

Study of intestinal protozoa infectio in the hospitalized patients diagnosed with diarrhoea in the Panembahan Senopati hospital

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ABSTRACT

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Background: Based on data from Bantul health profile 2012, diarrhoea was one of 10 major diseases in hospitalized patients in Panembahan Senopati Bantul Hospital. The presencetage of intestinal protozoan infection in the Panembahan Senopati Regional Public Hospital, Bantul, Yogyakarta is not known specifically.

Objective: To determine the percentage of intestinal protozoa cases and the related factors in the hospitalized patient with diarrhoea in the Panembahan Senopati hospital.

Methods: This study was conducted in September 2014-February 2015. The method used was observational analytic research.

Results: The number of intestinal protozoan infection in the patient with diarrhoea is 37 people (45.1%) of the total 82 research subjects. Intestinal protozoa *E. histolytica* is found as many as 4 people (4.9%), *E. coli* 1 people (1.2%), *Cryptosporidium* 25 people (30.5%), *Blastocystis* 2 people (2.4%) and mix infection (*E. histolytica* & *Cryptosporidium*) 5 people (6.1%). Bivariate analysis showed the factors related to the infection with the significant relationship ($p < 0.05$) are water sanitation facilities ($p < 0.000$), toilet facilities ($p < 0.000$), and garbage management ($p < 0.004$). Multivariate analysis showed the sanitary water facilities and toilet facilities can give risk at once.

Conclusion: The percentage of intestinal protozoan infection in the hospitalized patient with diarrhoea in Panembahan Senopati Hospital in the period of September 2014-February 2015 was 45%. Sanitary water facilities, toilet facilities, and garbage management facilities associated with the incidence of intestinal protozoan infection.

Latar Belakang: Berdasarkan data dari Profil Kesehatan Bantul 2012, diare adalah satu dari 10 penyakit utama pada pasien rawat inap di Rumah Sakit Panembahan Senopati Bantul. Persentase infeksi protozoa usus di Rumah Sakit Umum Daerah Panembahan Senopati, Bantul, Yogyakarta tidak diketahui secara spesifik.

Tujuan: Untuk menentukan persentase kasus protozoa usus dan faktor-faktor terkait pada pasien rawat inap yang mengalami diare di rumah sakit Panembahan Senopati.

Metode: Penelitian ini dilakukan pada bulan September 2014-Februari 2015. Metode yang digunakan adalah penelitian analitik observasional.

Hasil: Jumlah infeksi protozoa usus pada pasien dengan diare adalah 37 orang (45,1%) dari total 82 subjek penelitian. Protozoa usus *E. histolytica* ditemukan sebanyak 4 orang (4,9%), *E. coli* 1 orang (1,2%),

Cryptosporidium 25 orang (30,5%), *Blastocystis* 2 orang (2,4%), dan infeksi campuran (*E.histolytica* & *Cryptosporidium*) 5 orang (6,1%). Analisis bivariat menunjukkan faktor yang terkait dengan infeksi dengan hubungan yang signifikan ($p < 0,05$) adalah fasilitas sanitasi air ($p < 0,000$), fasilitas toilet ($p < 0,000$), dan pengelolaan sampah ($p < 0,004$). Analisis multivariat menunjukkan fasilitas air sanitasi dan fasilitas toilet dapat memberikan risiko pada saat yang sama.

Kesimpulan: Persentase infeksi protozoa usus pada pasien rawat inap diare di Rumah Sakit Panembahan Senopati pada periode September 2014-Februari 2015 adalah 45%. Fasilitas air sanitasi, fasilitas toilet, dan fasilitas pengelolaan sampah berhubungan dengan kejadian infeksi protozoa usus.

INTRODUCTION

Diarrhoea is one of the most common infectious diseases in developing countries. It is often associated with several conditions such as the level of knowledge, low socio-economic, poor sanitation situation, the limitations of existing water sources and inadequate health facilities.¹ The causes of diarrhoea can be the infection of *E. histolytica*, *G.lambli*a, *B.coli*, and opportunistic intestinal protozoa namely *Cryptosporidium*.

