Journal of Public Health and Development
Vol. 17 No. 1 January-April 2019

ORIGINAL ARTICLE

Prevalence and risk factors for diarrhea among children aged less than two years in Central Kalimantan Province, Indonesia

Suyitno[1, 2], Jiraporn Chompikul[3], Sariyamon Tiraphat[3] and Khin Sandar Anye[4]

[1] *M.P.H.M., ASEAN Institute for Health Development, Mahidol University, Thailand*
[2] *B.P.H., Faculty of Public Health, Ahmad Dahlan Yogyakarta University, Indonesia*
[3] *Ph.D., ASEAN Institute for Health Development, Mahidol University, Thailand*
[4] *M.P.H., USAID Global Health Supply Chain Program, No. 3/A-B Yeik Thar Condo, New University Road, Bahan Township, Yangon, Myanmar*

Corresponding author: *Jiraporn Chompikul* ***Email:*** *jiraporn.chm@mahidol.edu*
Received: *27 February 2019* ***Revised:*** *25 March 2019* ***Accepted:*** *2 April 2019*
Available online: *April 2019*

Abstract

Suyitno, Chompikul J, Tiraphat S and Anye KS. Prevalence and risk factors for diarrhea among children aged less than two years in Central Kalimantan Province, Indonesia. J Pub Health Dev. 2019;17(1):31-45

Diarrheal disease among children remains a major cause of morbidity and mortality worldwide. The youngest children are most vulnerable with the highest incidence of severe diarrhea in the first two years of life. A cross-sectional study was conducted to determine prevalence and risk factors for diarrhea in children aged less than two years in Central Kalimantan Province, Indonesia. The multi-stage cluster sampling was used to draw a sample of 469 respondents. The data collection was conducted from March to April 2018 using a structured questionnaire. Data were analyzed using Chi-square tests and multiple logistic regression to examine factors associated with diarrhea.

The results of this study showed that all of the respondents were females. Prevalence of diarrhea during the last two weeks in children aged less than two years was 16%. The results of multiple logistic regression showed that caregivers who had low family income (Adj. OR= 6.53, 95% C.I=2.99-14.25), poor practice of food preparation (Adj. OR=9.61, 95% C.I=4.15-22.30), poor to moderate knowledge about diarrhea and prevention (Adj. OR=5.17, 95% C.I=2.35-11.38) and poor healthcare accessibility (Adj. OR=5.88, 95% C.I=2.74-12.63) were statistically significant risk factors for diarrhea in children aged less than two years.

These findings suggested that public health providers should design public health programs for public health centers to provide mothers, other family members and caregivers with health information regarding diarrhea prevention. Comprehensive information should be delivered, including food preparation, feeding behavior and good formula milk feeding practice to their children.

Keywords: risk factors, diarrhea, children aged less than two years

วารสารสาธารณสุขและการพัฒนา
ปีที่ 17 ฉบับที่ 1 มกราคม-เมษายน 2562

ความชุกและปัจจัยเสี่ยงของโรคอุจจาระร่วงในเด็กอายุต่ำกว่า 2 ขวบในจังหวัดเซ็นทรัลกาลิมันตัน ประเทศอินโดนีเซีย

ซูยิตโน[1, 2] จิราพร ชมพิกุล[3] ศริยามน ติรพัฒน์[3] และ คิน แซนดา แอน[5]

[1] *M.P.H.M. สถาบันพัฒนาสุขภาพอาเซียน มหาวิทยาลัยมหิดล ประเทศไทย*

[2] *B.P.H., Faculty of Public Health, Ahmad Dahlan Yogyakarta University, Indonesia*

[3] *Ph.D. สถาบันพัฒนาสุขภาพอาเซียน มหาวิทยาลัยมหิดล ประเทศไทย*

[4] *M.P.H., USAID Global Health Supply Chain Program, No. 3/A-B Yeik Thar Condo, New University Road, Bahan Township, Yangon, Myanmar*

บทคัดย่อ

ซูยิตโน จิราพร ชมพิกุล ศริยามน ติรพัฒน์ และ คิน แซนดา แอน ความชุกและปัจจัยเสี่ยงของโรคอุจจาระร่วงในเด็กอายุต่ำกว่า 2 ขวบในจังหวัดเซ็นทรัลกาลิมันตัน ประเทศอินโดนีเซีย ว. สาธารณสุขและการพัฒนา 2562;17(1):31-45

