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OBSERVATIONAL STUDY OF LAMPUNG TRADITIONAL MEDICINAL HERB ON SIX TO TWELVE YEARS OLD DIARRHEAL PATIENTS

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ABSTRACT
Diarrheal disease remains a public health problem in developing countries such as Indonesia, because morbidity and mortality are still high. Incident Rate (IR) of diarrhea at Sub Directorate, Ministry of Health in 2010 were 411/1000 population. There are a lot of herbs that have been used as antidiarrheal in Lampung, wherein 21 herbs are antidiarrheal, 33 herbs pose antibacterial activities and 29 herbs interfere colon motility. Observational study with the cross sectional method was applied in this research. Eighty eight 6-12 years old patient were divided into two groups. Group 1 consist of forty four 6-12 years old patients with mild non-specific acute diarrhea who were given a traditional antidiarrheal with zinc tablet and Oral Rehydration Salts (ORS). Group 2 was the control subjects which consist of forty four 6-12 years old patients with mild non-specific diarrhea who were given a zinc tablet and ORS. Frequency of diarrhea and side effects of traditional herbs were observed. The study was conducted in 4 centers of traditional therapist in Bandar Lampung from October 1, 2013 to February 8, 2014. On the first day of treatment, frequency of diarrhea was reduced significantly by 1-3 times per day for the group I given traditional anti diarrheal (95.5 %) and on the fourth day, all subjects (44 subjects) were cured. In the control group, diarrheal frequency was decreased as much as the traditional herb group, but the cases got this relief were only about 72.2 % of subjects. On the fourth day, not all subjects (90.9 %) in the control groups were cured. Lampung traditional medicinal herbs with zinc tablet and ORS reduce diarrheal frequency among children suffered non -specific diarrhea ($p < 0.05$). Therefore, the Lampung traditional medicinal herb in combination with zinc tablet and ORS clinically and statistically contributed to decreasing diarrheal frequency with $R2 \leq 0.2$.
Keyword: Diarrheal frequency, Lampung traditional medicinal herb, non-specific acute diarrhea on children

INTRODUCTION

Diarrheal disease remains a public health problem in developing countries such as Indonesia, because morbidity and mortality rate are still high. Based on database at sub directorate ministry of health, diarrhea incident rate (IR) in 2010 were 411/1000 population. Case of diarrhea outbreak is often found, the Case Fatality Rate (CFR) in 2010 were 4204 patients in 33 districts with 73 deaths (CFR 1.74%.).[1] Diarrhea remains a leading cause of child death around the world. Two recent advances in managing diarrheal disease can reduce the number of child deaths drastically. First, newly formulated Oral Rehydration Salts (ORS) solution, containing lower concentrations of glucose and salts, to prevent dehydration and for intravenous therapy. Second, zinc supplementation to decrease the duration and severity of diarrhea and the likelihood of future diarrhea episodes in the 2-3 months following supplementation.[2] Traditional medicine has been used widely in Indonesia. It is developed and maintained as the nation`s cultural heritage that kept on improving through observation, research, examination, development and discovery of the medicine with science and technology approach. The traditional medicine is usually used as a self-treatment or obtained from the treatment services. There are many medicinal plants used as diarrhea drug empirically. Economic factors influence the community in choosing them as an alternative treatment. It is recorded that there are 21 herbs that have been investigated for their anti-diarrheal, 33 herbs their anti-bacterial and 29 herbs have been investigated for their influence on intestine.[3] Some of them have the effect as astringen, which pursed the intestinal mucous membrane, in order to reduce production of liquid diarrhea and dysentery. Others have effect as anti-inflammatory and anti-bacterial.[4] Turmeric (*Curcuma domestica* Val) can be used as a anti-diarrheal drug, with rhizome as the most important part.[5] The chemical substances in it are curcuminoids, which consist of diarylheptanoid with curcumin, dihydrocurcumin and bisdesmetoksicurcumin. Essential oil 2-5 % consisting seskuiterpen and phenylpropane turmeron (aril-turmeron, alpha turmeron and beta turmeron), kurlon, kurkumol, atlanton, bisabolene, sesquiphellandrene, zinciberin, aril curcumen, humulen. Arabinosa, fructose, glucose, pati, tannin and dammar. Mineral, such as being magnesium, iron, mangan, calcium, natrium, potassium, reciprocal, Shanghai, cobalt, aluminum and bismuth.[6] Turmeric (*Curcuma longa* or *Curcuma domestica* Val Auct.) contains curcumin, which increase liver function and act as hepatoprotective. Turmeric also contains antibacterial, anti-inflammatory, anti-diarrheal and relieves bloating. Curcumin stimulates gall bladder wall to put out more fluid to dissolve fat. Turmeric essential oil serves to reduce bowel movement so as useful as an antidiarrheal.[7] Wild Ginger (*Curcuma xanthorrhiza*) has long been used to treat various health problems such as to increase appetite, heal stomach ulcers, asthma, mouth sores, malaria, constipation and diarrhea.[8] Ketepeng China (*Senna alata*) especially Ketepeng China leaf has important content such as alkaloids, saponins, tannins,

