

# The Trend of Diarrhea in Kodi and Kodi Utara Subdistricts, Sumba Barat Daya District in 2013 and Its Related Factors

Cara Tasya Handita,<sup>1</sup> Saleha Sungkar<sup>2</sup>

<sup>1</sup>Medical Science Program, Faculty of Medicine Universitas Indonesia

<sup>2</sup>Department of Parasitology, Faculty of Medicine Universitas Indonesia

## Abstract

*Diarrhea is one of the most frequent diseases occur globally, including Indonesia, with mostly infected children under five years old. Sumba Barat Daya (SBD) is one of area in Nusa Tenggara Timur (NTT) with limited water sources, including Kodi and Kodi Utara subdistricts. Kodi has river that is accessible for the population, while Kodi Utara has no clean water sources. The purpose of this study was to know the trend and prevalence of diarrhea in 2013, and its relation with age and the availability of water sources Kodi and Kodi Utara, SBD district. This study used cross sectional design using secondary data taken from local health service of SBD. This study found that number of diarrhea cases in 2013 in the two subdistricts were fluctuated, with the highest cases belonged to population less than five years old. Prevalence of diarrhea in Kodi Utara (1.76%) was higher than in Kodi (1.68%). Analytical test using chi square showed that prevalence of diarrhea in the two subdistricts was significantly related to age ( $p<0.05$ ), but it was not significantly related to the area ( $p>0.05$ ). In conclusion, prevalence of diarrhea in Kodi and Kodi Utara was related to age, however it was not related with availability of water sources.*

**Keywords:** diarrhea, prevalence of diarrhea, clean water sources, Kodi, Kodi Utara, Sumba Barat Daya

## Trend Diare di Kecamatan Kodi dan Kodi Utara, Kabupaten Sumba Barat Daya Tahun 2013 dan Faktor-Faktor Terkait

## Abstrak

*Diare adalah penyakit tersering di dunia, termasuk Indonesia, yang sering menyerang anak di bawah usia lima tahun. Sumba Barat Daya (SBD) adalah daerah di Nusa Tenggara Timur (NTT). dengan sumber air yang terbatas, termasuk kecamatan Kodi dan Kodi Utara. Kodi memiliki sungai yang mudah diakses oleh penduduknya, sedangkan Kodi Utara tidak memiliki sumber air bersih. Tujuan penelitian ini adalah mengetahui trend dan prevalensi diare tahun 2013, serta hubungannya dengan usia dan ketersediaan sumber air di kecamatan Kodi dan Kodi Utara, Kabupaten SBD. Penelitian menggunakan desain potong lintang dengan menggunakan data sekunder yang diambil dari Dinas Kesehatan (DinKes) SBD. Dari penelitian ini didapatkan bahwa jumlah kasus diare tahun 2013 di kedua kecamatan berfluktuasi, dengan jumlah kasus terbanyak pada usia kurang dari lima tahun. Prevalensi diare di Kodi Utara (1,76%) lebih tinggi dibandingkan Kodi (1,68%). Analisis dengan uji chi square menunjukkan bahwa prevalensi diare di kedua kecamatan berhubungan secara signifikan dengan usia ( $p<0,05$ ), tetapi tidak berhubungan signifikan dengan area ( $p>0,05$ ). Disimpulkan bahwa prevalensi diare di Kodi dan Kodi Utara berhubungan dengan usia, namun tidak berhubungan dengan ketersediaan sumber air.*

**Kata kunci:** diare, prevalensi diare, sumber air bersih, Kodi, Kodi Utara, Sumba Barat Daya

## Introduction

Diarrhea is one of diseases with high number of incidence in the world, particularly in developing countries. Morbidity and mortality of this disease are still high and occurs among all ages, although children found to be more susceptible to suffer from diarrhea. Despite of causes of diarrhea are various and multifactorial, it is believed that infection is mostly the underlying cause of diarrhea. In some developing countries, diarrhea arises due to poor level of environment's sanitation, hygiene behavior, and clean water.

Diarrhea can be treated in the early stage of the disease. However, it may prolong and complications such as dehydration and malnutrition will eventually appear and lead to death. The mortality of diarrhea is higher in children. According to World Health Organization (WHO)<sup>1</sup> diarrhea becomes one of the top causes of global death, with nearly 800.000 numbers of children died from this disease.