โรคอุจจาระร่วงในเด็กยังคงเป็นสาเหตุสำคัญของการเจ็บป่วยและการเสียชีวิตทั่วโลก เด็กที่ยิ่งอายุน้อยมีความเสี่ยงที่จะมีอาการท้องร่วงรุนแรงเพิ่มขึ้นโดยเฉพาะในช่วงสองปีแรกของชีวิต การศึกษาแบบภาคตัดขวางมีวัตถุประสงค์เพื่อศึกษาปัจจัยเสี่ยงต่อโรคอุจจาระร่วงในเด็กอายุน้อยกว่าสองปีในจังหวัดกาลิมันตันกลาง ประเทศอินโดนีเซีย โดยใช้การสุ่มตัวอย่างแบบกลุ่มหลายขั้นตอนเพื่อสุ่มตัวอย่างผู้ตอบแบบสอบถาม 469 คน รวบรวมข้อมูลตั้งแต่เดือนมีนาคมถึงเมษายน 2561 โดยใช้แบบสอบถามที่มีโครงสร้าง วิเคราะห์ข้อมูลโดยใช้การทดสอบไคสแควร์และการถดถอยโลจิสติกพหุตูณเพื่อตรวจสอบปัจจัยที่เกี่ยวข้องกับโรคอุจจาระร่วง

ผลการศึกษาพบว่าผู้ตอบแบบสอบถามทุกคนเป็นเพศหญิง ความชุกของโรคอุจจาระร่วงในช่วงสองสัปดาห์ที่ผ่านมาในเด็กที่อายุน้อยกว่าสองปีคือ 16% ผลของการวิเคราะข้อมูลด้วยการถดถอยโลจิสติกพหุคูณพบว่าผู้ดูแลที่มีรายได้ครอบครัวต่ำ (Adj. OR=6.53, 95% CI=2.99-14.25) การปฏิบัติที่ไม่ถูกต้องของการเตรียมอาหาร (Adj. OR=9.61, 95% CI=4.15-22.30) การมีความรู้น้อยถึงปานกลาง (Adj. OR=5.17, 95% CI=2.35-11.38) และความไม่สดวกในการเข้าถึงการดูแลสุขภาพ (Adj. OR=5.88, 95% CI=2.74-12.63) เป็นปัจจัยเสี่ยงที่มีนัยสำคัญทางสถิติสำหรับโรคอุจจาระร่วงในเด็กอายุน้อยกว่าสองปี

ผลการวิจัยชี้ให้เห็นว่าผู้ให้บริการสาธารณสุขควรกำหนดกิจกรรมด้านสาธารณสุขสำหรับศูนย์บริการสาธารณสุขในการให้ข้อมูลเกี่ยวกับการป้องกันโรคอุจจาระร่วงแก่มารดา สมาชิกในครอบครัวและผู้ดูแลเด็ก ข้อมูลที่ให้ควรจะครอบคลุมถึงการเตรียมอาหาร พฤติกรรมการให้อาหาร และการฝึกฝนการให้นมผสมแก่เด็กอย่างถูกต้อง

คำสำคัญ: ปัจจัยเสี่ยง โรคอุจจาระร่วง เด็กที่อายุน้อยกว่าสองปี

Introduction

Diarrheal disease among children remains a major cause of morbidity and mortality worldwide like in 2009, the incidence of diarrhea in children was 1.5 billion whereas in 2017 showed about 1.7 billion children suffering from diarrhea as worldwide[1-2]. In the last eight years, the incidence of diarrhea increased in children about two billion[2]. The youngest children are most vulnerable to the incidence of severe diarrhea being highest in the first two years of life[3]. The main cause of malnutrition in children is diarrhea. Diarrhea is highly harmful to the growth of children in the developing country because malnutrition will cause stunting, anemia, and underweight[3].