steroids, anthraquinones, flavonoids and carbohydrates. Lampung SP3T (Development and Application of Traditional Medicine) team using bark of Ketepeng china as antidiarrheal.[9]

MATERIALS AND METHODS

Observational study with the cross sectional method was applied in the research. We observed and compared between traditional herbs of anti-diarrheal with zinc tablet and ORS with only zinc tablet and ORS on non specific subjects. The study was conducted in 4 centers of traditional therapists in Bandar Lampung from October 1, 2013 to February 8, 2014. The population of this research was all non-specific patients coming to the traditional therapists in Bandar Lampung, a number of 88 samples. The first 44 non-specific patients were given a zinc tablet with ORS as control group and the other 44 patients were given the traditional herbs of anti-diarrheal with zinc tablet and ORS as the treatment. The sample was chosen using purposive sampling technique with the characteristics of non-specifics subjects coming to the traditional therapists and were willing to be the participants. Data collection was done using a questionnaire which was set based on the evaluation of measuring instrument designed by the researchers. The instruments were based on the observation on the 1st and the 4th day of the visit to the therapists. Patients were given 3 open and closed questions, covering sex, age, diarrhea frequency with the stomach ache. Parents were also given 4 closed questions, covering name, sex, age, job and educational level. The data collected from the 4 traditional therapist was in the form of a questionnaire. Statistical analysis of tests used were univariate analysis with the all variables set descriptively with the frequency table, figure or graphic. Bivariate analysis was done using chi square, Kolmogorov-Smirnov, Fisher to analyze the differences and the diarrhea frequency with significance level $p < 0.05$. Infuse traditional medicinal herb used by healers was made in a dry powder form and combined in the form of sachet (1 sachet contains 4 grams: wild ginger, turmeric, and ketepeng china leaf). Powder for 1 time drink was packaged in 1 sachet, then dipped into boiling water temperature of 100°C with the 150 CC. Researchers added zinc and ORS in this study referring to the WHO protocol and aspects of ethical research.[2]

RESULT

The observation result of traditional herb utilization added with zinc tablet and ORS were compared with zinc tablet and ORS on 88 patients aged 6-12 years old in Bandar Lampung, Indonesia. The observed results are illustrated in Table 1-4.

Tabel 1 explain the comparison of demographic and clinical characteristics. The demographic data shown of the subjects given traditional herbs with zinc and ORS cover; most of subject education was an elementary school (88.6 %), the diarrhea duration was< 3 days (75.0 %) and the most diarrhea frequency was 3-5 times/day (86,4 %). The demographic data shown for the subjects given zinc and ORS cover; most of subject education was an elementary school (79.5 %), the diarrhea duration was < 3 days (38.6 %), and the most diarrhea frequency was 3-5 times/day (88,6 %).

Table 2 explain the comparison of diarrhea frequency between the traditional herbs added with Zn and ORS, with only Zn and ORS. Based on the data shown in Table 2, on the day-1 with the frequecy of the diarrhea 1-3 times per day was significant with $p<0.005$ (Kolmogorov-Smirnov), and on day 3 there was no diarrhea found with $p<0.005$ (Chi square).