Giardia lamblia infection mostly found in developing country with bad sanitation and insufficient water sanitation. This parasite is highly present in children than an adult.² The prevalence in the industrial countries was 2-5%, while in developing country was 15-20% in children under 10 years old.³ Another study found that children with malnutrition state are more easily infected by *Giardia lamblia*.⁴

Another parasite to cause infection is *Balantidium coli*. The prevalence of Balantidiasis in Southeast Asia is approximately 0.4%. Some studies show the interconnection of personal hygiene and environmental sanitation with *B. coli* infection.⁵ It is also related to the existence of pigs.⁶

Other than *E.histolytica*, *G. lamblia* and *B. coli*, opportunistic protozoa which is also a pathogen in a human was *Cryptosporidium*. Generally, this parasite is not directly causing the disease

but this protozoan can be a pathogen in an immunocompromised condition.⁷ A research conducted in Taiz, Yemen in 2007 showed that oocyst of *Cryptosporidium* found in 393 from a total of 712 faeces specimens (38.4%) of the children with diarrhoea. On the other hand, they found the *Cryptosporidium* oocyst in the 319 feces specimens (30.1%) of the children without diarrhoea.⁸ The research performed in Gujarat in 2008 found that the opportunistic protozoa infection existed in 25% of 100 faeces specimen taken from both immunocompromised and immunocompetent children.⁹

Based on data from Bantul health profile 2012, diarrhoea was one of 10 major diseases in hospitalized patients in Panembahan Senopati Bantul Hospital. However, the presence of intestinal protozoan infection is not known because the cases of diarrhoea in the hospital were usually grouped in the gastroenteritis diagnosis.¹⁰ Hence, the presence of opportunistic protozoa *Cryptosporidium* infection is not known either because the stool examination methods used in laboratories hospitals is a direct method, therefore, the parasite cannot be detected.

According to the Health Department of Republic of Indonesia (2002), the most dominant risk factor in causing disease transmission associated diarrhoea or intestinal protozoan agents are the source of clean water; sewerage form of latrine used by the public; disposal of wastewater; and garbage management.¹¹

METHODS

Sample

The research was done after receiving the ethics committee approval from the Medical and Health Research Ethics Committee (MHREC) Faculty of Medicine Gadjah Mada University with Ethics Committee Approval Ref: KE/FK/315/EC. The method used was analytic observational with a cross-sectional design. Inclusion criteria for this research were hospitalized patients with diarrhoea in the period of September 2014-February 2015 in Panembahan Senopati Hospital Bantul Yogyakarta and willing to be

the subject of research. Exclusion criteria were patients with pain conditions who are not allowed by the physician to become research subjects and the patients who withdrew before the study ended. Eighty-two patients met the criteria and follow the study.

The data taken for this study include (1) the characteristics of the subjects (age, sex, education, occupation), (2) the presence of contact with people with diarrhoea within the last 2 months, (3) history of illness, (4) and nutritional status. The information on environmental sanitation was obtained through the observation form and visitation of the subjects houses (include the condition of the water supply, toilet facilities and garbage management facilities).^{12,13} Intestinal protozoa examination was performed using Ritchie sedimentation method.¹⁴ The examination was done at the Department of Parasitology Faculty of Medicine. Meanwhile, the *Cryptosporidium* examination was completed using the Ziehl Nielsen stain.

Statistical analysis

A univariate analysis was presented by the frequency distribution of the studied variables. Computerized bivariate analysis with a Chi-square test was to determine the relationship between independent variables and the dependent variable. Significance level or probability values between independent variables and the dependent variable were stated using $\alpha = 0.05$ and 95% confidence intervals. A computerized multivariate analysis using the Regression binary logistic test was performed to calculate the odds ratio and the probability of intestinal protozoa infection in hospitalized diarrhoea patients.

RESULTS

The number of intestinal protozoan infections in hospitalized patients in the Panembahan Senopati Hospital is 37 people (45.1%) among the total 82 patients with diarrhoea (Table 1).