Socio-demographic factors greatly affect the occurrence of diarrhea in children such as age groups. In a study in Peru showed that the age of children greatly affects the occurrence of diarrhea. As in the group of children under five years of age, most at the highest risk of getting diarrhea is the range of children at the age of 6-24 months[4]. The incidence of diarrheal also obtained that unhealthy living habits become the main factor of diarrhea in children, especially for the mothers or caregivers. In addition, knowledge of healthy living habit is also an important aspect for mothers or caregivers[5]. Perception of mother or caregivers has the big effect in diarrhea disease. Mothers who have high concerns about the risk of diarrheal diseases will have high attention in preventing diarrhea against children when compared with mothers or caregivers who think diarrhea is a common disease, and do not need to worry about[6]. The children aged among 6 to 24 months who didn't start breastfeeding within 1 hours after birth were 2.87 times more likely to be affected by diarrhea disease compared with their counterparts[7]. Adequate complementary feeding (supply children with quality, nutritious and appropriate age foods) is an important factor in preventing the occurrence of diarrhea, especially for children aged less than two years[8].

Diarrhea is an endemic disease in Indonesia and it is also a disease potential illness of extraordinary events. Indonesia in ranked seven in the world in the incidence of diarrhea and pneumonia[9-10]. Central Kalimantan is in the fifth position of nationally with the latrines that do not have the septic tank in 2013. It is high risk for diarrhea to everyone there particular for children aged less than two years[11]. Based on data from the provincial health service diarrhea report of children aged less than two years as much as 43.51% of all cases of diarrhea in children under five years[12]. Previously, research on factors associated with diarrhea in Central Kalimantan Province has not been conducted. Therefore, this study was aimed at determining prevalence and risk factors for diarrhea in children aged less than two years in Central Kalimantan Province 2018.

Methods

Study design

A community based cross-sectional study was carried out in Central Kalimantan Province. The data collection was conducted from March to April 2018 after getting approval from the office of the Committee for Researce Ethics, Faculty of Social Science and Humanities, Mahidol University Institutional Review Board (Certificate of Approval No. 2018/042.0603).

Target population

The target population consisted of children aged 6-24 months living in Central Kalimantan Province, Indonesia. The information about the children will be obtained from the caregivers. The inclusion was as follows: 1) caregivers aged more than 18 years and older who are taking care of child aged 6-24 months 2) caregivers who live in Central Kalimantan Province at least one year. Caregivers raising children aged 0-6 months were excluded from the study.

Sample size and sampling technique

The sample size was estimated using a confidence interval of 99%, an acceptance error of 5%, and a diarrhea prevalence of 0.214 in 2017[13]. Total children were equal to 238,908 in 2017[13] and about 10% of the total sample size was added to compensate for missing cases. Thus, the required sample size was at least 469. Multi-stage cluster sampling was use to draw a sample of 469. As fourteen districts were similar in term of environment and sanitary, seven districts were randomly selected for this study. One sub-district was randomly selected from each selected district. One village was randomly selected from each selected sub-district. The households were randomly selected using the list obtained from the volunteers in the sub-districts. Total number of households in each district was proportional to size of the population.

Research instruments

The research instrument in this study was the structured questionnaire which was used to ask mothers/caregivers about their children. The questionnaire was composed of seven parts: socio-demographic factors of caregivers and children, prevention behavior, sanitary facility, knowledge about diarrhea prevention, healthcare accessibility, and diarrhea history and management. All questions were originally designed in English and translated to Bahasa Indonesia. The trained research assistants did face to face interview using Bahasa Indonesia. Basically, the questions were the closed-ended type. Kuder Richardson 20 (KR-20) was used for the reliability test of the knowledge which was 0.719 in the pre-test. The pre-test of 30 caregivers was conducted in another area which is similar to the study areas.

Prevention behavior consisted of three parts: food preparation practice (6 questions), feeding behavior (4 questions) and formula feeding practice (9 questions). Correct practice was scored “1” and wrong practice was scored “0”. The total score of each part was classified into two groups using median as a cut-off point: good if total score > median and poor if total score ≤ median.

Sanitary facility (11 questions): two questions about the source of water and type of drinking water. About 9 questions had an answer that was scored of "1" and "0". The correct/standard answer was scored “1” and the incorrect answer was scored “0”. Total score was classified into two groups using median: good if total score > median and poor if total score ≤ median.

Knowledge of caregivers (10 questions) about diarrhea and prevention that for each question, the correct answer was scored “1” and the incorrect answer was scored “0”. Total score was classified into three groups using Bloom’s criteria: good (> 80%), moderate (60%-80%) and poor (< 60%)

Health care accessibility (8 questions) that the "Yes" answer was scored "1" and "No" answer was scored "0". Total score was classified into two groups using the median: good if the total score > median and poor if the total score ≤ median.

