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Dysentry in children under five year of age: a longitudinal prospective study in primary health care in Indonesia

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ABSTRACT We conducted a longitudinal community-based survey between August 1991 and August 1992 started with a pilot study in May 1991 in two rural villages which involved 497 children aged 0-59 moyths, 58 community health workers(CWHs), 44 community representatives, and 5 health center personnel. The qualitative component was carried out using in-depth interviewss with the mothers, CWHs, and health personnel. It appeared that the three terms for diarrhea used in the community were similar to medical terminology. However the community perception was that only cases of diarrhea with dehydration shpould be referred to the health center (HC) for tretment; bloody diarrhea was not considered to be referred. Through case findings, 168 (33.8%) diarrheal episodes were identied among 141 children (1.2 episodes per child). Twenty-tewo of 168 cases (13.1%) had bloody stool, shigella was isolated in 9 (41%) of these patients. No death occurred in this study. Diagnostic agreement on bloody and watery stool specimens between HC personnel and CHWs was analyzed using data from the 72 stool specimens that were seen by both parties, which showed a kappa coefficient of 0.50. Breast feeding (90%) nand additionalk food (89%) were given during diarrhea in almost all cases. Oral rehydration salts solution was given in 80% odf cases. The study shows that the existing treatment guidelines in the HCs were not properly followed by the health personnel. **[Paediatr Indones 2001; 41:141-148]**

DIARRHEAL DISEASES CONTINUE TO BE AN IMPORTANT cause of death and disease in infants (11.2 deaths per 1000 live births) and in children under five years old (2.8 deaths per 1000) in Indonesia.[1] Although oral rehydration therapy (ORT) has proven to be successful in lowering the morbidity and mortality from dehydrating diarrhea, morbidity and mortality due to dysentery is not lessened by ORT, as it is widely known that dehydration is not the major problem in these cases.[2] It is assumed that dysentery-related mortality is mostly due to shigellosis.[3] Dysentery, which has the same meaning as bloody diarrhea, i.e diarrhea with visible blood in the stool has been used in most community-based studies.[4]

A national survey on diarrhea in Indonesia showed that 15% of children under five suffering from diarrhea had a dysentery-like illness.[5] Dysentery needs to be treated promptly and appropriately to prevent severe complications and possible death; therefore, the ability of mothers or other child care providers to recognize dysentery is essential. Community health workers (CHWs) or health cadres have not been trained in the criteria needed to identify dysentery as intensively as the criteria used to identify dehydration in acute watery diarrhea, a diarrhea which lasts several hours or days,[6] without any blood in their stools. Ethnographic data collected in other Southern Asian countries and the Philippines have found that CHWs do not actively identify dysentery.[7] However, it should

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be possible to identify patients with dysentery, as Stoll et al[8] have shown that visible blood was more common in stools of patients infected with Shigella (51%) or *E histolytics* (39%) than those infected with other agents (6%). Therefore, it should be possible for CHWs to use visible blood in stools as a means of identifying dysentery cases in the community. In the Indonesian Primary Health Care (PHC) system, CHWs are responsible for ambulatory services of nutrition, the control of diarrheal disease (CDD), family planning, maternal and child health (MCH), and immunization in the Integrated Health Posts (Posyandus). "Posyandu" is a health service unit provided by the community and for the community, supported by the health center staff. Majority of the CHWs are women and members of Pendidikan Kesejahteraan Keluarga (PKK) or Family Welfare Education. This was initially introduced by the Ministry of health during the Home Economics seminar held in Bogor, West Java.[9] It renders those above mentioned five basic health programs: family planning MCH, nutrition, immunzation and CDD. Majority are married female between 20-40 years with a primary school education.[9] This movement has been successful in disseminating ORT throughout the PHC system; they therefore might be equally effective in educating mothers and other childcare providers on the recognition of dysentery. The Indonesian PHC system, a central point and strength of this country which has also dealt with acute (mostly watery) diarrhea successfully, will be the system studied. Furthermore, as decentralization of the Indonesian health care system is now being prepared, this study, which is conducted in two communities within the same regional health care system, will not only be useful to Indonesia's local health system policy, but its model and approach will be beneficial to the country as a whole.

