

Original Article

Shigellosis in children less than five years in urban slum area: a study at primary health care in Jakarta

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Abstract

Background Shigellosis has a global distribution especially in countries with poor hygiene and sanitation. The most common manifestation of shigellosis in children is diarrhea with broad spectrum manifestations from watery diarrhea to classical dysentery. Appropriate antibiotic management is important to eradicate *Shigella* spp.

Objective To find out shigellosis prevalence and manifestations and also *Shigella* spp. resistance pattern in children less than 5 years with acute diarrhea in certain district urban slum areas in Jakarta.

Methods This cross sectional study involved 475 outpatients of less than 5 years old with acute diarrhea who visited primary health cares in Jakarta from July– October 2005. Stool for culture and antibiotic resistance test was taken with single rectal swab.

Results *Shigella* spp. was found only in 3 (0.6%) patients. The subjects were between 6 to 24 months. Watery diarrhea was found in 1 subject and so was the classical dysentery manifestation of fever and bloody diarrhea. Two strains were found, 2 cases of *S. sonnei* and 1 case of *S. flexneri*. They were resistance to cotrimoxazole, tetracycline, and colistine.

Conclusion *Shigella* spp. was not the main cause of acute diarrhea in children less than 5 years old. Due to the small number of cases, we could not find the most common manifestation and resistance pattern of shigellosis in these children. [Paediatr Indones 2007;47:42-46].

Keywords: shigellosis, children, clinical manifestation, antibiotic resistance

Shigellosis continues to be a major public-health problem and remains endemic in many developing countries. *Shigella* spp. causes acute and debilitating diarrhea in young children

worldwide.¹⁻³ In developing countries where affected populations are immuno-compromised by poor nutrition and infections, deaths attributed to shigellosis are common. *Shigella* spreads by fecal oral route and the most common mode is person-to-person spreading. Four strains are recognized. *S. sonnei* and *S. boydii* are usually associated with short-mild illness with watery or bloody stool.^{1,2} *Shigella flexneri* is generally more severe, lasts longer, and more common with bloody diarrhea. This strain remains the leading cause of shigellosis in most developing world.^{1,4,5} The last is *S. dysenteriae* which causes the most severe complication such as hemolytic-uremic syndrome with a high mortality rate.^{2,4,6}

Epidemiological changes and resistance problem of *Shigella* spp. have been documented in the last two decades of 20th century.^{1,7} Significant changes have occurred. It is very important to reevaluate the issue about shigellosis as an emerging diseases, its clinical manifestations in children especially less than 5 years, and its resistance pattern to various antibiotic in urban slum areas in Jakarta. The purpose of this study was to find out the shigellosis proportion and manifestations as well as *Shigella* spp. resistance pattern in children

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less than 5 years with acute diarrhea in certain district urban slum areas in Jakarta.

Methods

This cross sectional study was conducted at 4 certain urban slum areas in Jakarta consisted of Johar Baru, Senen, Kemayoran, and Tebet Primary Health Cares (PHC) from July to October 2005. The sample size was calculated using single formula with shigellosis prevalence estimation of 5%.³ A total of 475 subjects aged 0–59 months with diarrhea less than 7 days whether watery or bloody were included in this study. All of the subjects hadn't received any antibiotic and without any complication. All the parents signed informed consent. The Committee for Medical Research Ethics of the Faculty of Medicine, University of Indonesia approved this study.

Caregivers were interviewed about history of the diseases such as fever, vomiting, abdominal pain, tenesmus, dehydration symptoms, passage and characteristics of stools (frequency, consistency, and color). Physical examination was performed to confirm diagnosis and nutritional status was determined based on actual weight to ideal body weight percentage by National Center of Health Statistic standard. Degree of dehydration was determined based on the WHO standard.⁷

Stool specimens were taken by single rectal swab using a sterile cotton then were inserted into the Amies media (transport medium package, Trans Bact®).^{2,8} The transport mediums were placed in the container (temperature of 20 – 30 °C) while being transferred to the laboratory of Clinical Pathology Department of Cipto Mangunkusumo Hospital. Stool specimens were cultured for *Shigella* on *Salmonella-Shigella* agar. Suspected *Shigella* colony was identified biochemically by standard methods then serologically grouped by a slide agglutination test with commercial antiserum and examined for antibiotic resistancy by standard method.⁸ Data from completely filled forms were processed using computer program SPSS 10.

