Original Article

Cryptosporidiosis in children less than three years old in Ciliwung Riverside, Kampung Melayu Village, Jakarta, Indonesia

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Abstract

Background *Cryptosporidium* infection is often found in children, especially children below three years old. Many risk factors can affect *cryptosporidiosis* prevalence. At this moment, the prevalence and risk factors of *cryptosporidiosis* in children in Jakarta are unknown.

Objectives To determine the cryptosporidiosis prevalence, clinical manifestations, and risk factors in children below three years old.

Methods This cross sectional study involved 474 subjects between the age of 0 to 35 months in Ciliwung riverside, Kampung Melayu village, from December 2005 until April 2006. Stool specimens were examined using modified acid-fast staining. Nutritional status was measured based on actual body weight over ideal body weight ratio (NCHS-CDC 2000).

Results Cryptosporidium cysts were found in stool sample of 10/474 subject (2.1%). Most of the cases used ground water as a source for drinking and washing. All positive cases lived in houses with bad sanitation, flooded house and 9/10 cases had a crowded household. Cat and mice were the two most frequently found animals around the house. We found five asymptomatic cases and all of the cases were undernourished.

Conclusions The prevalence of cryptosporidiosis in this study is 2.1%. Due to small number of cases no risk factor could be identified. Use of groundwater as a water source, bad sanitation, cat and mice around the house, flooded house, crowded household and undernourishment might be related to cryptosporidiosis prevalence. Half of the infected children were asymptomatic. [Paediatr Indones 2008;48:99-103].

Keywords *cryptosporidium, children, prevalence, risk factor, clinical manifestations*

Parasitic gastrointestinal infection has high morbidity and mortality rate worldwide.[1,2] Indonesia as a tropical and developing country with low economic level is assumed to have a high prevalence of this kind of infection. Cryptosporidiosis prevalence in developing countries is predicted to be between 5-20%.[3-6] Cryptosporidium infection is often found in children, especially children below three years old due to immunological status.[7] Many risk factors reported to affect cryptosporidiosis prevalence such as lack of clean water, bad sanitation, crowded household, animal around the house, house located near farm and river, flooded house, climate, and poor nutritional status.[8-11] The clinical manifestations of cryptosporidiosis vary from asymptomatic to persistent diarrhea. At this moment, there are no known data about cryptosporidiosis prevalence and risk factors in children in Jakarta.

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Methods

This cross sectional survey involved children aged 0 - 35 months in Ciliwung riverside, Kampung Melayu village, from December 2005 until April 2006. The sample size for the study was calculated using the formula for sample size for single proportion of 5%.[9] Subjects were excluded if the parents refused to participate, did not fill the questionnaire completely or did not collect stool as instructed. This study was approved by The Ethics Committee of the Faculty of Medicine University of Indonesia.

Data were collected by questionnaire. Physical examination, including body height and weight was done by an investigator. Stool specimen was collected using a bottle filled with potassium dichromate 2,5%. Parents were asked to collect stool of their child every defecation as per 2 standard spoon for 3 days in a row. Stool specimens were examined using modified acid-fast staining at the laboratory of Parasitology Department Faculty of Medicine University of Indonesia.

Results

There were 474 subjects included in the study, with an age range of 0-35 months. The characteristics of the subjects are shown in **Table 1**. Ground water was the most frequent water source for drinking (70.9%) and washing (67.1%). No one used river water for drinking but 64 subjects (13.5%) were using river water as a water source for washing. Physically

Tabel 1. Characteristics of subjects

Characteristic	n	%
Age (month)		
0 – 11	132	27.9
12 – 23	138	29.1
24 – 35	204	43
Sex		
Male	258	54.4
Female	216	45.6
Nutritional status		
Obese	34	7.2
Overnourished	63	13.3
Wellnourished	241	50.8
Undernourished	125	26.4
Severe malnourished	11	2.3

defiled water source was used by 17.3% subjects. Most of the subjects used river (36.5%) and public toilet (37.3%) as place for defecation while the rest of subject (26.2%) used private toilet. Only 3.8% subjects had good sanitation. Houses of these subjects were lying on a flood-stricken area. Only 10 subjects (2.1%) had houses in non flood-stricken area. Four hundred eighteen subjects (88.2%) have a crowded household and 342 subjects (72.2%) had 2 or more animals around the house. Cats (89.7%) and mice (78.9%) were the two most frequent animals found.

Cryptosporidium cysts were found in 10/474 stool sample of subjects (2.1%). From those 10 cases we also found mix infection between *Cryptosporidium* with *Blastocystis hominis* in three subjects and with *Giardia lamblia* on one subject. The characteristic's of subjects with cryptosporidiosis are shown in **Table 2**.

All cases had bad sanitation, house on flood-stricken area and 9/10 cases had crowded household. Most of positive subjects (9/10) had two or more animals around the house. Cats (10/10) and mice (9/10) were the two most frequent animals reported.

Five cases had one episode of diarrhea and five have 2-5 episodes of diarrhea in the last six months. No one had history of persistent diarrhea and only one case had a history of prolonged diarrhea in the last six months.