Acute diarrhea was defined as passing at least three watery/sagging stools or one mucosal stool within 24 hours[2]. The diarrhea in children was recorded within the last two weeks before the data collection.

Data analysis

Outcome measurement was diarrhea occurence (Yes, No) within the last two weeks. Descriptive statistics was used to determine the frequency, percentage, median and interquartile range for all variables. Chi-square test and multiple logistic regression were used to examine associations between independent variables and diarrhea occurrence.

Results

Table 1 shows 469 caregivers whose age ranged from 17 to 44 years with median of 26 years. The majority (87.4%) was married. 41.6% of caregivers had low education (illiterate, primary school, and secondary school) and about 58.4% had high education (senior high school and university level).

The majority of the occupation of caregivers was housewife (78.7%) around 21.3% were agriculturers, fisherman, honorary and civil servants. However, 36.2% of family had less than Rp. 2,000,000 and 63.8% of family had Rp. 2,000,000 and above. More than half of caregiver 50.5% were Muslim. The majority (96.2%) was a mother.

Table 1 Distribution of caregivers by socio-demographic factors

Socio-demographic factors of caregivers	Frequency	Percent
Caregiver's age (years)		
≤ 25	225	47.9
> 25	244	52.1
Median = 26, QD = 3, Min = 17, Max = 44		
Marital Status		
Married	410	87.4
Unmarried	59	12.6
Education levels		
High	274	58.4
Low	195	41.6
Occupation		
Housewife	369	78.7
Outside	100	21.3
Family income		
High	299	63.8
Low	170	36.2
Median = Rp. 2,000,000, QD= 750,000,		
Min= Rp. 600,000, Max = Rp. 8,000,000		
Religion		
Islam	237	50.5
Cristian	168	35.8
Catholic	52	11.1
Hindu	12	2.6
Relation with the child		
Mother	451	96.2
Other	18	3.8

a = Rp. 14,000 for 1 USD

Table 2 shows the age of children ranged from 6 to 24 months and median 12 months old. Approximately, 40.3% were aged less than 12 months, and 59.7 percent of children were age 12 months and above. The median of family members in each household was 5 and ranged from 3 to 9 members. Nearly half was boys and another half was girls. The immunization status was checked from the pink book, 81.4 % got immunization completely and 18.6 % did not. Median of birthweight was 3000 grams with minimum of 1500 grams, maximum of 4500 grams and QD of 200.

Table 2 Distribution of children by the socio-demographic factors

Socio-demographic factors of children	Frequency	Percent
Child's age (months)		
Less than 12	189	40.3
12 and above	280	59.7
Median = 12, QD= 3.5, Min= 6, Max = 24.		
Family Members		
Less than 5	218	46.5
5 and above	251	53.5
Median = 5, QD=1, Min= 3, Max = 9.		
Number of children		
1st	123	26.2
2nd and above	346	73.8
Median = 2, QD=1, Min=1, Max = 7.		
Child's sex		
Males	226	48.2
Females	243	51.8
Exclusive Breastfeeding		
Yes	185	39.4
No	284	60.6
Immunization Status of children		
Yes	382	81.4
No	87	18.6
Birth Weight of children		
Less than 3000 grams	187	39.9
3000 grams and above	282	60.1
Median = 3000, QD= 200, Min= 1500, Max = 4500		

Episodes of diarrhea within the last two weeks were recorded (3 days apart from one attack to another attack of diarrhea). Table 3 presents the majority of children had no diarrhea, only 16% got it. The characteristics of feces was: 15.8 % was loose/watery stool and 0.2% was mucus bloody stool. 11.1% of children passed feces three times within 24 hours. 1.1% of the caregivers did not any treatment for their children with diarrhea, 5.8% gave ORS and 9.2% choose to consult with doctors/health workers. 10.9 % of children got breastfeeding during diarrhea.