In Indonesia, diarrhea is also one of the most common problems in the population, due to the increasing trend almost every year. A survey conducted by ministry of health showed that there was an increasing trend of diarrhea from 2000 to 2010. The highest incidence rate of diarrhea was on 2010 with 411 per 1000 population.<sup>1</sup> In 33 regions, diarrhea also became an outbreak with 4.204 cases and caused 73 people died. As a consequence, diarrhea became one of the most leading causes of death in Indonesia, particularly in children under five years old. According to *Riskesdas*<sup>2</sup> in 2007 diarrhea reached the highest place of mortality cause in children, with 31.4% in neonatal period and 25.2% in age five.<sup>3</sup>

In most of eastern part of Indonesia, the calculation of diarrhea incidence is more than 9%, including Nusa Tenggara Timur.<sup>3</sup> The most probable reason of incidence is likely due to bad sanitation and low knowledge about diarrhea and hygiene behavior in the population. Besides, unsupported environment such as living near the cages as well as the absence of clean water may also lead to many infectious diseases including gastrointestinal disorder.

Sumba Barat Daya (SBD) district is one of areas in Nusa Tenggara Timur (NTT), which has limited water resources and bad environment and sanitation, including Kodi and Kodi Utara subdistricts. In Kodi Utara subdistrict, residents have difficulties to get water, due to the location of clean water resources are far from their house. On the other hand, people of Kodi seem to have a better living, because residents can get water easily for their daily activities from river near human

settlement. Therefore, we wanted to know the trend of diarrhea in Kodi and Kodi Utara and the relation between age and the availability of water sources with the disease.

## Methods

This study used cross sectional design without any intervention. Collection of data was taken in June 25<sup>th</sup>, 2014 in health department district of Tambolaka, SBD. The whole study was conducted for 8 months. Data for this research was secondary data, taken from health department district of SBD. The target population was all populations in SBD in year 2013. The accessible population was all populations of Kodi and Kodi Utara subdistricts. The sample of this study was all populations of Kodi and Kodi Utara subdistricts, who met the research criteria. Inclusion criteria was all Kodi and Kodi Utara population who were recorded in health department district in 2013. Exclusion criteria in this study was all Kodi and Kodi Utara population who were recorded in health department district with any incomplete data such as no diagnosis and no age. Although the minimum sample needed was 92 subjects, we decided to include all recorded data to obtain the trend of diarrhea in a year. Prevalence is defined as number of diarrhea per year divided with number of population in Kodi and Kodi Utara. Age group is defined as group of age, where in this study it is divided into three groups, which are <5, 5-14, and ≥15 years old. The age groups are followed *Riskesdas*, according to the vulnerability of the population towards diarrhea. The dependent variable was the prevalence of diarrhea in Kodi and Kodi Utara, while the independent variables were patient's age and the area (Kodi and Kodi Utara). Research proposal was submitted to research module committee. Furthermore, we asked for permission to conduct a research from the dean of FMUI. We also asked permission from the head of local health service of SBD and *Bupati* SBD. After we received the permission, we came to Tambolaka to collect the data and observe the location.

Diarrheal data from health department district was managed and analyzed, followed by writing study report. All data of diarrhea patients who admitted to local primary health care in Kodi and Kodi Utara processed by SPSS 20.0. Data was divided into three age groups: <5, 5-14 and ≥15 years old, and two areas with different profile (Kodi with river and Kodi Utara with no river). To analyze the data, we used Chi square test to see the relationship between prevalence of diarrhea

and age and the availability of water sources. To conduct this study, we submit the research proposal and request approval and permission to conduct this research from Research Module FKUI. After the approval, we requested approval and permission for conducting this research to the health department district in SBD. Data that has been taken was kept confidentially.

