Admission to Hospital with Childhood Acute Gastroenteritis in Kuala Lumpur, Malaysia

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SUMMARY

Mortality from acute diarrhoea in developed countries is low, but the morbidity and financial cost remains significant. A one-year prospective, descriptive, non-interventional, hospital-based study of acute gastroenteritis (AGE) was conducted in the year 2002 in the paediatric unit of University of Malaya Medical Centre, Kuala Lumpur, an urban hospital in Malaysia, to determine its morbidity and management. During the study period, 393 children with AGE were admitted, utilizing 0.50% of total patient-bed-day of the hospital. The median duration of symptoms before admission was two days. Seventy-seven percent of patients had consulted family physicians before admission. Anti-diarrhoeal drugs (57%) and anti-emetics (48%) were commonly prescribed, but oral rehydrating solution (36%) was rarely advised. Upon admission, severe vomiting (24%) and severe diarrhea (24%) were not common, while 17% had moderate or severe dehydration. Rotavirus (22%) was the commonest pathogen identified. Electrolyte derangement, secondary septicaemia and chronic diarrhoea were all rare. Eighty-nine percent of patients received intravenous fluid therapy whilst in the hospital. No death was noted. The morbidity and mortality of children with AGE requiring hospital care in this study was low. However, preadmission management and fluid therapy after admission was not ideal. Efforts to encourage better adherence to established management protocol of AGE among family physicians and hospital clinicians should be instituted.

KEY WORDS:
Acute gastroenteritis, Admission

INTRODUCTION

Acute diarrhoeal illness is one of the leading causes of childhood mortality[1]. Acute dehydrating diarrhoea is estimated to cause 2.5 million deaths a year[2], most of which deaths occur in developing countries[3].

In developed countries, the mortality resulting from acute diarrhoea is low, but the morbidity and financial cost due to clinic visits and hospital admission remains significant[4]. In the United States, for example, acute diarrhoea in children accounted for more than 1.5 million outpatient visits, 200,000 hospitalizations, and approximately 300 deaths each year[4].

There have been few studies on the pattern of morbidity among children with severe diarrhoea requiring hospital care[5-7]. In Malaysia, the mortality of severe diarrhoea in children requiring hospital admission was low, with a case fatality rate of 2.1/1000 admissions[8]. Rotavirus and non-typhoidal salmonellae were the most common viral and bacterial pathogens causing severe diarrhoea in children requiring hospital admission [9, 10]. However, there is no comprehensive data on the magnitude of morbidity and mortality in children with severe diarrhoea requiring in-patient care in Malaysia.

MATERIALS AND METHODS

University of Malaya Medical Center (UMMC), an 862-bedded hospital, is located at the periphery of Kuala Lumpur, the capital of Malaysia, and the Department of Paediatrics has six wards with 120 beds.

This is a non-interventional, prospective, descriptive, hospital-based study of childhood acute gastroenteritis (AGE) using a standardized format and questionnaire. The study was approved by the ethical committee of the hospital.

Patients: AGE was defined as acute diarrhoea with frequent loose stool lasting less than 14 days upon admission. All children with AGE admitted to the paediatric wards of UMMC from 1st Jan - 31st Dec 2002 were included in the study. The following patients were excluded: (a) patients with no diarrhoea, (b) history of chronic diarrhoea with symptoms lasting more than 14 days before admission, (c) immunocompromized states e.g. chemotherapy, (d) surgical causes of diarrhoea e.g. acute appendicitis, (e) other systemic infections due to non-enteropathogenic organism e.g. dengue fever.

Data collection: Parents or caregivers of all patients admitted were interviewed after verbal consent was obtained. The following data were collected by direct questionnaire: demography, pre-admission treatment, stool pathogens, fluid therapy including oral and intravenous (IV), duration of hospitalisation and complications. All patients had stool collected for culture and virology studies, wherever feasible. Hospital admission data were obtained from the annual report of the hospital[11].

