WATER SOURCE AS THE RISK FACTOR OF *H. pylori* INFECTION IN CHIDREN AGED 0 - 5 YEARS IN SUBURBAN AREA OF SURAKARTA

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ABSTRACT

The objective of this study was to identify the risk factor of H. pylori infection source in children aged 0 - 5 years in suburban area of Surakarta. An observational cohort analytic epidemiological study was carried out in suburban area of Surakarta from July 2001 to January 2003 in 213 children aged 0 -5 years and their families, with positive PHA results in 101 children. From 112 children with negative PHA in preliminary examination, 34 showed seroconversion. Results showed that the prevalence of H. pylori infection in those children was 47.4% and the incidence was 30.4%. Higher rate of prevalence and incidence indicated various infection sources. DNA assay in drinking water showed 70% positive with H. pylori. In conclusion, drinking water has a role as risk factor of H. pylori infection in children aged 0 - 5 years in suburban area of Surakarta.

Keywords**:** *drinking water, H. pylori, underfives, suburban area, Surakarta*

INTRODUCTION

Epidemiological studies of *H. pylori* infection revealed that underdeveloped and developing countries represent a high number of the infection compared to industrial countries. Preliminary research in sub-urban area of Surakarta showed that the prevalence of *H. pylori* infection in children aged 0-4 was 42.11% (Subagyo, 2000), while, in contrast, it was considerably low (0%) in industrial countries (Marshall, 1994). Furthermore, a group German children aged of 5-8 years had 4.9% (Rothenbacher et al, 1999). These prevalence differences were presumably due to various types of *H. pylori* infection sources in industrial and developing countries.

The high prevalence in developing countries may be attributable to several reasons. First, the sources of infection is assumed from both internal and external of family, which for the latter can be derived from neighbors who are infected with *H. pylori* as well as poor neighborhood hygiene and sanitation. Second, *H. pylori* infection is difficult to be diagnosed due to its unclear symptoms (Graham, 1991). Invasive examination is highly costly and limited. Since serologic test is expensive and not constantly represent high specificity and sensitivity, the test cannot be used as diagnostic method for all time (Harijono, 1995); In addition, the earliest infection starts under 5 years old. Several studies even disclose the fact that it commences at infancy (Suparyatmo, 1995; Subagyo, 2000; Torres et al, 2000). A young individual infected with *H. pylori* will later become a new infection source. Finally, vaccine that serves as preventive agent is still unavailable.

The route of transmission of *H. pylori* is theoretically by oral-oral or feco-oral (Meground et al, 1995). In developing countries the route can be both oral-oral and feco-oral (Sahay, 1995; Clemens et al, 1996). Environmental hygiene and sanitation in industrial countries are generally better than those in developing countries. In this regard, environmental health plays minor factors. The transmission of *H. pylori* on young child is, therefore, through close contact between mother and child, or alternatively in connection with intimate individual interaction of teenager or adult couple. Infection may also be transmitted by fecal-oral; for example, in nurses who works in care center of gastroenterology infection.

There are several methods to diagnose *H. pylori* infection, including culture from biopsy specimen of peptic ulcer, hydrogen respiration test and serologic test, both ELISA and PHA; fecal culture, fecal EIA HpSA test, and DNA assay (Thomas et al, 1992, Kelly et al, 1996, Vaira et al, 1999). Imported ELISA does not always provide high sensitivity and specificity. Consequently, diagnostic trial is required in research site before the test is utilized (Megroud et al, 1995; Harijono, 1997; Gold BD, 2001)

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MATERIAL AND METHODS

This was a prospective cohort analytic epidemiologic study. *H. pylori* infection was diagnosed using PHA (passive hemaglutination) serologic examination, which detected anti-*H. pylori* IgG in serum. The examination was conducted in Biomedical Research Laboratory, Mataram Hospital, using diagnostic kit produced by the same laboratory.

Three mm of blood serum was sampled from 0 - 5 years old children. Participating families were asked to sign inform consent. PHA examination was repeated 6 months to a year later in children with negative result in preliminary examination. Prevalence and incidence of *H. pylori* infection in those children were then quantified.

Types of drinking water source used by family members with positive PHA, were recorded. Subsequently, we established different test analysis on users of drinking water source as to well and public water supply; and 10 DNA assay for drinking water sample. The DNA assay was performed in Biomedical Research Laboratory of Mataram Hospital.