## Results

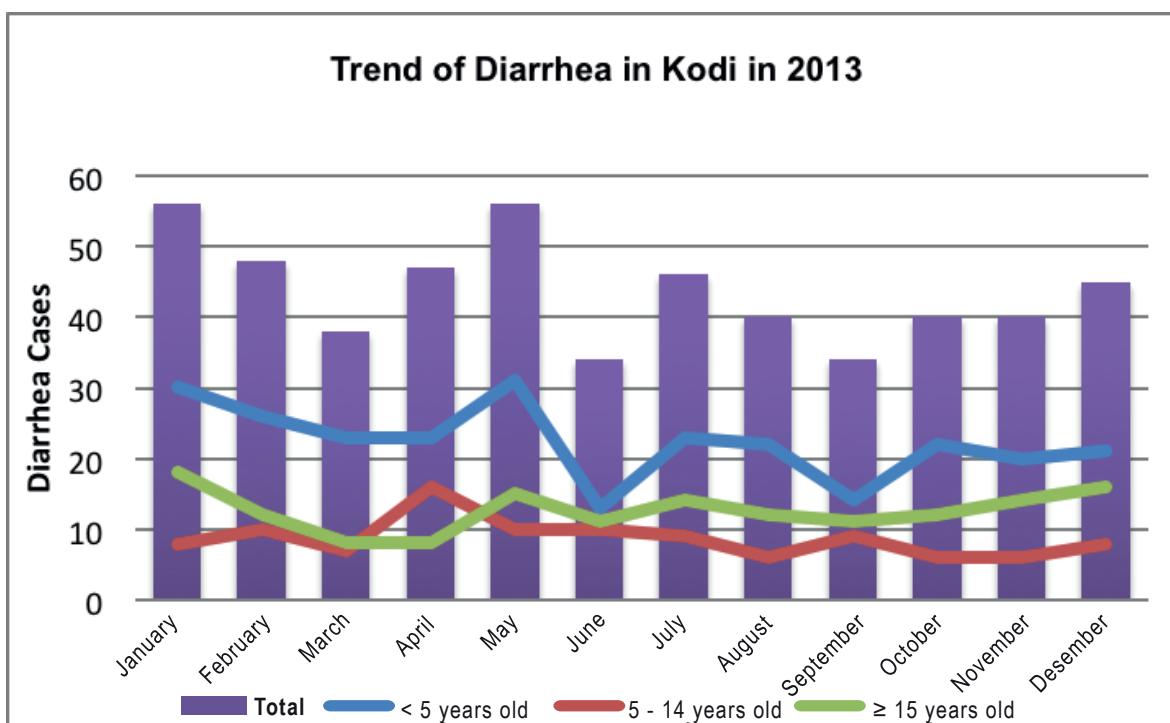
This study has a purpose to compare means of diarrhea in Kodi and Kodi Utara. Kodi Utara has a greater area than Kodi, as well as the total population. In both areas, male populations are outnumbered female population. The average populations in both districts are people with range of age between 15 to 44 years old (Table 1).

**Table 1. General Demographic Population of Kodi and Kodi Utara**

Districts	Area (km <sup>2</sup> )	Total	Sex		Age Groups				
			Male	Female	0-4	5-14	15-44	45-64	≥65
Kodi	11.105	31.223	15.946 (51.1%)	15.277 (48.9%)	5.106 (16.3%)	9.298 (29.7%)	12.408 (39.7%)	3.398 (10.8%)	1.013 (32.4%)
Kodi Utara	24.382	50.864	26.419 (51.9%)	24.445 (48.1%)	9.284 (18.2%)	15.237 (29.9%)	20.048 (39.4%)	5.160 (10.1%)	1.189 (2.33%)

Figure 1 and figure 2 show the trend of diarrhea patients in both specific districts throughout the year. From the Figure 2, the highest cases throughout the year of 2013 were in January and May, with 56 patients suffered from diarrhea and admitted to the Bondokodi primary health care. However, the least proportions of

diarrhea patients in 2013 were found in June and September, with only 34 patients. From the age group found that population below 5 years old dominantly suffered from diarrhea during 2013. On the contrary, the lowest age group with diarrheal disease was found mostly in patients with range or 5 to 14 years old.



**Figure 1. Trend of Diarrhea in Kodi, SBD Year 2013**

Figure 2 below shows the trend of diarrhea found in Kodi Utara subdistricts and recorded in Kori primary health care. As well as in Kodi, events of diarrheal in Kodi Utara throughout the year also showed a variation. The highest cases in 2013 occurred in April and September, share the same patients number with 111 people admitted to the

Kori primary health care. In opposition to that, the lowest cases in Kodi Utara found in December with only 52 patients admitted to the hospital because of diarrhea. Among all age groups, there were variations in the number of diarrhea cases. However, the most frequent diarrhea cases remained occur in population with age group less than five.