Table 3 Distribution of children by diarrhea history and treatments

Variables	Frequency	Percent
Diarrhea in children during the last two weeks		
Yes	75	16.0
No	394	84.0
Characteristic of feces		
No diarrhea	394	84.0
Mucus bloody stool	1	0.2
Loose stool / Watery stool	74	15.8
Times passing feces within 24 hours		
No diarrhea	394	84.0
3 times	52	11.1
4 times	19	4.1
5 times	4	0.9
Episodes of diarrhea within the last two weeks		
No Diarrhea	394	84.0
One Time	75	16.0
The treatment for children during diarrhea		
No Diarrhea	394	84.0
nothing	5	1.1
ORS	27	5.8
Consult with doctor/health worker	43	9.2
Breastfeeding during diarrhea		
No Diarrhea	394	84.0
Yes	51	10.9
No	24	5.1

The following factors were not significantly associated with diarrhea in children: caregivers' s age and occupation, child's age and order of the child. On the other hand, Table 4 shows following factors were significantly associated with diarrhea in children: marital status of caregivers, education levels of caregivers, family Income, relation with child, family member of children, sex of children, having exclusive breastfeeding, immunization status, birth weight, food preparation levels, feeding behavior levels, formula feeding levels, sanitary facility, knowledge levels, and healthcare accessibility. Children without exclusive breastfeeding were about 10 times more likely to have diarrhea than those having it. Children without complete immunization were about 5 times more likely to have diarrhea than those having it. Children with caregivers who had poor formula feeding practice were about 9 times more likely to have diarrhea than those with caregivers who gad good practice. However, formula feeding practice was not included in the full model multiple logistic regression because there were only 369 respondents. If this variable was included in the logistic model, 100 respondents will be excluded from the analysis.

Children having a poor sanitary facility were about two times more likely have diarrhea than those having a good sanitary facility. Children with caregivers who had poor to moderate knowledge were about 12 times more likely have diarrhea than those with caregivers who had good knowledge. Children with poor healthcare accessibility were about 10 times more likely have diarrhea than those having good healthcare accessibility.

Table 4 Association between each independent variable and diarrhea in children

Independent variables	n	Diarrhea		Crude OR (95% CI)	P-value
		Yes %	No %		
Marital status	469				**0.013**
Married	410	14.4	85.6	1	**0.014**
Unmarried	59	27.1	72.9	2.21 (1.17-4.18)	
Education levels	469				**<0.001**
Higher	274	9.5	90.5	1	**<0.001**
Lower	195	25.1	74.9	3.20 (1.99-5.37)	
Family income	469				**<0.001**
High	289	5.5	94.5	1	**<0.001**
Low	180	32.8	67.2	8.32 (4.60-15.05)	
Relation with child	469				**<0.001**
Mother	451	14.2	85.8	1	**<0.001**
Other	18	61.1	38.9	9.50 (3.55-25.4)	
Family members	469				**0.013**
Less than 5	218	11.5	88.5	0.52(0.31-0.87)	**0.014**
5 and above	251	19.9	80.1	1	
Child's sex	469				**0.040**
Males	226	12.4	87.6	0.59 (0.35-0.98)	**0.042**
Females	243	19.3	80.7	1	
Exclusive breastfeeding	469				**<0.001**
Yes	185	3.2	96.8	1	**<0.001**
No	284	24.3	75.7	9.57 (4.06-22.57)	
Immunization status	469				**<0.001**
Yes	382	11.3	88.7	1	**<0.001**
No	87	36.8	63.2	4.59 (2.67-7.86)	
Birth weight of child	469				**<0.001**
Less than 3000 grams	187	25.1	74.9	3.06 (1.83-5.08)	**<0.001**
3000 grams and above	282	9.9	90.1	1	
Food preparation levels	469				**<0.001**
Good practice	324	3.1	96.9	1	**<0.001**
Poor practice	145	44.8	55.2	25.51 (12.55-5187)	
Feeding behavior levels	469				**<0.001**
Good behavior	267	9.7	90.3	1	**<0.001**
Poor behavior	202	24.3	75.7	2.97 (1.77-4.98)	
Formula milk feeding	369				
Good practice	236	6.8	93.2	1	**<0.001**
Poor practice	133	39.1	60.9	8.82 (4.77-16.34)	**<0.001**
Sanitary facilities	469				**0.037**
Good	276	13.0	87.0	1	**0.039**
Poor	193	20.2	79.8	1.69 (1.03-2.77)	
Knowledge levels	469				**<0.001**
Good	331	5.4	94.6	1	**<0.001**
Poor to Moderate	138	41.3	58.7	12.23 (6.83-21.93)	
Healthcare accessibility	469				**<0.001**
Good	300	5.3	94.7	1	**<0.001**
Poor	169	34.9	65.1	9.52 (5.25-17.25)	

Table 5 shows the final model of multiple logistic regression. Family income, food preparation practice of caregivers, knowledge about diarrhea and healthcare accessibility were significant predictors of diarrhea in children aged less than two years in Central Kalimantan Province. Children with caregivers who had poor to moderate knowledge were about 5.17 times more likely have diarrhea than those with caregivers who had good knowledge after adjusting other factors in the model.