Definitions: On admission all children were clinically assessed for the presence of dehydration. The degree of dehydration was assessed clinically according to the description in Nelson's Textbook of Pediatrics. The severity of dehydration was evaluated after careful history and physical

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examination, and was classified into none, mild, moderate or severe dehydration[12]. Generally, children with mild dehydration had a history compatible with dehydration but with few physical signs, those with severe dehydration had marked physical signs, while patients with moderate dehydration were somewhere in between[12]. Electrolyte disturbances were defined as follows: (i) hypo- and hypernatraemia serum sodium concentrations of <135 mmol/L and >145 mmol/L, respectively; and (ii) hypokalaemia as a serum potassium level <3.0 mmol/L.

Lactose intolerance and cow's milk protein intolerance were routinely looked for in all children who had watery stools or who had a prolonged course of illness. Presence of stool reducing substance was demonstrated by using the method described by Kerry and Anderson[13]. Lactose intolerance was diagnosed when there was a recurrence of watery stools with the presence of more than 0.5% of reducing substances when the formula containing the offending carbohydrate was fed to the child[14]. Cow's milk protein intolerance was diagnosed clinically when there was a delay in the recovery (continued or relapsing diarrhoea on the re-introduction of milk feeds with or without vomiting and failure to thrive), with recovery after the exclusion of cow's milk from the diet[15]. Prolonged diarrhoea was defined as diarrhoea of more than 14 days duration.

Statistics: Data collected was tabulated into SPSS version 11.0.0. The following statistical tests were used where appropriate: Chi-square test, student's t test, one-way ANOVA and logistic regression.

RESULTS

During the 12-month study period, a total of 427 children with an admitting diagnosis of AGE were admitted to the paediatric wards of UMMC, Kuala Lumpur. Twenty eight patients were excluded as the final diagnosis was not AGE. A further six patients were excluded due to incomplete records. The remaining 393 admissions were included in the study.

AGE in children was responsible for 6% of 6722 total paediatric admissions of UMMC in 2002, or approximately 1% of the total 40,668 admissions of the entire UMMC in 2002. It utilized 1209 patient-bed-days or 0.50% of the total 244,073 patient-bed-days of the entire UMMC in 2002.

Demographic data (Table I): Two hundred and thirty six (61%) of the patients were males, ranging in age from 2 to 139 months (median 36.0 months, mean 29.6 months, S.D. ± 27.5 months). Twenty-nine percent of the patients were infants aged below one year of age.

Pre-admission consultations (Table II): More than three quarters of the patients had pre-admission consultation with 83% being referred by their family physicians.

A total 68% of children were prescribed drugs before hospital admission. The commonest was anti-diarrhoeal drugs (57%). Two children (0.5%) developed paralytic ileus as a result of these anti-diarrhoeal drugs. Both recovered uneventfully. Only one third of patients were given oral rehydration solution.

Clinical features (Table I): The duration of symptoms before admission was brief in most patients, the median duration being two days. Half (50%) had duration of symptoms of two days or less before admission, while 76% had symptoms for less than three days. Vomiting was present in more than 90% of children on admission. However, only 29% had moderate vomiting (5-10 times/day), and 24% had severe vomiting (>10 times/day). Diarrhoea was present in all children on admission (100%). Severe diarrhoea (>10 times/day) was noted in a quarter of patients (24%), while another 38% had mild diarrhoea (< 5 times/day).

Febrile seizures resulting from fever were noted in 21 patients (5.3%). Of these 15 had simple febrile seizure and six had complex febrile seizures. Another child who had underlying epilepsy suffered a breakthrough seizure.

Significant degree of dehydration was not commonly noted on admission. Only 12% had moderate dehydration and 5% had severe dehydration on admission. Two patients (0.5%) had hypovolaemic shock on admission. All children with dehydration were successfully rehydrated with no adverse consequence noted. The commonest electrolyte derangement was hypokalaemia (6%). Derangements of sodium level were uncommon.

There was no significant difference between patients with positive rotavirus detection on the duration of symptom before admission, presence of fever, severity of vomiting or degree of dehydration (Table I). There was, however, a trend for patients with rotavirus gastroenteritis to have a more severe diarrhoea and to be younger, although both of these did not reach statistical significance.