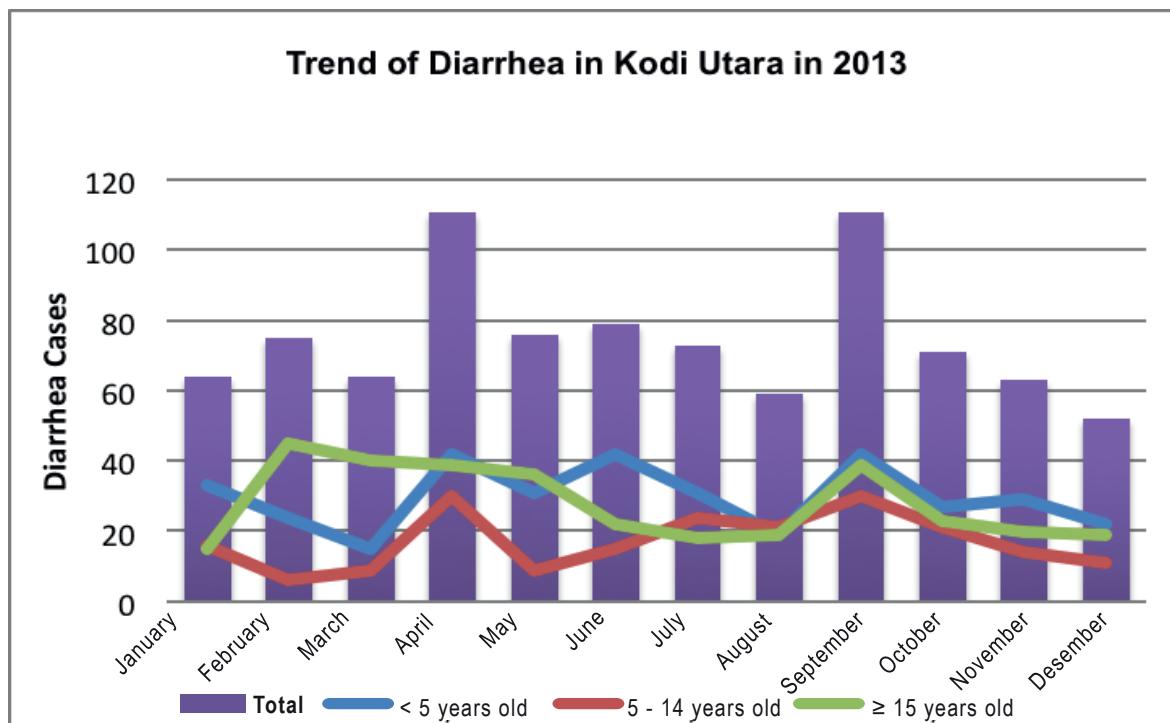


Figure 2. Trend of Diarrhea in Kodi Utara, SBD Year 2013

Table 2. presents number of diarrhea patients in Kodi and its prevalence among population in different age groups. The prevalence of diarrhea in Kodi found to be higher in population less than

5 years old compared to other age groups with 0.9%. Analytical result using Chi square showed that the p value was less than 0.05, meaning that there was a significant difference between diarrhea prevalence and age.

Table 2. Relationship between Prevalence of Diarrhea and Age in Kodi in 2013

Age	Diarrhea in Kodi		Total	
	Yes	No		
<5	268 (0.9%)	4838 (15.5%)	5106	(16.4%)
5-14	105 (0.3%)	9193 (29.4%)	9298	(29.8%)
>15	151 (0.5%)	16668 (53.4%)	16819	(53.9%)
<b>Total</b>	<b>524 (1.7%)</b>	<b>30699 (98.3%)</b>	<b>31223</b>	<b>(100%)</b>

Table 3. shows data of diarrhea patients in Kodi Utara. The table stated that the highest prevalence of diarrhea occurred in this subdistrict belongs to the same group as Kodi. Chi square test also told that there was significantly different between prevalence of diarrhea and age by showing p-value

less than 0.05. Overall, from the two tables, Kodi Utara has higher prevalence of diarrhea compared to Kodi in 2013 with 1.8% and 1.7% respectively. As seen in the table as well, that less number of diarrhea found more in Kodi, although the range number was not too far.