Table 1. The incidence of intestinal protozoa infection in the hospitalized patient in Panembahan Senopati Hospital Bantul Yogyakarta at September 2014-February 2015

Examination	Number	Percentage (%)
Intestinal Protozoa		
Positive	37	45,1
Negative	45	54,9
Total	82	100

The type of intestinal protozoa and its case number of from the highest to the lowest respectively are *Cryptosporidium* 25 patients (30.5%), mixed infection of *E. histolytica* and *Cryptosporidium* 5 patients (6.1%), *E. histolytica* 4 patients (4.9%), *Blastocystis* 2 patients (2.4%), and *E. coli* 1 patient (1.2%) (Table 2). According to the history of other diseases (regardless of the type), from the total

22 patients with diarrhoea, 15 subjects were found positively infected with the protozoa (40.5%). More detailed regarding the disease types can be seen in Table 3. The characteristics Subjects of this research were mostly adult with age more than 45 years, male gender, elementary school educational, farmworkers, no history of the disease nor previous patient contact, and normal nutritional status (Table 4).

Table 2. The type of intestinal protozoa found in the stool examination

Intestinal protozoa type	Number of patients	Percentage (%)
<i>E. histolytica</i>	4	4,9
<i>E. coli</i>	1	1,2
<i>Cryptosporidium</i>	25	30,5
<i>Blastocystis</i>	2	2,4
<i>E.histolytica & Cryptosporidium</i>	5	6,1
Total	37	45,1

Table 3. The medical history of the subjects with intestinal protozoa infection

Diseases	Number	Percentage (%)
Bronkopneumonia	1	6,7
Cancer neoplasia	4	26,6
Cardiomegaly	1	6,7
Chronic diarrhoea	1	6,7
DM/ Diabetes mellitus	2	13,3
Gastritis	1	6,7
DSS/ <i>Dengue Shock Syndrome</i>	1	6,7
Urinary tract infection	2	13,3
Peritonitis	1	6,7
Thypoid Fever	1	6,7
Total	15	100

Research subjects with positive intestinal protozoan infections, most experience symptoms of fatigue/lethargy followed by symptoms of dizziness, fever, nauseous vomit. Abdominal pain is a symptom of the least experienced (Table 5). Stool macroscopic examination showed the majority of the patient has a watery consistency and brown faeces without mucus and blood (Table 6).

Our study showed some factors related to the intestinal protozoan infection in Panembahan Senopati Hospital. Clean water management system and toilet sanitation statistically signifies their correlation to the infection (Table 7 and 8, p-value < 0.05). The strongest factor which influences the infection was clean water management (OR 23.43) and followed by toilet sanitation (OR 20.42).

Table 4. The characteristics of the subjects based on age, gender, education background, occupation, medical history, contact with infected person and nutritional status

Characteristics	Positive (%)	Negative (%)	Total (%)
Age (year)			
toddler (0-5)	11 (29,7)	12 (26,7)	23 (28,0)
children/ elementary school (6-11)	1 (2,7)	0 (0)	1 (1,2)
adolescent (12-25)	0 (0)	11 (23,9)	11 (13,4)
adult (26-45)	11 (29,7)	8 (17,7)	19 (23,2)
elderly (>45)	14 (37,8)	14 (31,1)	28 (34,1)
Gender			
male	20 (56,8)	14 (31,1)	34 (41,5)
female	17 (45,9)	31 (68,8)	48 (58,5)
Education background			
No formal education	10 (27,0)	10 (22,2)	20 (24,4)
Unfinished elementary school	0 (0)	3 (6,7)	3 (3,7)
Elementary school	16 (43,2)	6 (13,3)	22 (26,8)
Junior high school	2 (5,4)	4 (8,9)	6 (7,3)
Senior high school equal	8 (21,6)	20 (44,4)	28 (34,1)
College/ higher education	1 (2,7)	2 (4,4)	3 (3,7)
Occupation			
farmer	17 (45,9)	10 (22,2)	27 (32,9)
employer	3 (8,1)	10 (22,2)	13 (15,9)
entrepreneur	3 (8,1)	3 (6,7)	6 (7,3)
others	2 (5,4)	9 (20)	11 (13,4)
jobless	12 (32,4)	13 (28,9)	25 (30,5)
Medical history			
present	15 (40,5)	7 (2,2)	22 (26,8)
absent	22 (59,5)	38 (84,4)	60 (73,2)
Previous patient contact			
present	5 (13,5)	6 (13,3)	11 (13,4)
absent	32 (86,5)	39 (86,7)	71 (86,6)
Nutritional status			
underweight	8 (21,6)	6 (13,3)	14 (17,1)
inormal	26 (70,1)	35 (77,7)	61 (74,4)
obesity	3 (8,1)	4 (8,9)	7 (8,5)