Stool enteropathogens: 288 patients (73% of 393) had their stool tested for enteropathogens. Of these 244 patients had both virological and bacteriological examination, while 11 had only virological examination alone and 33 had microbiological examination. The remaining 105 patients had no stool examinations, the main reasons being cessation of diarrhoea after admission or admission during weekends. Of the 288 patients whose stools were processed in the laboratory, 40% (n=116) had a positive enteropathogen identified, representing 30% of all admissions for AGE. The commonest pathogen identified was rotavirus (n=85, 22% of 393 patients), followed by non-typhoidal salmonellae (n=25, 6%), enteropathogenic *E. coli* (n=2, 1%) and *Ascaris lumbricoides* (n=1, 0.3%).

Fluid therapy: 23 patients (6%), with no or mild dehydration, were admitted for observation and were allowed to continue with their feeding practice. The remaining 370 patients (94%) received rehydration therapy. Eighteen (5%) of these 370 patients were offered ORS alone, 187 (48%) were given IV fluid alone, while another 165 (42%) were given a combination of IV and oral rehydration therapy. One patient who was in hypovolemic shock had the resuscitating fluid administered via intraosseous route at the casualty department.

Of the 260 patients with mild dehydration, 247 (96%) received IV fluid therapy. All patients with moderate or severe dehydration also had IV fluid. ORS was only offered in 126 of these patients, all of whom tolerated the ORS without vomiting.

Table I: Age distribution, clinical features and outcome of 393 children admitted for acute gastroenteritis.

Demography	Total (n=393)		Rotavirus positive (n= 86)		Rotavirus negative (n= 307)		
	n	%	n	%	n	%	p-value*
Age < 1 year	114	29	26	30	88	29	0.07 (a)
1-5 years	224	57	53	62	171	56	
> 5 years	55	14	7	8	48	16	
Duration of symptoms							
1 day	105	27	22	26	83	27	0.59
2 days	90	23	23	27	67	22	
3 days	102	26	24	28	78	25	
≥ 4 days	96	24	17	20	79	26	
Presence of fever							
No	50	13	12	14	38	12	0.69
Yes	343	87	74	86	269	87	
Frequency of vomiting							
No vomiting	37	9	4	5	33	11	0.162
<5 times / day	146	37	28	33	118	38	
5 – 10 times / day	115	29	28	33	115	37	
> 10 times / day	95	24	26	30	69	22	
Frequency of diarrhea							
< 5 times / day	150	38	24	28	126	41	0.08
5 – 10 times / day	149	38	37	43	112	36	
> 10 times / day	94	24	25	29	69	22	
Degree of dehydration							
Not dehydrated	65	17	11	13	54	18	0.19
Mild (5%)	260	66	55	65	205	67	
Moderate (5-10%)	48	12	16	19	32	10	
Severe (>10%)	20	5	4	5	16	5	

* Comparison between rotavirus-positive and negative acute gastroenteritis
(a) < 5 years vs. > 5 years

Table II: Pre-admission consultations and treatments of 393 children admitted for acute gastroenteritis

		n	%
Preadmission consultation	Yes	302	77
	No	91	23
No. of times of preadmission consultations	1	191	49
	2	75	19
	> 2	35	9
Source of referrals (n=302)	General practitioners	252	83
	Private hospitals	6	2
	Others	44	15
Medications prescribed	Anti-diarrhoeal	223	57
	Antipyretics	222	57
	Antiemetics	190	48
	Antibiotics	141	36
	Anti-spasmodics	35	9
	Others *	31	8
	Oral rehydration solution	141	36
	Change of feeding practice	56	14

* Others included vitamin syrups, anti-pyretic suppositories, diazepam, anti-histamines, antacids, or information incomplete. Two children developed paralytic ileus. Both were given anti-diarrhoeal drugs prescribed by general practitioners before hospital admission.

Table III: Complications and outcomes of 393 children admitted for acute gastroenteritis

Electrolytes derangement (n=385)[a]	Hypernatraemia	5	1.2
	Hyponatraemia	4	1.0
	Hypokalaemia	24	6.2
	Hyponatraemia & hypokalemia	1	0.3
Other complications[b]	Secondary lactose intolerance	4	1
	Secondary bacteraemia[c]	2	0.5
	Cow's milk protein intolerance	0	0
	Deaths	0	0

Notes:
a. Serum electrolytes were estimated in 385 children (98% of all admissions).
b. See text for definitions.
c. Blood cultures were performed in 49 patients, 47 were negative. One each was positive for Klebsiella spp.and Enterobacter cloacae. Three lumbar punctures were performed. The cerebrospinal fluid cultures were all negative.