**Table 3. Relationship between Prevalence of Diarrhea and Age in Kodi Utara in 2013**

Age	Diarrhea in Kodi Utara		Total
	Yes	No	
<5	357 (0.7%)	8873 (17.4%)	9230 (18.1%)
5-14	206 (0.4%)	15031 (29.6%)	15237 (30.0%)
>15	335 (0.7%)	26062 (51.2%)	26397 (51.9%)
<b>Total</b>	<b>898 (1.8%)</b>	<b>49966 (98.2%)</b>	<b>50864 (100%)</b>

Table 4. illustrated a comparison between prevalence of diarrhea in Kodi and Kodi Utara and relate it to water availability. From number of patients, Kodi Utara had received 898 patients during 2013 in their local primary health care, outnumbered Kodi district with only received 524 patients. The prevalence of diarrheal cases in Kodi was 1.68%, while in Kodi Utara was found to be slightly higher with 1.76%. This statement supported our assumption previously that

area with limited water sources (in this case was Kodi Utara) seemed to be higher in prevalence compared to the other one (Kodi).

Chi square was performed to compare between the prevalence in two areas. Although Kodi Utara has higher number of prevalence, p-value showed that there was no significant difference between the two result, meaning that there was no association between area that has river and no river ( $p=0.367$ ).

**Table 4. Prevalence of Diarrhea in Kodi and Kodi Utara**

Subdistricts	Diarrhea				Total
	n	Yes	n	No	
Kodi	524	1.68%	30699	98.3%	31223
Kodi Utara	898	1.76%	49966	98.2%	50864
<b>Total</b>	<b>1422</b>	<b>1.73%</b>	<b>80665</b>	<b>98.3%</b>	<b>82087</b>

## Discussion

Diarrhea is one of the diseases in the world, especially in developing countries, that have became a concern since few last years due to further complications such as dehydration, hospitalization and mortality at the end. The incidence of diarrhea increases every year, with patients who are under five years old found to be higher than adult patients. A study by Mandomando et al<sup>4</sup> has revealed that 22% patients under 5 years old who were admitted to the local hospital were diagnosed as diarrhea,

with 54% of them were less than 1 year old and the rest were more than 1 year of age.

### Trend of Diarrhea in Kodi, SBD in 2013

From the current study result, in 2013, Kodi district had a fluctuation trend of diarrhea. The highest number of diarrhea cases found in January and May, while the less frequent diarrhea cases were in June and September. These situations could be related to seasonal factors. Refer to previous study in Mozambique, which has a same

climate change and season, found that during rainy season from November to April, the rate of diarrhea incidence is elevated.<sup>4</sup>

From the age group, it shows that the highest frequency of diarrhea throughout the year found in Bondokodi primary health care came from group of children less than 5 years old. Also, a great number of diarrhea also belonged to infants group, with 268 cases. Number of diarrhea cases in Kodi's infants seen to be higher, because their susceptibility to suffer from infection, including diarrhea. Secondly, it was undoubtedly due to the mother's habits were still far from good hygiene level. The third one was because of the environment that was not clean enough for the infants to be disease-free. The statement before also reported by Kusumawardani<sup>5</sup> in 2010, that there was a close relationship between hygiene and sanitation with diarrhea frequency in 6-24 months old baby.

On the other hand, the lowest frequency of diarrhea through the year came from patients ranging between 5-14 years old, in August. Probably, it was because of this age group has ability to go to the river easily. Secondly, these people are majorly consisted of school age to teenager, when the information regarding awareness towards hygiene is usually provided by the cadres, local government or even school.

#### **Trend of Diarrhea in Kodi Utara, SBD 2013**

Kodi Utara district showed also an unstable trend throughout the year. The highest number of diarrhea cases in the district appeared in April and September, and lowest proportion was in December. It seemed different with Kodi district, where the peak number of diarrhea patients was during rainy season; in here, high number of patients was found in different season.

The highest frequency of diarrhea presented in a group of people with more than 15 years old, by showing the upward trend of line graph in February, with 45 patients of adults admitted to the local primary health care. This specific age group may contribute a lot to the diarrheal cases due to the number of population that mainly come from this group. However, children less than 5 showed the most numerous visits to Kori primary health care with 357 diarrhea cases in 2013.