Table 5 Multiple logistic regression for predictors of diarrhea in children

Independent variables		95% C.I for Adj. OR		
	Adj. OR	Lower	Upper	P-value
Family income				
High	1			
Low	6.53	2.99	14.25	**<0.001**
Food preparation practice				
Good	1			
Poor	9.61	4.15	22.30	**<0.001**
Feeding behavior				
Good	1			
Poor	1.93	0.91	4.06	0.083
Knowledge of caregivers				
Good	1			
Poor to moderate	5.17	2.35	11.38	**<0.001**
Healthcare accessibility				
Good	1			
Poor	5.88	2.74	12.63	**<0.001**

Discussion

This study revealed that with in the last two weeks prior to the data collection, the prevalence of diarrheal disease in children aged less than two years was only 16%. This result is different with the prevalence of diarrhea from the previous study in Hadaleala District, Northeast Ethiopia in 2017 which found that about 31.3% of children had diarrhea7. The prevalence from this study is consistent with the finding from the national scale research (4,820 mothers) which showed that 14.4% of children were reported that they suffered from diarrhea in Indonesia in 2016[14].

In this study, the results showed that marital status, education levels, relation with children and family income were the significant risk factors of diarrhea among children aged less than two years. The marital status of unmarried caregivers was more likely to have children suffering from diarrhea than other caregivers (OR=2.21, 95% Cl=1.17-4.18).

The result was consistent with the previous studies in Ethiopia[15-16]. The children who were cared by caregivers with low education level were more prone to have diarrhea than those high education level (OR= 3.20, 95% Cl=1.99-5.37). The result was also consistent with the research done in Ethiopia, Nigeria, and Northwest Tigray[15, 17-19]. The children were treated with caregivers who were not their mother were more likely to get diarrhea than those raising by their original mothers (OR= 9.50, 95% Cl=3.55-25.40). This result contradicted with previous research in Ethiopia which this variable was not a significant association with diarrhea[20].

In this study, the children live in the poor sanitary facility were nearly two times to have diarrhea than those having a good sanitary facility (OR= 1.69, 95% Cl= 1.03-2.77). This result was same with the previous study which children living in the poor environmental situation was significantly related to the risk of diarrhea[14, 19, 21]. It implies that the sanitation facilities is one of the important components which should be available at a household level in order to prevent diarrhea. Therefore, the local stakeholders need to help the community to build adequate and standard sanitation facilities. In addition, people need to be educated with a healthy life and behavior.

The children who got poor formula milk feeding were nearly 9 times to have diarrhea than those having good formula milk feeding (OR= 8.82, 95% Cl= 4.77-16.34). This result was similar to previous research in East Java in Indonesia which found that none caregiver followed six WHO-recommended measures of hygienic formula milk feed preparation. The same assumption of both those research could be confirmed that such not optimal hygiene practices were common[22]. It was shown that the study proved poor formula milk feeding practice is the significant association with diarrhea among children. It indicates that caregivers need to be introduced with health promotion by the health providers in the public health center about six steps WHO-recommended measures of hygienic formula milk feed preparation to their children.

The families have low income were more likely to have children with diarrhea (Adj. OR=8.32, 95% CI=4.60-15.05). The result was the contradiction with research in Northwest Ethiopia which family incomes was not associated with diarrhea[20]. However, based on the research in Papua province in Indonesia 2018, the family income was a significant factor[19]. The low-income family was related to the lack of good environmental conditions in household and good sanitation facilities. Therefore, the community which have poor family income should be supported with adequate health education and sanitation facilities by the government.

Based on the result of this study, caregivers having low to moderate of knowledge about diarrhea were about five times more likely to children having diarrhea than those had good knowledge (Adj. OR=5.17, 95% CI=2.35-11.38). In the previous research, the cause that influenced diarrhea for children in Southern Odisa and Surakarta were caregivers with low knowledge about diarrhea[23-24]. In other literature, knowledge of mothers was not a significant factor to prevent children under five years from diarrhea like in Buol District and in Coimbatore, India[6, 25]. This is because of the different culture, ethnic and environmental. Probably in some areas, the community was resistance to diarrhea. Finally, there have to improve

health education for caregivers by the government.