Table IV: The degree of dehydration with intravenous fluid therapy.

Degree of hydration	n	%	IV fluid therapy		% received IV therapy
			No	Yes	
No dehydration	65	17	29	36	55
Mild dehydration (< 5%)	260	66	13	24	96
Moderate dehydration (5-10%)	48	12	0	48	100
Severe dehydration (> 10%)	20	5	0	20	100
Total	393	100	42	351	89

IV: intravenous

Complications and outcome: The median hospital stay was 3.0 days. All patients were discharged uneventfully. Secondary lactose intolerance was uncommon, seen only in 4 (1%) patients. Cow's milk protein intolerance and prolonged course of illness were not seen. No deaths were recorded.

DISCUSSION

In developed countries, the morbidity and mortality of acute diarrhoea is low[5-7]. The present study, conducted in an urban hospital in Malaysia, showed that during the study period of one year, no deaths were recorded among the 393 children who were admitted with acute diarrhoea. In addition, the morbidity resulting from acute diarrhoea was low. Complications of AGE such as severe electrolyte derangement, secondary lactose intolerance, cow's milk protein intolerance and persistent diarrhoea were all rare. Thus, the low morbidity and absence of mortality associated with childhood AGE among Malaysian children in this study was similar to the pattern seen in developed communities[5, 6].

However, this pattern of low morbidity and an absence of mortality may also be partly explained by the fact that children with mild disease were also admitted to hospital. For example, most of children in this study had brief duration of symptoms before admission with 75% having symptoms for three days or less. This was probably due to the urban nature of the study population, where health care is easily accessible.

The family physician was the main source of advice as most patients (77%) had consulted these physicians prior to hospital referral. However, preadmission management prescribed by these physicians was far from ideal. Therapy deemed inappropriate for diarrhoea was commonly prescribed[16,17]. For example, more than half of patients (57%) were prescribed anti-diarrhoeal drugs, while approximately half (48%) were given antiemetics. Oral rehydration solution, the safe and recommended therapy for acute dehydrating diarrhea[16, 17], was rarely prescribed. Similar practices have been noted by other authors[18,19].

Reasons for this poor adherence to established management protocol are many. Among the possible reasons may be ignorance of the family physicians on the presence of diarrhoea management guidelines, personal preference of the physicians, or preference of the parents[20]. Thus education to increase the use of oral rehydration solution should be directed to both family physicians and parents[18].

This study also showed that childhood AGE utilized a significant share of hospital resources. It accounted for more than 0.5% of all total patient-bed-days of the whole hospital. However, not all the patients referred for hospital admission in this study required hospital care. Significant dehydration (moderate or severe dehydration) was only found in 17% of the patients on admission. Reasons for admitting those patients with no or mild dehydration may include parental anxiety or parental preference for hospital care, young age of patients, or inability to tolerate oral feeding. Clear guidelines on criteria for admitting children with AGE may also help to reduce unnecessary hospital admissions. A short-stay ward attached to the casualty unit or alternative care settings designed to provide hospital care for short periods have also been found to be feasible, thereby reducing the number of hospital admissions[21, 22].

The hospital management of AGE after admission in this study was not ideal as well. There was an overuse of IV fluid therapy and under utilisation of oral rehydration therapy. For example, more than half of patients with no dehydration and almost all patients with mild dehydration were given IV fluid therapy. These patients could have been offered oral fluid in the first instance and IV therapy only used when oral therapy was not successful or when there was persistent vomiting[16,17]. Efforts to educate both medical and nursing personnels on the appropriate use of oral fluid therapy in children with acute diarrhoea should be increased.

In conclusion, the morbidity resulting from AGE among Malaysian children in this study was low. No mortality was observed. Both pre-admission management by family physicians and fluid therapy instituted by the hospital clinicians in this group of children with AGE were not ideal. Education of parents and efforts to encourage better adherence to established management protocol of AGE among family physicians and hospital clinicians should be instituted.

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