RESULT

Table 1 shows preliminary PHA examination with 101 positive results from 213 or 47.4%.

Table 1. Preliminary examination of PHA

Total cases	PHA result	Percentage (%)
1. 213 children aged 0-5	1a. 101 Positive	47.4
	1 b. 112 Negative	42.6

Table 2 reveals reexamination result, which obtain 34 positive seroconversion from 112 PHA or 30.4%.

Table 2. Second PHA examination result.

Total cases	PHA result	Percentage (%)
2 .112 negative PHA	2a. 34 positive	30.4
	2b. 68 negative	69.6

Table 3 shows prevalence related to age group. It was 14 or 53.9% for boys and 12 or 46.5% for girls; these are for children under 2 years old. While result for those over 2 years old is 52.9% for boys and 47.1% for girls

Tabel 3 . Details of 34 children with positive IgG anti *H. pylori* in second examination related to sex and age.

Age	Boys (+)	Girls (+)	Total
0-6 months	2	4	6
7-12 months	2	5	7
13-24 months	10	3	13
Total of 0-24	14 (53.85%)	12 (46.15%)	26 (100.0%)
25-36 months	2	3	5
37-60 months	2	1	3
Total of 25-60	4 (50.0%)	4(50.0%)	8(100.0%)
Total	18 (52.94%)	16 (47.06%)	34 (100.0%)

Table 4 exhibit variables related to the samples' age, with 22 months as mean, 3 months as minimum age and 55 months as maximum age.

Table 4. Population description in second examination related to children's age

Variable	Observation	Mean	St.Dev	Min	Max
Child age	112	21.22	14.48	3	55

Table 5 reveals the preliminary examination result, which showed positive PHA in 45 boys and 49 girls, There was no difference between boys and girls who suffered from *H. pylori* (p = 0.309).

Tabel 5 . Preliminary examination result on children related to sex

Sex	Positive PHA	Negative PHA	Total
Boys	45	68	113
	39.8%	60.2%	100.0%
	48.4%	52.7%	50.9%
Girls	49	61	110
	44.5%	55.5%	100.0%
	51.6%	47.3%	49.1%
Total	94	129	223
	42.2%	57.8%	100.0%
	100.0%	100.0%	100.0%

(p=0.309)

Table 6 shows DNA assay result from drinking water source. It reveals 6 positive result from 8 sample of well or 75%, whereas public water supply showed 1 positive sample from 2 or 50%.

Table 6. DNA assay of drinking water source

	Well	Public supply
Total sample	8	2
Positive *H pylori* DNA	6 (75%)	1 (50%)

Table 7 shows the discriminant test between users of drinking water source as to well or public supply. Seroconversion between them showed no difference (p = 0.303)

Tabel 7. Discriminant test between types of drinking water sources with 34 positive seroconversion children.

Types of drinking water sources	Seroconversion of *H. pylori* in children Became positive	Seroconversion of *H. pylori* in children Remained negatif	Total
Well Number	23	60	83
% within well	27.7%	72.3%	100.0%
%within PHA2	67.6%	76.9%	74.1%
% of total	20.5%	53.6%	74.1%
Public supply number	11	18	29
% within public supply	37.9%	62.1%	100.0%
% within PHA2	32.4%	23.1%	25.89%
% of total	9.8%	16.1%	25.89%
Total Number	34	78	112
% within drinking water	30.4%	69.9%	100.%
% within PHA2	100.0%	100.0%	100.0%
% of total	30.4%	69.6%	100.0%

(p =0.303).

DISCUSSION

Table 1 presents the prevalence of *H. pylori* in children aged 0-5, which were 101 from 213 or 47.4%. The prevalence of the bacteria in industrial country was considerably low to 0% (Marshall, 1994), while it took 4.9% on 5-8 years old Germanys ethnic children (Rothenbacher et al, 1999). If we compared those two studies in both industrial countries, the prevalence was 47.4%, which was almost ten times higher. Table 2 demonstrates 30.4% of incidents for six months - a year. It was such a very high number compared to the prevalence in Germany.

In underdeveloped and developing countries, poverty is presumably a risk factor that responsible for the infection of *H. pylori* in population since its several impacts, such as dense housing, poor waste management, poor health environmental facilities, and poor nutrition supplies, may weaken body defense mechanism (Promila et al, 1993; Utami T, 1996; Gilbert, 1996).