Moreover, this district has different situations related to the environment. In contrast with Kodi, Kodi Utara has inadequate environment to live. The houses distances are far between one and another. The society live in houses made of bamboo and

straw. Some of the houses have cages for their pet under the house's main floor. The typical pets that live under the house are pigs and dogs; and most of the times, they enter the houses as well. Most of houses in the district have no toilet. Consequently, they prefer to defecate in the bushes or above the tree. The environment surrounding the houses is not decent enough for a living. In this context, these kinds of houses are not classified into healthy house because they do not fulfill one of the criteria, which is own a healthy toilet. A study by Panza and Wilunda<sup>6</sup> found that there was a significant relationship between economical status and incidence of diarrhea, caused by environmental sanitation and unhealthy house. The information about how important to keep hygiene also lack in the society, which can be seen from the cadres who also had the same habits.

The habits of washing hands before and after meals, or even after defecate are not applied in the local society, probably caused by the unavailability of water sources, due to low rainfall rate and no drainage under the land. As a consequence, it makes them hard to do daily activities, such as washing hands and taking shower, hence creates group of societies who were reluctant towards hygiene. As supported by a study conducted in Beijing,<sup>7</sup> which found that diarrhea incidence can be reduced up to 29% by maintaining hygiene behavior including washing hand before meals and post defecate.

#### **Association between Prevalence of Diarrhea and Age**

Diarrhea infection would not stand alone without any trigger. There are many factors that contribute to diarrheal disease. Purwanto<sup>8</sup> has mentioned in his study that factors such as economical status, social, and environment have given contributions in diarrhea incidence. However, those three aspects are not the only factors that trigger the disease. Some risk factors may contribute to the role of achieving this disease, such as knowledge or education, food, hygiene behavior, water, and age.

The current study has proved that in both districts, Kodi and Kodi Utara, there were significant difference between diarrhea and age group; meaning the prevalence of diarrhea was associated with age. Kodi and Kodi Utara also showed frequency of diarrhea in 2013 were higher mostly in children under five, with 268 and 357 respectively. The result of this study supported by several recent studies. Few studies proved that diarrhea was

closely related to age, especially children under 5 years old due to the susceptibility of getting infection in children.<sup>9</sup> A study by Suraatmaja<sup>10</sup> try to explained in his book that diarrhea episode usually happen in the first 2 years, with the highest incidence during 6-35 months old. The most probable reason could be caused by during this age, infants already received food supplement (*makanan pengganti ASI*) besides breastmilk.<sup>11</sup> Another reason was because this is the age of infants learning to crawl and get in touch with new pathogen through dirty floor or soil, or either from contaminated food, toys or utensils. The most probable pathogens in infant are from *E. coli*, *A. lumbricoides* and *Strongyloides stercoralis*. A survey also conducted in Indonesia that the younger the age of children, the greater the tendency to suffer from diarrhea, due to the low resistance of the body towards infection.<sup>13</sup> However, infant in 0-5 months are seemed to be unlikely to acquire new infection because they still get adequate immunity from the mother through breastmilk.<sup>11</sup>

In terms of prevalence, as we can see in the two tables, diarrhea seemed to be a small issue compared to the population. We assumed before that the prevalence was high. However, the small percentages came from patients who already recognized that they have suffered from diarrhea. There was a tendency in population to not visit local healthcare or hospital until the diseases were severe enough for them to be treated. The issues not only about the awareness towards illness were very low, but also due to distance between living place and health care were distant and required much time and cost, which makes them prefer to stay at home with traditional treatment.

### **Association between Water Sources and Diarrhea**

This study found that Kodi Utara has higher prevalence of diarrhea (1.76%) compared to Kodi (1.68%). The most probable cause was because people in Kodi Utara have limited access to get water from its sources, hence they were unable to do daily routines that require water. As explained before, the area of SBD is far from healthy and proper condition to live. The poor level in this area also low. Therefore, authors believe that economical status might be considered as one of the factors, which can lead to diarrhea cases. This statement also supported by Darmawan in 2008, which found that 95% of diarrhea patients came from low to medium income family.

A study by Admisasmito<sup>15</sup> stated that the most reliable factors that causing diarrhea were environment, including clean water and toilet, and wastewater disposal and also healthy house. Authors assumed that the difference would be significant due to the demographic and environmental background, also from the fact that the populations were still lack of water availability. The fact that water resources are tightly linked to incidence of diarrhea have been stated in a study conducted in Bogor, where getting contaminated water resources might increased 1.79 times of diarrhea compared with uncontaminated water.<sup>16</sup>

From the observation on the field, water is necessary yet hard to obtain in Kodi Utara. The residents have to walk more than 2 kilometers to reach the nearest water sources. They always bring containers to collect water and bring it into the house. However, it is hard for them to go there frequently, due to the distance. The villagers are preferred to do daily activity without water. Therefore, hygiene behaviors were lacked from expectation, which would be one of the reasons of triggering diarrhea. On the other hand, conditions in Kodi make the population to be more advantageous compared to people who live in Kodi Utara. The area has accessible river near the human settlement. Consequently, people of Kodi are able to do daily routines that require water easily.