To date, ethnographic data in regard to cultural classification of diarrheal disease have primarily been used to establish programs of therapy particularly on acute watery diarrhea emphasizing the use of oral rehydration therapy (ORT). As mortality of this disease has been decreasing dramatically within the last 20 years, this program was considered successful.[4,10,11] Learning from this success, a plan to develop classification and algorithm for dysentery was designed, as this type of diarrhea caused a significant number of deaths due to diarrhea.

Methods

Setting

The study was carried out in a rural area consist of two villages in Klaten regency, Central Java, approximately 40 kilometers east of the study office at the Gadjah Mada University medical school in Yogyakarta. Based on data from the Regency Health Office, these two villages belonged to a group that was reported as having the largest number of diarrheal cases. The two villages were chosen for this study to fulfill the requirements with respect to sample size for the rates of dysentery and the manageability of the area from the medical school. Furthermore, both villages were located at the same distance from the same river, and were considered to have other similarities. This area is mostly inhabited by farmers and peasants, who supplement their income with home handicrafts, such as the production of batik, umbrellas, and woodcarvings.

Design and Subjects

This study was designed as a one-year study that began with an additional three-month pilot study started from May 1991. The study was carried out in the two villages from August 1991 to August 1992. The two villages had a total population of 3,338, and a total of 497 children aged 0 to 59 months were involved in the study. The villages were medically served by a total of 10 Posyandus, 59 volunteer CHWs (30 in one village and 28 in the other), 1 regional Health Center (located in one of the villages), and a supporting Health Center, located in the other village.

Informed Consent

After being well informed about the study, all mothers or other responsible child care givers with children under five in the two villages were asked permission for their children to be enrolled in this study. All agreed to this at the beginning of the study, which made all 497 of the children under five living in the two villages eligible. All the subjects were provided free service by the Health Centers during the study, and particular attention was given to the children with a low nutritional status.

Interviews

In order to avoid confusion due to the words or classification used for dysentery, which might cause misreporting of the total number of diarrheal episodes, local perceptions of the disease were taken into consideration. In-depth interviews were therefore carried out in the two study villages. The interview also covered their health care seeking behaviors, their first aid in treating diarrhea, and their expectation on the treatment of diarrhea/dysentery by the HC staff. After being tested, questionnaires consisting of mainly close-ended questions were used by the CHWs for interviewing mothers during twice-weekly visits.

Community Health Care Workers

Each household with a child under five was visited twice a week by a CHW. Before beginning the study the CHWs were instructed in their study activities by the study investigator team. The training took place in the CHWs local office, using a simple method that gave examples that were repeated by the CHWs, in small groups of 6-8 CHWs with one facilitator. These sessions were also attended by village officers and the wife of the village heads, who were also the chairwomen of the village women association, whose members included the CHWs. During regular monthly meetings at least one study investigator would continue to meet with the CHWs to discuss any problems, and to reinforce their study-related activities (see below). They also spoke on other health topics that were proposed by the CHWs.

During home visits, the CHWs would inquire about the diarrheal status of the children in the home by asking whether there were any change in stool frequency or consistency as diarrhea is defined in this study. When a child was reported by his/her mother and /or defined by a CHW as having diarrhea, the CHW classified the type of diarrhea according to stool appearance as either bloody diarrhea/dysentery, if there was blood in its stool, or watery diarrhea, if there were no blood. Demographic data, the presence of abdominal pain during the illness, appetite (normal, decreased, or absent), and the child's general condition (normal, irritable) were recorded. Abdominal pain was reported by mothers as complaints from their children; in infants, it infants, it was reported by the mothers as seeing them cry differently and giving the impression of pain, mostly from the flexion position of their toes. Any stool passed by a child with diarrhea during a CHW visit was inspected and recorded. Data regarding consistency, volume, color, and the presence of mucus and/or blood was also recorded. Oral rehydration salts (ORS) solution or home-fluid solutions were given to mothers by the CHWs as needed. The type of solution and the volume ingested was also recorded. All this information was recorded on forms for later analysis.