Results

Four hundred seventy five children with acute diarrhea aged 0 – 59 months were joined in the study

Table 1. Characteristics of subjects with acute diarrhea

Characteristics	n (%)
Primary health care area	
Johar Baru	204 (42.9)
Senen	118 (24.8)
Kemayoran	62 (13.1)
Tebet	91 (19.2)
Age (months)	
0 – 5	50 (10.5)
6 – 11	122 (25.7)
12 – 35	229 (48.2)
36 – 59	74 (15.6)
Sex	
Male	272 (57.3)
Female	203 (42.7)
Nutritional status	
Well nourished	264 (55.6)
Undernourished	208 (43.8)
Severe malnutrition	3 (0.6)

during July–October 2005. These children were ambulatory patients from 4 PHC working areas of Johar Baru, Senen, Kemayoran, and Tebet. Most of the subjects who lived in urban slum areas in those districts belonged to middle-low socio-economic status. The complete characteristics of the subjects are shown in **Table 1**.

Fever was the most common manifestation that accompanied the diarrhea while vomiting was less frequent (66.3% vs. 32.8%). Abdominal pain and tenesmus were only found in subjects aged 36 – 59 months (74 children). We found 24 of them suffered from abdominal pain and 11 with tenesmus. Bloody diarrhea was only found in 12 children (2.5%). Classical dysentery manifestations with fever, abdominal pain, tenesmus, and bloody diarrhea were found in 9 children.

Enteric-pathogen bacteria were positive in 4 specimens (0.8%) consisted of 3 *Shigella spp.* specimens and 1 enteropathogen *E. coli* (EPEC) specimen. Shigellosis prevalence in children less than 5 years was only 0.6%, 1 case came from Johar Baru and 2 from Senen. Stools specimen in subject A was taken on fourth day of diarrhea. The passage of stool was less frequent and only consisted of blood and mucous. From history of illness, there was watery diarrhea at the first day. The dysentery clinical manifestation was only found in subject A, the oldest subject. The consistency was very different from that of subject C which was watery and caused moderate dehydration. Shigellosis manifestations are shown in **Table 2**.

Table 2. Clinical manifestations of *Shigella spp* subject

	Subject A	Subject B	Subject C
Area	Johar Baru	Senen	Senen
Age (months)	24	14	6
Nutritional status	undernourished	undernourished	undernourished
Manifestation			
o Fever	+	+	+
o Vomiting	-	-	-
o Feses color	yellow	yellow	yellow
o Consistency	mucous & blood (+)	loose, mucous (+)	watery, mucous (+)
o Frequency	≥10 times/day	≥10 times/day	4–9 times/day
o Dehydration status	(-)	(-)	moderate

Table 3. *Shigella spp* strain and resistance pattern

Subject	A	B	C
Strain	<i>Shigella sonnei</i>	<i>Shigella sonnei</i>	<i>Shigella flexneri</i>
Sensitivity#			
• Ampicillin	+	+	-
• Amoxicillin	+	+	-
• Nalidixic acid	+	+	+
• Chloramphenicol	+	+	+
• Cefixime	+	+	+
• Cephalotine	+	+	-
• Cyprofloxacin	+	+	+
• Colistine	-	-	-
• Tetracycline	-	-	-
• Co-trimoxazole	-	-	-

Shigella spp. specimen culture revealed two strains consisted of 2 *S. sonnei* and 1 *S. flexneri*. *S. flexneri* showed resistance to more numbers of antibiotics than *S. sonnei*. Both of them were resistance to co-trimoxazole, tetracycline, and colistine but were still sensitive to nalidixic acid, chloramphenicol, cefixime, and ciprofloxacin (Table 3).