Table 3 explain the comparison of diarrhea frequency during the treatment between Lampung traditional herbs added with Zn and ORS with Zn and ORS based on diarrhea period stratification. The observation was done in 4 days, divided into partitions: less 3 days and 3-7 days. Based on the data in table 3, $p<0.05$ was found in the observation <3 days, exactly on the first day after the traditional herbs given, the diarrhea frequency became 1-3 times per day (93.9 %). For those who were given Zn and ORS, the diarrhea frequency decreased in 1-3 times per day (70.6 %). On the 3-7 observation day partition, the test used were Kolmogorov-Smirnov and Fisher $p>0,05$.

Table 4 explain the correlation between the independent variable (Lampung traditional herbs) and dependent variable (diarrhea frequency), it is symbolized with correlation coeficient (r). The role of Lampung traditional herbs is symbolized with R^2. To measure the correlation between the independent variable and dependent variable and the role of Lampung traditional herbs, uses Guilford criteria. It is said very strong if >0.9, strong >0.7-0.9, low >0.4-0.7, quite low >0.2-0.4, and very low ≤0.2.

DISCUSSION

Despite improving trends in mortality rates, diarrhea still causes 18 % of all deaths in children under five and accounts for nearly two million child deaths in developing countries every year.[10] It is estimated that on an average, a child under five years will have approximately 3.2 episodes of diarrhea each year.[11] Diarrhea is also an important cause of malnutrition, particularly when it is prolonged.[12] Treatment of diarrhea with ORS reduces mortality due to dehydration. Zinc supplementation could help to reduce the duration and the severity of diarrhoea, and therefore have an additional benefit over ORS in reducing children mortality.[13] The utilization of traditional medicine has been used widely in Indonesia. It is developed and maintained as the nation's cultural heritage that kept on improving through observation, research, examination, development and discovery of the medicine with science and technology approach.

Table 1: The comparison of demographic and clinical characteristics

		Traditional herbs + Zn + ORS		Zn+ ORS	
		n	%	n	%
Sex	Male	21	47,7	24	54,5
	Female	23	52,3	20	45,5
Age		9 (8-10)		9 (7-10)	
Education	Preschool	1	2,3	7	15,9
	Kindergarten	4	9,1	2	4,5
	Elementary	39	88,6	35	79,5
Diarrhea period	<3 days	33	75,0	17	38,6
	3-7 days	11	25,0	27	61,4
Diarrhea frequency	< 3 times/day	6	13,6	3	6,8
	3-5 times/day	38	86,4	39	88,6
	6-10 times/day	0	0,0	2	4,5
Diarrhea type	Just liquid	12	27,3	10	23,3
	Liquid+pulp impurities	32	72,7	33	76,7
Stomach aches	Yes	16	36,4	12	27,3
	No	28	63,6	32	72,7
Vomit	Yes	4	9,1	2	4,5
	No	40	90,9	42	95,5
Convulsions	No	44	100,0	40	100
Dehydration	No	44	0,0	35	0,0
Weight (Kg) ^		34,0 (24,25-39,0)		33,5 (22,75-38,00)	

Table 2: The comparison of the diarrhea frequency during the treatment between the traditional herbs added with Zn + ORS and Zn+ ORS

		Traditional herbs+Zn+ ORS		Zn+ORS		P value
		n	%	n	%	
Day 1	1-3 times	42	95,5	32	72,7	0,004$
	4-5 times	2	4,5	10	22,7	
	>5 times	0	0,0	2	4,5	
Day 2	No diarrhea	8	18,2	6	13,6	0,119$
	1-3 times	36	81,8	33	75,0	
	4-5 times	0	0,0	5	11,4	
Day 3	No diarrhea	39	88,6	24	54,5	0,001#
	1-3 times	5	11,4	20	45,5	
Day 4	No diarrhea	44	100,0	40	90,9	0,116*
	1-3 times	0	0,0	4	9,1	
Total		44	100,0	44	100,0	