Health Center Evaluation

For the purpose of this study, all diarrhea cases were documented by CHWs and were referred to the relevant HC for examination, diagnosis, and treatment by HC laboratory and medical staff. The health centers guidelines for the treatment of diarrhea are as follows: fluids, especially ORT; feeding and antibiotics for cholera, Shigella dysentery, amoebiasis, and giardiasis. As anti-diarrheal drugs are not recommended,6 these were not given. Despite the availability of these guidelines, all health center staff were trained in these procedures and were instructed to refrain from following other treatment procedures that differed from the recommended guidelines. The importance of not giving antibiotics before the stool specimens were taken was also emphasized.

HC personnel (physicians, midwives, and nurses) took histories, examined the children, and categorized the diarrheal illness as either watery or bloody. Stool specimens, if available, were analyzed for while blood counts (WBC), red blood counts (RBC), and parasites by the HC laboratory technician. All historical and physical examination data and the treatment prescribed by HC personnel were recorded on study forms. During their twice weekly visits, the study nvestigators discussed any problems with the HC staff.

Follow-up

The CHWs followed all diarrheal cases by revisiting the home and interviewing the children's mothers to determine the condition of the child, the course of diarrhea, and whether the treatment prescribed at the HC had been followed. Unimproved cases were referred back to the HC for further care. Unimproved cases were defined as follows: 1) begins to pass a lot of

watery stools; 2) has repeated vomiting; 3) becomes very thirsty; 4) eats or drinks poorly; 5) has persistent high fever; 6) has blood in the stool; or 7) the diarrhea does not get better in three days. Children examined at a HC were considered as having a fever if their temperature was higher than those examined at home, were considered to have a fever if the mother or CHW felt that the children were warmer than usual.

Stool specimens

Stool specimens and/or rectal swabs from children in the study area were collected by a HC-trained laboratory technician, and the specimens were transported to the Gadjah Mada University laboratory for culture within 48 hours. Cultures were plated according to existing laboratory protocols developed for the morbidity and vitamin A "Morvita" study.[12,13] Shigella, Salmonella, and Campylobacter jejuni were identified, and shigella serotyping was also carried out. Shigella was isolated using Salmonella-Shigella agar (Oxoid CM 99) and McConkey Agar (Oxoid CM7). It was incubated at 37oC for 24 hours. Colonies suspicious of shigella (non-lactose fermenting colonies), were identified using Kligor Iron Agar (Oxoid CM 33), Semi solid Sucrose Agar (Difco 0105-01-3), Lysine Iron Agar (Oxoid CM 38) and Motility Indol Ornithine (Difco 0735-01-1). For serotyping, shigella anti serum against polygroups A, B, C, and D (Difco 2834-47, 2836-47 and 2837-47) were used. For sensitivity tests, an agar diffusion disk using Mueler Hinton Agar (Oxoid CM 337) was used.

Data analysis and management

At the end of the study it was found that the incidence of diarrhea in children under five was very low compared to the reported data from the Regency Health Office and even form that of the Health Centers, where this study was conducted. It was then discovered that a dam across the river that passes the two villages had been recently built to control the floods that often occur during the heavy rainy season, and that no flooding had occurred since then. This fact had not been identified during the preparation of the study area; however, as few problems had been encountered during the three-month pilot study, it was decided to incorporate the data gathered during the last 2 months of that (pilot study) period of June and July, so as not to miss cases due to either the dry weather or the dam.