In industrial countries, the environmental hygiene and sanitation is generally better than that in developing countries. In addition, the family size is small. There, a lot of women have double role, both as career woman and as housewife. Consequently, they have only a little time to take care of their babies. Mother's education is generally higher and this makes better awareness and habit of living healthy. Hence, the prevalence of *H. pylori* infection in young children is low.

Microbiological study from Brenner (1994), reveals the correspondence of *H. pylori* strain presence in family member. It was showed in Germany that parents were risk factors for their child infection. OR of mothers suffer from *H. pylori* infection for children aged 5-8 was 16.5 times (in range of 8.9 – 30.8) while OR of sufferer father (in range of 2.5 – 24.2) was 7,8 times. (Rothenbacher et al, 1999).

The prevalence of the bacteria in poor area of South Africa, examined by ELISA was 66% for 0-13 years of age and even over 80% for children over 10 years of age (Sathar et al, 1997). In Bangladesh, serological prevalence in children aged 2-5 was 48% (Clements et al, 1996)

Also using ELISA method, a study in Andes suggests that older brother played a role as risk factor of the infection to their younger brother (Goodman et al, 2000). In Italy, an infected male individual with vomiting history contributed as infection source to his brothers. From these several studies we can draw inference that *H. pylori* transmission occurred within the family (Luzza et al, 2000)

Table 3 shows no significant difference between infected boys and girls. The explanation is laid on the

statement that *H. pylori* was originally from drinking water. Therefore, the probability of infection in both sex are equal. Some studies represent higher number of infected girls compared to boys since the girls sometimes perform houseworks their mothers do, such as washing vegetables (Soewignyo, 1995).

Crossectional study in Obstetric Department of Mataram Hospital showed the presence of anti-*H. pylori* IgG in 63% from 100 pregnant mothers. This pregnancy has potentials as a source of *H. pylori* infection to their babies. The prevalence of anti *H. pylori* IgG, in inpatient wards of Mataram Hospital, in regard with these mother-child relations was 67.4% (Soewignjo dkk, 1993; Djelantik dkk, 1994)

Table 3 shows that *H. pylori* infection is occurs at very early age. The origin of the infection was most likely both from intern and extern, or environmental, of the family. Transmission of *H. pylori* in industrial country is by individual contact and in general, theoretically, by oro-oral, i.e. food or drink sharing between teenage or adult couple or close friend. More rare is by feco-oral e.g. nurse who works in gastroenterology ward and deals with *H. pylori* gastritis patients. (Marshall, 1994; Dunn et al, 1997)

Table 4 illustrates range of age in sample, which are from 3 months up to 55 months of age, with mean of 22 months. A study carried out in RSUD Dr Meowardi and in suburban city of Surakarta showed that the youngest *H. pylori* infected patient was 5 months of age (Soeparyatmo dkk, 1995; Subagyo, 2000). The infection already began at very early age. This early infection can derives from internal and external environment of the family.

According to Roekiandari's in Surabaya, bacteria can survive in well water, public water supply and waste water for 6 days (Roekiandari et al, 1999). Moreover, Gold's report suggests that bacteria can live in water for more than 18 days (Gold, 2000). Karita's study in Japan concluded that drinking water derives from ground water is potential as *H. pylori* infection source. The prevalence of *H. pylori* infection in population consuming well water for more than 10 years was 85.3%, whereas those that less than 10 years was 25% (Karita et al; 2000).

Some researchers succeeded to culture fecal specimen (Thomas et al, 1992; Kelly et al, 1994; Vaira et al, 1999). However, those from food and beverages remained unproved (Duynhoven et al, 2001). From the DNA assay, we obtained 75% of *H. pylori* positive result from 8 well waters and 1 positive result from 2 public supplies (Subagyo B, 2004). However, risk factor analysis in both types of drinking water sources toward *H. pylori* infection on 34 children revealed no significant difference. In other word, both sources had the same potential risk factor for *H. pylori* infection in children aged 0 -5 years.

From those various studies, especially in developing and underdeveloped countries, we concluded that drinking water have considerable role as a risk factor of *H. pylori* infection. The transmission may occur during taking a bath, washing hand, washing vegetables and other activities related to *H. pylori*-contaminated drinking water. Thereby, both the high prevalence and incidence of *H. pylori* infection in suburban area of Surakarta in children aged 0 - 5 years and in developing countries was generally high concerning to drinking water as potential risk factor of *H. pylori* infection.

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