa TJ, Salazar-Lindo E, Cleary TG. Management of children with infection-associated persistent diarrhea. *Semin Pediatr Infect Dis* 2004; 15:229-36.
26. Thanh PW, Ly DT, Dung PT, Le PD. Clinical aspects of acute versus persistent diarrhoea in Ho Chi Minh City, Vietnam. *Acta Paediatr Suppl* 1992; 381:121-2.