Routine case reports were available for both villages from the CHWs, who kept a small office in the center of each village, in a villager's home. CHWs filled out and left the forms within 24 hours of a home visit. The completeness and validity of the information collected was checked by study investigators or staff twice weekly during random home visits; questionable data were also checked by home visits. To ensure that cases were not missed, the field staff visited all the under five children, and spent additional time with those who had diarrhea. The field staff also checked questionable issues during the meetings with investigators on their visits. Investigators also met and discussed with field coordinators who were available most visits. The field staff in each village checked the CHWs activities on a daily basis, by visiting all of the children under five. Most problems could be identified and reported by those field coordinators.

Descriptive statistics of the distribution of diarrheal episodes per child, and of cases according to age, duration, place, proportion of dysentery among diarrheal cases, and types of health centers treatment (gathered by CHWs using semi-structured ended questionnaires), are contained in the tables. Kappa coefficient is used to assess the degree of agreement in diagnosing bloody diarrhea stools between the CHWs and HC personnel. A Kappa coefficient under 0.40 is considered low, between 0.40-0.70 is moderate, and over 0.70 is good agreement.[14] Statistical analysis was performed using SPSS and EPI INFO (version 6.0).

Results

One hundred and forty-one children in this study suffered a total of 168 diarrheal episodes (1.2 episodes per child) over the 14 months. Seventeen children had 2 episodes, one child had 3 episodes, and one child had 4 episodes in this period of time. Of these episodes, 87% were watery diarrhea, and 13% were bloody; and 2 (9%) out of the 22 cases (9%) of bloody diarrhea became persistent, lasting more than 14 days (Table 1). No deaths occurred during the 14-month study. The nutritional status of the children in the study ranged from 59% (83/141) with normal status, 24.0% (32/133) with mild status, 13.5% (19/141) with moderate status, and 3.8% (7/141) with severe malnutrition.

TABLE 1. DISTRIBUTION OF CASES AS DIAGNOSED BY HC PERSONNEL

Diagnosis	n	%
Watery diarrhea	146	86.9
Bloody diarrhea	22	13.1
Total	168	100.0

Two of 22 cases of bloody diarrhea (9%), one with mild and the other with moderate malnutrition, developed persistent diarrhea.

The clinical and laboratory features of dysentery and watery diarrhea are seen in Table 2. Bloody diarrhea lasted significantly longer than acute diarrhea (7.8 days+6.6) in dysentery (2.9 days +1.1 in watery, p=0.0001). More cases of dysentery showed tenesmus (pain during defecation) compared to watery diarrhea (55% vs 11%, p). Of 109 stool specimen that were cultured, Shigella (sonii and flexneri) were identified in 2 of the 9 cases with bloody stools. Two Salmonella were all isolated in 96 specimens from children with watery diarrhea.

During infancy, dysentery normally accounts for 23% of diarrhea. No dysentery was found in children surveyed under the age of 6 months. Between the ages of 12-17 months, 23% of episodes were bloody diarrhea, and between the 18-23 months, only one child had dysentery.

No dysentery cases were seen between August and December 1991, where the watery diarrhea was also low (Fig.1) . It was still questionable whether there were really no cases of dysentery as the total cases of diarrhea was also low. It was decided then that the data from the two last months of the pilot study (June & July 1991) were to be analyzed (Fig.1). When watery diarrhea increased in May 1992, the incidence of dysentery also increased.