#Test of Chi square; $ Test of Kolmogorov-Smirnov; *Test of Fisher

Table 3: The comparison of diarrhea frequency during the treatment between Lampung traditional herbs added with Zn + ORS and Zn + ORS based on diarrhea period stratification

			Traditional herbs +Zn+ ORS		Zn+Oral ORS		p value
			n	%	n	%	
<3 days	Day 1	1-3 times	31	93,9	12	70,6	0,024#
		4-5 times	2	6,1	4	23,5	
		>5 times	0	0,0	1	5,9	
	Day 2	No diarrhea	8	24,2	2	11,8	0,099#
		1-3 times	25	75,8	13	76,5	
		4-5 times	0	0,0	2	11,8	
	Day 3	No diarrhea	29	87,9	9	52,9	0,012*
		1-3 times	4	12,1	8	47,1	
	Day 4	No diarrhea	33	100,0	17	100,0	-
	Total		33	100,0	17	100,0	
3-7 days	Day 1	1-3 times	11	100,0	20	74,1	0,066#
		4-5 times	0	0,0	6	22,2	
		>5 times	0	0,0	1	3,7	
	Day 2	No diarrhea	0	0,0	4	14,8	0,793#
		1-3 times	11	100,0	20	74,1	
		4-5 times	0	0,0	3	11,1	
	Day 3	No diarrhea	10	90,9	15	55,6	0,060*
		1-3 times	1	9,1	12	44,4	
	Day 4	No diarrhea	11	100,0	23	85,2	0,303*
		1-3 times	0	0,0	4	14,8	
	Total		11	100,0	27	100,0	

Test of Kolmogorov-Smirnov; *Test of Fisher

Table 4: The correlation and the role of Lampung traditional herbs added with Zn+ ORS against the decrease of diarrhea frequency in non-specific patients

Role of Traditional Herbs	r	R Square
The role on Day 1	0,31	0,0961
The role on Day 2	0,164	0,0269
The role on Day 3	0,378	0,1429
The role on Day 4	0,218	0,0475

Remark:r=correlation coefficient and R^2 value counted based on r^2 value

Plants have been the basis for medical treatments in human history and such traditional medicine is still widely practiced today. Modern medicine began to move away from herbal treatments in the 19th century in favor of treatments based on evidence gathered using scientific method. Plants derived chemical compounds remained an important part of medical treatment.[14]

Several studies have evaluated the effectiveness of some traditional medicines in treating diarrhea in many different continents. Indonesia has a great environmental and biological diversity as compared to the rest of the world. A range of medicinal plants with anti-diarrheal properties has been widely used by the traditional healers; however, the effectiveness of many of these anti-diarrheal traditional medicines has not been scientifically evaluated. Some of them have the effect of astringent, which is pursed the intestinal mucous membrane, in order to reduce production of liquid diarrhea and dysentery, and the effect of anti-inflammatory and anti-bacterial.

Our result shows that Lampung traditional herbs in the form of a powder sachet given 3 times per day, clinically can decrease the diarrhea frequency on non-specific patients. In study, groups were observed for the day 1 to day 4 (Table 2). Kolmogorov-Smirnov test shows that 44 patients with nonspecific diarrhea who were given Lampung traditional herbs with Zn and ORS 95.5 % had a reduction in diarrhea frequency 1-3 times per day after 3 times per day dose. The similar incidence was observed in 44 patients with nonspecific diarrhea who took Zn and ORS 72.7 % of patients had a reduction in diarrhea frequency 1-3 times per day after taking dose 3 times per day.

On day 1, the frequency of diarrhea was decreased in both groups and traditional medicinal herbs Lampung with Zn and ORS group had shown the significant difference with the incidence of the patients who received Zn and ORS.

On the Day two, 81.8 % patient in the group of Lampung traditional herbs with Zn and ORS group showed the reduction in their diarrhea frequency 1-3 times per day after three times a day dose (Table 2). The similar data were detected in the Zn and ORS group, wherein 75 % of the patients showed a reduction in their diarrhea frequency 1-3 times per day. Even though Kolmogorov-Smirnov test is not significant (Table 2), clinically there was 6.8 % of reduction in diarrhea frequency in the group of Lampung traditional herbs with Zn and ORS and it was higher than the reduction in the group of Zn and ORS.