Based on this study, the household have poor healthcare accessibility for household were six times more likely to have diarrhea than those having good healthcare accessibility (Adj. OR=5.88, 95% CI=2.74-12.63). This result was similar to the research previously conducted in Indonesia, Nepal, and Nigeria[26-27]. Distance is the problem in getting health care services[28]. This was supported by the finding from UNICEF that innovation of prevention disease cannot be maximum if the accessibility of health care services is still difficult[29]. Therefore, in order to improve disease prevention, the healthcare facility should be more accessible by building roads, hospitals, and recruit health workers who must have professional skills.

Recomendations

From the findings, there were three important issues for public health programs; 1) Public health providers should design public health programs for public health centers to provide mothers, other family members and caregivers with health information regarding diarrhea prevention. Comprehensive information should be delivered, including food preparation, feeding behavior, and formula milk feeding practice to their children. 2) Related stakeholders should also provide adequate sanitation facilities at the household level, particularly for the poor families in order to enable diarrhea prevention among children under two years. 3) increasing accessibility to healthcare facilities which meet with national standard. The improvement of accessibility of health care facilities is a very important as well as recruiting health workers who have professional skills.

Acknowledgements

I thank all the public health district officers and caregivers who participated in the data collection of the study. I am very grateful to the ASEAN Institute for Health Development and the International Relations Division of Mahidol University for the support of my study. This research is partially supported by the Graduate Studies of Mahidol University Alumni Association.

References

1. Fund UNCs. Diarrhea: why children are still dying and what can be done: WHO Library Cataloging-in-Publication Data; 2010 [Cited 2018 January 15]. Available from: https://www.unicef.org/media/files/Final_Diarrhoea_Report_October_2009_final.pdf
2. World Health Organization. Diarrhoeal disease 2017 [Cited 2018 January 15]. Available from: http://www.who.int/mediacentre/factsheets/fs330/en/
3. Mokomane M, Kasvosve I, Melo Ed, Pernica JM, Goldfarb DM. The global problem of childhood diarrhoeal diseases: emerging strategies in prevention and management. Therapeutic Advances in Infectious Disease. 2018;5(1):29-43.
4. Ballard A. The Effects of Improved Water and Sanitation Access on Under Five Child Diarrhea in Peru [Theses and Dissertations--Public Health (M.P.H. & Dr.P.H.)]. Uknowledge: Kentucky University; 2017.
5. Budyanra DPS. The Risk Factor that Affect Children Diarrhea in The Island of Java 2013 (Riskesdas 2013 Data Analysis). Journal of

Educational, Health and Community Psychology. 2017;6(1):1-10.