TABLE 3. DIAGNOSTIC AGREEMENT BETWEEN HC PERSONNEL AND CHWS

CWH	HC personnel Watery	Bloody	Total
Watery	63	2	65
Bloody	3	4	7
Total	66	6	72

Observed agreement = 0.93
Change expected agreement = 0.84
Kappa coefficient = 0.58 (05%CI 0.54; 0.75)

TABLE 2. CLINICAL AND LABORATORY FEATURES OF CASES WITH WATERY AND BLOODY DIARRHEAN

	Bloody diarrhrea n=22	Watery diarrhea n=146	p-value
Age (mon)	26±4.5	18±2.6	0.035*
Duration of illness (day)	7.8+6.6	2.9±1.1	0.035*
History:			
abdo,minal pain	17	80	0.079
fever	9	58	0.898
tenesmus	12	16	<0.0001
vomiting	1	35	0.048
Stool microscopy			
WBC>10/HPF	6	0	<0.0001
RBC>10/HPF	6	0	<0.0001

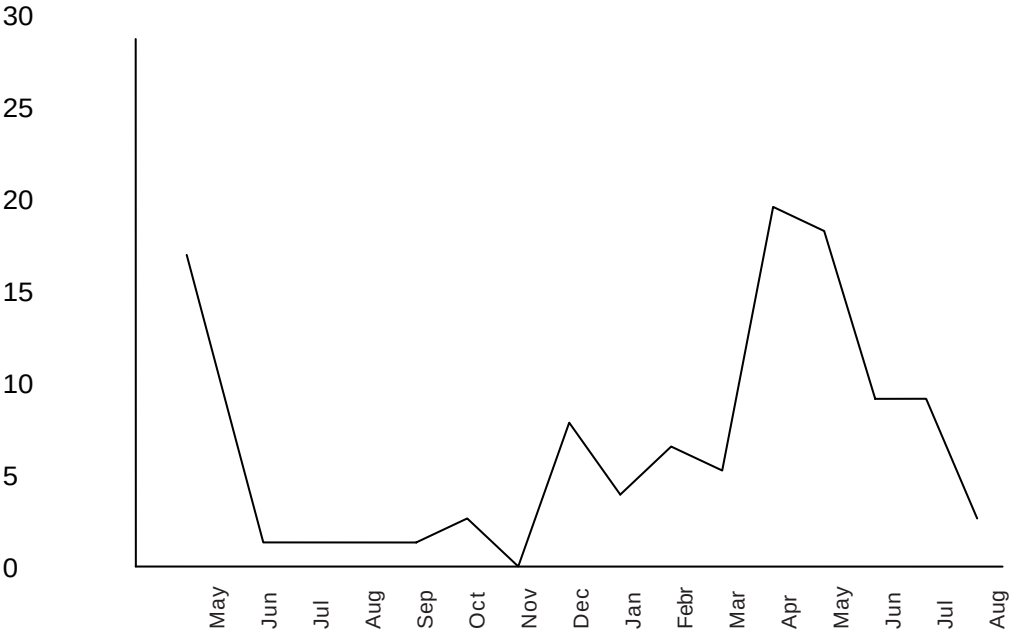

Figure 1. Acute diarrhea and dysentery in children under five years of age in two villages in Central Java, from May 1991 to August 1992.

Table 3 shows the 72 diarrheal cases in which identical stool samples were seen by both the CHWs and HC personnel. They agreed on the identification of 63 cases of watery diarrhea and 4 cases of dysentery. The CHWs identified 2 cases of watery diarrhea that the HC personnel identified as dysentery, and 3 cases of dysentery that the HC personnel called watery, with a Kappa coefficient of 0.58.

Observing the pattern of treatment by the HC personnel revealed that 86% (19/22) of dysentery cases were treated with antibiotics. None of these cases was treated with anti diarrheal agents alone; fourteen percent (3/22) of the dysentery cases were treated with anti diarrheal agents in combination with antibiotics. Furthermore, 70% (84/114) of the watery diarrhea cases were also treated with antibiotics. Antidiarrheal alone were given to 3% of watery diarrhea cases (3/114), while 7% (8/114) of these diarrhea l cases received no drugs at all from the HC staff.

Discussion

Overall, 92% of all cases of diarrhea seen in the HC were unnecessarily treated with antibiotics by HC personnel. Unlike studies mentioned-earlier, Henry et al[15] identified that Shigella, in addition to Seromonas, Giarda and toxigenic E coli were isolated with less frequency in persistent than in acute diarrhea.