Table 5. Clinical sign and symptoms of the subjects during the disease course

Characteristics	The number of positive intestinal protozoa (%)					Total
	<i>E.histo</i>	<i>E.coli</i>	<i>Crypto</i>	<i>Blastocystis</i>	<i>E.histo & Crypto</i>	
Fever						
yes	2 (50)	1 (100)	19 (76)	1 (50)	2 (40)	25 (67,6)
no	2 (50)	0 (0)	6 (24)	1 (50)	3 (60)	12 (32,4)
Fatigue/Lethargy						
yes	4 (100)	1 (100)	20 (80)	2 (100)	2 (40)	29 (78,4)
no	0 (0)	0 (0)	5 (20)	0 (0)	3 (60)	8 (21,6)
Nauseous vomit						
yes	4 (100)	0 (0)	16 (64)	1(50)	3 (60)	24 (64,9)
no	0 (0)	1 (100)	9 (36)	1 (50)	2 (40)	13 (35,1)
Dizzines						
yes	4 (100)	1 (100)	18 (72)	1 (50)	4 (80)	28 (75,7)
no	0 (0)	0 (0)	7 (28)	1 (50)	1 (20)	9 (24,3)
Abdominal pain						
yes	2 (50)	1 (100)	9 (36)	0 (0)	1 (20)	13 (35,1)
no	2 (50)	0 (0)	16 (64)	2 (100)	4 (80)	24 (64,9)

Note: *E.histo*:*E. histolytica*; *Crypto*: *Cryptosporidium*

Table 6. Feces characteristic based on macroscopic stool examination of the subjects

Characteristics	The number of positive intestinal protozoa (%)					Total
	<i>E.histo</i>	<i>E.coli</i>	<i>Crypto</i>	<i>Blastocystis</i>	<i>E.histo & Crypto</i>	
Color						
whitish	0 (0)	0 (0)	0 (0)	1 (50)	0 (0)	1 (2,7)
yellow	0 (0)	0 (0)	12 (48)	0 (0)	1 (20)	35,1)
brown	4 (100)	1 (100)	12 (48)	1 (50)	3 (60)	21 (56,8)
green	0 (0)	0 (0)	0 (0)	0 (0)	1 (20)	1 (2,7)
black	0 (0)	0 (0)	1 (4)	0 (0)	0 (0)	1 (2,7)
Consistency						
watery	4 (100)	1 (100)	25 (100)	2 (100)	5 (100)	37 (100)
Mucus						
present	1 (25)	1 (100)	9 (36)	1 (50)	1 (20)	13 (35,1)
absent	3 (75)	0 (0)	16 (64)	1 (50)	4 (80)	24 (64,9)
Blood						
present	1 (25)	1 (100)	3 (12)	1 (50)	0 (0)	6 (16,2)
absent	3 (75)	0 (0)	22 (88)	1 (50)	5 (100)	31 (83,8)

Note: *E.histo*:*E. histolytica*; *Crypto*: *Cryptosporidium*

Table 7. Bivariate analysis on the sanitary facility condition related to the intestinal protozoa infection