6. Rumboa H, Wichaikullb S, Sanguanprasitb B. Factors Influencing Preventive Behaviors of Mothers for Diarrhea in Children Aged 1-5 Years in Buol District, Indonesia. Sociology. 2016; 6(12):745-53.
7. Gizaw Z, Woldu W, Bitew BD. Child feeding practices and diarrheal disease among children less than two years of age of the nomadic people in Hadaleala District, Afar Region, Northeast Ethiopia. International Breastfeeding Journal. 2017;12(1):14-24.
8. Unicef. Diarrhoea remains a leading killer of young children, despite the availability of a simple treatment solution 2017 [Cited 2018 January 25]. Available from: https://data.unicef.org/topic/child-health/diarrhoeal-disease/#
9. Ministry of Health Indonesia. Indonesia's Health Profile 2016. Jakarta: Ministry of Health; 2017.
10. International Vaccine Access Center (IVAC), Johns Hopkins Bloomberg School of Public Health. Pneumonia and Diarrhea Progress Report 2016: Reaching Goals Through Action and Innovation; 2016.
11. Ministry of Health Indonesia. Research Primary Health. Research And Health Development Agency Ministry of Health of Indonesia; 2013.
12. Central Kalimantan Provincial Health Office. Data of diarrhea in 2017. Secondary data; 2017.
13. Ministry of Health Indonesia. Data of diarrhea in 2017. Palangkaraya: The Provincial Health Office of Central Kalimantan; 2017.
14. Komarulzaman A, Smits J, de Jong E. Clean water, sanitation and diarrhoea in Indonesia: Effects of household and community factors. Global Public Health. 2017;12(9):1141-55.
15. Asfaha KF, Tesfamichael FA, Fisseha GK, Misgina KH, Weldu MG, Welehaweria NB, et al. Determinants of childhood diarrhea in Medebay Zana District, Northwest Tigray, Ethiopia: a community based unmatched case–control study. BMC Pediatrics. 2018;18(1):120-30.
16. Desta BK, Assimamaw NT, Ashenafi TD. Knowledge, Practice, and Associated Factors of Home-Based Management of Diarrhea among Caregivers of Children Attending Under-Five Clinic in Fagita Lekoma District, Awi Zone, Amhara Regional State, Northwest Ethiopia, 2016. Hindawi Nursing Research and Practice. 2017; 12(1):1-8.
17. Desmennu AT, Oluwasanu MM, John-Akinola YO, Oladunni O, Adebowale SA. Maternal education and diarrhea among children aged 0-24 months in Nigeria. African Journal of Reproductive Health. 2017;21(3):27-36.
18. Getachew A, Guadu T, Tadie A, Gizaw Z, Gebrehiwot M, Cherkos DH, et al. Diarrhea Prevalence and Sociodemographic Factors among Under-Five Children in Rural Areas of North Gondar Zone, Northwest Ethiopia. International Journal of Pediatrics. 2018;94(1):1-8.
19. Tungga TM, Dewi YLR, Murti B. Path Analysis: Psychososial and Economic Factors Affecting Diarrhea Incidence in Children Under Five in Jayapura, Papua. Journal of Epidemiology and Public Health. 2018;3(3):331-41.
20. Acharya D, Singh JK, Adhikari M, Gautam S, Pandey P, Dayal V. Association of water handling and child feeding practice with childhood

diarrhoea in rural community of Southern Nepal. Journal of Infection and Public Health. 2018;11(1):69-74.

21. Larsen DA, Grisham T, Slawsky E, Narine L. An individual-level meta-analysis assessing the impact of community-level sanitation access on child stunting, anemia, and diarrhea: Evidence from DHS and MICS surveys. PLoS Neglected Tropical Diseases. 2017;11(6):1-13
22. Gibson S, Sahanggamu D, Fatmaningrum D, Curtis V, White S. 'Unfit for human consumption': a study of the contamination of formula milk fed to young children in East Java, Indonesia. Tropical Medicine & International Health. 2017;22(10):1275-82.
23. Padhy S, Sethi RK, Behera N. Mother's knowledge, attitude and practice regarding prevention and management of diarrhoea in children in Southern Odisha. International Journal of Contemporary Pediatrics. 2017;4(3):966-71.
24. Zicof E, Rahardjo SS, Murti B. Multilevel Analysis: Biopsychosocial Determinants and Environmental Factor on the Incidence of Diarrhea Among Children Under Five in Surakarta. Journal of Epidemiology and Public Health. 2018;3(3):323-30.
25. Mathiazhakan U. A study to assess the knowledge, attitude and practice of caregivers of children admitted with diarrhoea at KMCH Hospital, Coimbatore. Int J Pharmacy Biol Sci. 2016;6(1): 16-22.
26. Agustina R, Shankar AV, Ayuningtyas A, Achadi EL, Shankar AH. Maternal agency influences the prevalence of diarrhea and acute respiratory tract infections among young Indonesian children. Maternal and Child Health Journal. 2015; 19(5):1033-46.
27. Ghimire PR, Agho KE, Renzaho AM, Dibley M, Raynes-Greenow C. Association between health service use and diarrhoea management approach among caregivers of under-five children in Nepal. PloS One. 2018;13(3):e0191988.
28. Akinyemi AI, Fagbamigbe AF, Omoluabi E, Agunbiade OM, Adebayo SO. Diarrhoea management practices and child health outcomes in Nigeria: Sub-national analysis. Advances in Integrative Medicine. 2018;5(1):15-22.
29. United Nations Children's Fund. Access to healthcare through community health workers in East and Southern Africa New York: 2014 [Cited 2018 June 10]. Available from:https://www.unicef.org/health/files/Access_to_health-care_through_community_health_workers_in_East_and_Southern_Africa.pdf