The usual method for indicating the extent of clinical diagnostic agreement when there is no gold standard is the Kappa coefficient. This study showed a moderate agreement between the diagnosis of dysentery by CHWs and HC personnel with a Kappa value of 0.58.

Zeitlyn and Islam[16] found that the effectiveness of health education depends on an understanding of the recipients ideas and customs. As dysentery was not considered an infectious disease by the commu-

nities in this study area (published separately), further education about the nature and management of dysentery cases should be seriously considered.

From a review of morbidity and mortality studies of diarrheal disease among children under five in a variety of locations published since 1980[17] the incidence of diarrhea was 2.6 episodes per child per year. Despite differences in the frequency of surveillance, definition of diarrhea, and the duration of the studies, our study showed only 1.2 episodes per child, which is less than half that of the reviewed result. Baqui et al[18] showed a much higher rate of 4.6 episodes of diarrhea per child per year in a rural area of Bangladesh. However, our figure is in line with the report from the Indonesian MOH, that each child had 1 to 2 times diarrhea per year.[19]

The evidence shows that the severity of diarrhea illness is closely related to nutritional status.[20,21] Our study showed that most of the children were in good nutritional status as only 12.8% were severely malnourished. The low prevalence of diarrhea, compared to other reported studies, may be associated with the better nutritional status of these children. Two out of 12 (17%) children with bloody diarrhea, or 2 out of 168 of all diarrheal episodes, were prolonged for more than 14 days. This was extremely low compared to several other studies.[18,22] While there are differences in the frequency of surveillance, definitions used, and the duration of the studies, data collected by Hutly et al[22] showed that 16% of diarrheal cases developed persistent diarrhea, while Baqui et al[18] showed that 34 out of 100 children developed persistent diarrhea. In our study all the children with persistent diarrhea (2) had bloody stools. Baqui et al[18] observed that children with persistent diarrhea were three times more likely to have blood in their stool than children with diarrhea of less than one week. Unlike many other studies, no death occurred in our study, which also suggests that the diarrheal diseases seen in this study were not as severe as those seen in other studies, and that our population was perhaps better nourished. Only 2 cases developed persistent diarrhea, which did not have a normal nutritional status: one was moderate, while the other was mild. This is in agreement with our study, in which bloody diarrhea cases had a longer duration than watery diarrhea. There was no bloody diarrhea from August to December 1991, when a long dry season occurred. The incidence of watery diarrhea was also low during this period. When watery diarrhea reached its peak in May 1992, dysentery also increased.

Vomiting was significantly lower, abdominal pain and tenesmus were significantly higher in bloody diarrhea cases compared to acute watery diarrhea cases. This might be the reason that mothers or care givers were more afraid seeing their children having acute watery diarrhea than bloody diarrhea.

All 22 of the dysentery cases were treated with antibiotics; 3 of these cases were also treated with antidiarrheal drugs. Two of these 22 cases developed persistent diarrhea, and their nutritional status was less than normal. The CHWs were concerned about the 2 cases of persistent diarrhea and reported them to the HC, but the parents of these cases did not return to the Health Centers with their children. These two cases finally recovered after treated with trimetoprim-sulfamethoxasole.

We further noted that folk terminology for dysentery in the study communities were fairly equivalent to the biomedical terminology, which suggest that CHW could become involved in recognizing dysentery cases. This is further supported by the finding that the diagnostic ability of trained CHW moderately agreed with that of the Health Center personnel. In conclusion, the perceptions of the community concerning dysentery is a problem, because it is not regarded as a dangerous disease, which deters them from seeking treatment. Therefore, it is suggested that in developing a diagnostic and management algorithm for bloody diarrhea involving CHWs, the referring of cases to the health center should be optimized for dysentery management. Educational campaigns in the village regarding the risk of dysentery and the need for treatment would also be of benefit.

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