We had different clinical manifestations of *cryptosporidiosis* in our series. Two patients had diarrhea, fever, anorexia, weight lost and one patient had diarrhea, fever, anorexia without weight lost. All of these three patients had acute diarrhea (less than seven days) with 1-4 times diarrhea per day. One patient had diarrhea without other symptoms but it persist until 14 day. We also found

Table 2. Characteristics of *cryptosporidiosis* cases

Characteristic (n=10)	Total
Age (month)	
0-11	1
12-23	5
24-35	4
Sex	
Male	5
Female	5
Nutritional status	
Undernourished	10

five asymptomatic cases in this study. The clinical manifestations of cryptosporidiosis cases are shown in **Table 3**.

Table 3. Clinical manifestations of *cryptosporidiosis* cases

Clinical manifestation[*]	Number
Diarrhea	4
Anorexia	4
Fever	3
Weight lost	2
Vomitus	1

*Every subject could have more than 1 clinical manifestations.

Discussion

This study has several limitations. Epidemiological studies in several countries generally were performed on a high risk population and with a longer duration. This was a community-based study to get a picture of cryptosporidiosis in children below three years old on riverside, but we chosed only in Kampung Melayu because of funding and time limitations. In this study we also made modification for stool specimen collection. Stool specimens were collected using a bottle filled with *potassium dichromate* 2.5% for three days in a row. The weaknesses of this method include no target for stool amount, and also it could not represent "stool for three consecutive days" if the subject had constipation.

We found the prevalence of cryptosporidiosis of 2.1%; this result was similar to Katsumata's study[9] in Surabaya which found cryptosporidiosis prevalence of 2.1% in hospital-based study and 2% in community-based study. The result was strikingly different from Kang[12] in India which found 39.7% with or without symptoms. Perch[7] reported cryptosporidiosis prevalence of 7.7% in 1991-1997 in West Africa. Study in Australia in 1997 reported 0.4% prevalence in asymptomatic population.[13] These differences are possibly caused by different characteristics of the subjects.

The prevalence of cryptosporidiosis was 4.82% in children with diarrhea and 1.5% in those without diarrhea. These results was similar to the other studies. Katsumata[9] reported cryptosporidiosis in 10% of children with diarrhea and 1.2% in children without diarrhea. These data show us that *cryptosporidium* is an important pathogen associated with childhood diarrhea.

Among the children with positive result, 5/10 were 12-23 months old, and 4/10 were 24-35 months old. Higher prevalence in age group above 12 months was appropriate with the parasite's characteristic. As already known, this was caused by low hygiene level as a child become more active. We also found that gender did not affect the prevalence of cryptosporidiosis. All subjects with positive cryptosporidiosis were undernourished. This could be a risk factor although it could be also an impact of cryptosporidiosis itself; however, the nature of the study could not allow us to conclude the relationship.

The symptoms of cryptosporidiosis that we found were diarrhea, anorexia, fever, weight lost and vomiting. We noted four diarrhea cases patients; three with acute diarrhea (less than seven day) and one with diarrhea persisted until 14 days. It corresponds to the literature that the clinical manifestations of cryptosporidiosis vary from asymptomatic to persistent diarrhea.[4,14-8] Three of the 10 patients had fever; this was in accordance with literature that fever may be found in 30-60% of patinets.[6,8,17,18] We obtained five asymptomatic cases in this study, similar to that of Wang[19] that most cryptosporidiosis patients are asymptomatic. Checkley[11] also found that lots of asymptomatic cryptosporidiosis were found in smaller children.

Cryptosporidiosis is a disease which has a strong relationship with the environmental status. Many risk factors that could be related to cryptosporidiosis prevalence such as lack of a clean water, bad sanitation, crowded household, animals around the house such as cows, pigs, cat, mice and dogs, house located near farm and river, flooded house, climate and nutritional status.[8-11] Katsumata[9] found a relationship between cats, number of people in household, rainy season, flood and prevalence of cryptosporidiosis. In this study we also found 9/10 cases had 2 or more animals around the house. Uga *et al*[20] and Arai *et al*[21] found that cats play an important role in *cryptosporidium* transmission. Study by Quy *et al*[22] found rat as a reservoir host. In this study, cats and mice might be the sources of infection as we found cats (10/10) and mice (9/10) were the two most frequent animals but we could not prove it because we did not perform animal's stool identification.

We obtained only one family using physically defiled water source; but all victims had houses with

a bad sanitation and lied down on a flood-stricken area. This information shows that ground water used by 8/10 cases might be contaminated by *cryptosporidium* even it was not physically defiled water source. Katsumata[9] found relationship between number of people in household and prevalence of *cryptosporidiosis*. We also found 9/10 cases had crowding household in this study. This is appropriate with the literature that said human to human *cryptosporidium* transmission.[18]

In summary, the cryptosporidiosis prevalence in this study was 2.1%. Cryptosporidium is an important pathogen associated with diarrhea in children. We could not find a relationship between risk factors and cryptosporidiosis prevalence due to small number of cases but we found groundwater as water source for drinking and washing, bad sanitation, cats and mice around the house, flooded house, number of people in a household and undernourished might be related to cryptospridiosis prevalence. Half of the infected children showed no symptoms.

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