Sanitary Facility Condition	Protozoa Intestinal Infection Number (%)		Number	Chi square p-value
	Positive	Negative		
Clean Water				
very high risk	17 (45,9)	1 (2,2)	18 (22)	0.000
high risk	13 (35,13)	1 (2,2)	14 (17,1)	
intermediate risk	7 (18,9)	10 (22,2)	17 (20,7)	
low risk	0 (0)	33 (73,3)	33 (40,2)	
total	37 (100)	45 (100)	82 (100)	
Toilet Facilities				
Very high risk	20 (54,1)	2 (4,5)	22 (26,8)	0.000
High risk	15 (40,5)	6 (13,3)	21 (25,6)	
Intermediate risk	2 (5,4)	19 (42,2)	21 (25,6)	
Low risk	0 (0)	18 (40)	18 (22)	
total	37 (100)	45 (100)	82 (100)	
Garbage Management Facilities				
high risk	9 (24,3)	0 (0)	9 (11)	0.004
intermediate risk	22 (59,5)	24 (53,3)	46 (56,1)	
low risk	6 (16,2)	21 (46,7)	27 (32,9)	
total	37 (100)	45 (100)	82 (100)	

Table 8. Multivariate analysis on the sanitary facility condition related to the intestinal protozoa infection.

Model	Variable	p	OR	CI
II	Facility condition of clean water	0.001	23.436	3.842-142.96
	Sanitary conditions of toilet facilities	0.001	20.421	3.379-123.418

DISCUSSION

Our results showed there were common parasites found in the patients, however, other intestinal protozoa such as *G. lamblia* and *B.coli* were absent. This is believed due to the lack of a definitive host of the parasites such as pigs. Regarding the characteristics, we found that most of the subjects were the traditional farm-workers with lower educational background

and little knowledge of sanitation. This links to the poor environmental and personal hygiene which possibly contribute to the intestinal infections.

Opportunistic infection due to other protozoa such as *Cryptosporidium* and *E. histolytica* was most commonly found in the research subjects. This result is consistent with the previous study conducted by Hunter et al

(2002) which states that the manifestations of *Cryptosporidium* may occur in patients with the immunosuppressed condition.¹⁵ The stool macroscopic examination also showed that the watery consistency of the faeces suited this opportunistic infection. According to our result, most research subjects did not have any previous contact with infected patients. This finding can be inferred that the transmission infection took place on the environment rather than inside the house.

We found that clean water management and toilet condition are significantly related to the intestinal protozoa infection in the Panembahan Senopati Hospital. This might be caused by the very close latrine location to the water source (less than the recommended 10 meters). Besides, we found that septic hole was less than 11 meters from wells and the latrine sit higher than the wells. Another cause is due to the cracked floor on the bottom of the wells which allow water to infiltrate into the wells. Consequently, the people were facing difficulty in accessing clean water hence they were more vulnerable to the intestinal protozoa infection.

The previous study by Fauzi et al (2005) found that a close distance between the latrines installation with clean water sources can cause infiltration of faecal droppings water into the clean water source. This will allow the microorganisms such as intestinal protozoa contained in the stool will leak into the water.^{16,17} Another factor that related to infection is the waste management facilities. Our observation showed that the yard was not cleaned every day and there was no garbage selection prior to disposal.

CONCLUSION

The percentage of intestinal protozoan infection in the hospitalized patient with diarrhoea in Panembahan Senopati Hospital in the period of September 2014-February 2015 was 45%. Sanitary water facilities, toilet facilities, and garbage management facilities associated with the incidence of intestinal protozoan infection.

The number of cases of infection based on intestinal protozoa from the highest to the lowest were *E. histolytica*, *E. coli*, *Cryptosporidium*, *Blastocystis*, and mixed infection of *E. histolytica* and *Cryptosporidium*. Macroscopic stool examination revealed liquid consistency with brown in colour, without mucus or blood.

Unfortunately, the examination of the opportunistic protozoan infection has not been performed in Bantul area. Therefore, this examination is necessary and should be encouraged in the pertinent area. Some factors discovered to have a significant relationship with the intestinal infection were clean water system (OR 23.43) and, toilet facilities (OR 20.42), as well as the garbage management.

CONFLICT OF INTEREST

None declare.

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