Discussion

Previous epidemiological studies were performed on medical record data in which the clinical manifestations were recorded well and the stool culture was done routinely. The duration of studies was long enough within wide area and better method to get local strain pattern, resistance pattern, and climate preference.

Several studies also showed similar results. Ashkenazi et al⁹ revealed the prevalence of shigellosis in adults and children in Israel was 5.8% from 51,300 stools culture performed during a 6-year period. This number seems not far from the study of Subekti et al³

which showed 5% of 3,848 children and adult patients from 8 hospitals in 7 provinces in Indonesia.³ Thisyakorn et al⁶ needed 5-year study to collect 230 children with positive stool cultures for *Shigella*. Batthiki et al¹⁰ reported the prevalence of shigellosis in Jordan was only 0.13% of 34,529 isolates. Lee et al¹¹ reported that they had to review for almost 10 years in order to collect 386 (1.4%) *Shigella* isolates from 26,320 children stools culture in an urban community in Malaysia.

This study was a community-based study to identify shigellosis burden in small number of children less than 5 years in restricted urban slum areas in Jakarta due to fund and time limitations. In this study shigellosis prevalence was only 0.6% compared to other studies in Indonesian children where shigellosis accounted for 17.8-30%.^{12,13} Most studies conducted in developing countries showed that stool culture may only identify 37–55% *Shigella* of those suspected shigellosis.¹⁴ Even in the developed countries such as United State of America, one study showed that stool culture was insensitive in identifying bacterial

enteropathogen.¹⁵ Thiem *et al*¹⁶ supported this statement by reconfirming the culture by PCR and detected 36% of culture-negative patients were PCR confirmed shigellosis.

Shigellosis clinical manifestations may vary from asymptomatic to severe dysentery with several complications. Huskin *et al*¹⁷ described that there was significant difference between shigellosis manifestations in infants and children. Infants were more common to have a history of non bloody diarrhea, moderate to severe dehydration, or bacteremia, but less common to have fever. Subekti *et al*³ found that abdominal pain and vomiting were two major symptoms in shigellosis. Stool consisted of mucous and blood was only found in 27% cases. Dwipoerwantoro *et al*¹⁸ found that shigellosis manifestations in children was unspecific; 67% of those were without fever, 92% without tenesmus and 96% with watery diarrhea. It was different with that found by Thisyakorn *et al*.⁶ Their study revealed that watery diarrhea only accounted for 11.9% of shigellosis cases. Unfortunately, we could not get a better picture of shigellosis manifestations in children less than 5 as only 3 subjects with stool confirmed shigellosis in this study.

From shigellosis clinical manifestations, we could not map the *Shigella* strain distribution in this study. We only found 2 most common *Shigella* strains, which were *S. sonnei* and *S. flexneri*. These strains were reported from several studies, *S. sonnei* was commonly reported from the developed countries^{9,15,19} and *S. flexneri* was found in a large portion in developing countries.^{3-6,11,16-18} Lee *et al*¹¹ reported that there was shifting strain distribution in the last 5-year study in Malaysia, the number of *S. flexneri* positive culture decreased. *S. flexneri* caused more severe illness in the youngest subject (6 months old) with watery diarrhea and moderate dehydration in this study.

Both of *S. sonnei* strains in this study were still susceptible to ampicillin and amoxicillin. Subekti *et al*³ stated that only 23% of *S. sonnei* were resistance to ampicillin in Indonesia, while some studies reported that ampicillin and amoxicillin were no longer effective for the treatment of shigellosis.^{18,20-25} Resistance to much more antibiotics was showed by *S. flexneri* in this study.

In summary, our study shows that *Shigella spp.* is not the main cause of acute diarrhea in children less than 5 years. Due to small number of cases, we cannot

find out the most common manifestations and the resistance pattern of shigellosis. We suggest that laboratory for culture study is placed in the working area to avoid any inoculation delay and to make it easier to observe.^{2,8}

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