On the Day three, 11.4 % patient in the group of Lampung traditional herbs with Zn and ORS group showed the reduction in their diarrhea frequency 1-3 times per day after receiving dose of 3 times (Table 2). The similar data were detected in the Zn and ORS group, whereas 45.5 % of the patients got a reduction in their diarrhea frequency 1-3 times per day. Even though the Chi square test was significant (Table 2), but clinically there was 34.1 % of reduction in diarrhea frequency in group Zn and ORS and it was higher than the reduction in the group of Lampung traditional herbs with Zn and ORS.

On day four, 100 % patient in the group of Lampung traditional herbs with Zn and ORS group showed the reduction in their diarrhea frequency 1-3 times per day after receiving 3 times a day dose (Table 2). The similar data were observed in the Zn and ORS group, wherein 90.9 % of the patients shown the reduction in their diarrhea frequency 1-3 times per day. Even though the Fisher test was not significant (Table 2) but clinically there was 9.1 % of reduction in diarrhea frequency in the group of Lampung traditional herbs with Zn and ORS, it was higher than the reduction in the group of Zn and ORS. The role of Lampung traditional herbs added with Zn and ORS was very low against the reduction of diarrhea frequency as shown with $R^2 \leq 0.2$ from day 1 to day 4.

Prescription of Lampung traditional herbs added with Zn and ORS influences the reduction of diarrhea frequency on non-specific diarrhea patients clinically and statistically as shown in Table 2 and curcumin content in rhizome turmeric is predicted as anti-diarrheal.[15] Three Lampung traditional herbs have synergy effects as anti-diarrheal. The pharmacodynamic effect of Lampung traditional herbs as anti-diarrheal works as; astringent (turmeric), reducing intestinal peristalsis (turmeric), eliminating bloating and as anti-bacterial (*Senna alata*). The research on turmeric in the form of infusion, using mice as the subject experiment, proven an anti-diarrhela, but the research was done on mice with the dose of 7.8 mg.[16] There has been no other research which used 3 infuses (rhizome turmeric, wild ginger and bark of Ketepeng china) on human beings that can be used as a comparison or standard.

It is expected that this research can enrich Indonesian traditional herbs repositories. Zinc was effective for diarrhea in children aged over six months. Zinc also reduced acute diarrhea duration. The magnitude of the effect was clinically important, particularly for diarrhea at day seven, which is an indicator for the risk of persistent diarrhea. This benefit withstood extensive subgroup analysis for nutritional status, geographic region, background zinc deficiency, zinc type, and study setting. Evidence of diarrhea severity was less clear, as fewer trials reported on this, and different units and time points were used. Zinc also reduced the duration of persistent diarrhea, but the evidence was inconsistent regarding the

severity of persistent diarrhea. No conclusions regarding zinc's impact of hospitalization or death can be drawn from this review since the trials were not designed to look out for these outcomes, and most were conducted in hospital where death rates were low. Large community trials would be needed to explore whether zinc treatment for diarrhea reduces hospitalization rates. Treatment with zinc was associated with an increase symptom in vomiting, although the reduction in diarrhea seems to outweigh. This sign was consistent across trials in all age groups, including one large trial with adequate allocation concealment that was designed to look out for safety. This trial reported that vomiting was limited to one episode in most children and mainly occurred within 10 minutes of administration.[17] Zinc has a metallic after-taste, and development of a more palatable formulation may minimize this. There was no clear evidence of copper deficiency resulting from zinc supplementation at the regimens used.

CONCLUSION

The diarrhea frequency of non-specific diarrheal patients who received traditional herbs with Zn and ORS was lower than those of the patients took Zn and ORS ($p < 0.05$). Lampung traditional herbs in combination with Zinc tablet and ORS is effective in reducing diarrhea frequency with $R^2 \leq 0.2$.

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