Supposedly, from the explanation above we can conclude that Kodi might have less number of diarrhea cases. However, our study showed that reachable water sources have no relation with prevalence of diarrhea, by the analytical result of chi square test that showed insignificant difference between prevalence of diarrhea in the two districts.

Although Kodi's location is better than Kodi Utara, we cannot assume that diarrhea occurs more in places without water. Hence, the underlying causes could be integrated with several reasons. There were great tendency for Kodi's residents to use river as their regular water for all daily habits, such as drinking, bathing, washing utilities, toilet habits or even washing their pets; and share it with others. As a consequence, in spite of Kodi has river and no limitation to reach water resources, the water probably has already contaminated with other pathogens, which can lead to water-borne diarrhea.

Therefore, we considered water as one of the necessary factors that might contribute to diarrheal disease, however unlimited and reachable water resources are not included into those factors. Yet,

the investigation of water resources should be passed through several processes until the water can be classified as uncontaminated water. In addition to that, societies in both subdistricts should receive more information regarding the implication of using river properly.

## Conclusion

The trend of diarrhea in Kodi and Kodi Utara found to be fluctuated in 2013. A large number of diarrhea cases in Kodi found in January and May, while the small number found in June and September. On the other hand, the most frequent diarrhea cases found in Kodi Utara were in April and September, while the least frequent was in December. Diarrhea cases in Kodi and Kodi Utara mainly belonged to population below 5 years old, with 268 and 357 respectively. The prevalence of diarrhea patients in 2013 was lower in Kodi with 1.68%, compared to Kodi Utara with 1.76%. This study found that there was an association between prevalence of diarrhea with age of patients. However, the results mentioned that the prevalence of diarrhea in both subdistricts has no relation with the availability of water sources.

## References

1. WHO. Diarrhoea: why children are still dying and what can be done [Internet]. 2009 [cited 2014 August 14]. Available from: [http://www.unicef.org/media/files/Final Diarrhoea Report October 2009](http://www.unicef.org/media/files/Final%20Diarrhoea%20Report%20October%202009.pdf)
2. Riset Kesehatan Dasar (Riskesdas). Pedoman pewawancara petugas pengumpul data. Jakarta: Badan Litbangkes Depkes RI. 2007. Indonesian.
3. Kementerian Kesehatan RI. Situasi diare di Indonesia. Jakarta: Kementerian Kesehatan; 2011. Indonesian.
4. Mandomando IM, Macete EV, Ruiz J, Sanz S, Abacassamo F, Vallès X, et al. Etiology of diarrhea in children younger than 5 years of age admitted in a rural hospital of Southern Mozambique. *Am J Trop Med Hyg*. 2007;76(3):522–7.
5. Kusumawardani B. Hubungan praktik hygiene sanitasi makanan pendamping air susu ibu (MP-ASI) tradisional dengan kejadian diare pada anak usia 6-24 bulan di kota Semarang [Tesis]. Semarang: Universitas Diponegoro; 2010. Indonesian.
6. Wilunda C, Panza A. Factors associated with diarrhea among children less than 5 years old in Thailand: a secondary analysis of Thailand multiple indicator cluster survey 2006. *J Health Res*. 2009;23:17–22.
7. Ma C, Wu S, Yang P, Li H, Tang S, Wang Q. Behavioural factors associated with diarrhea among adults over 18 years of age in Beijing, China. *BMC Public Health*. 2014;14(1):451.
8. Purwanto H. Hubungan faktor social ekonomi keluarga dan faktor lingkungan dengan kejadian diare pada balita [Tesis]. Jakarta: Universitas Indonesia; 1996. Indonesian.
9. World Gastroenterology Organisation (WGO). WGO practice guideline: acute diarrhea. Munich, Germany: World Gastroenterology Organisation (WGO); 2008.
10. Suraatmaja, S. Kapita selekta: gastroenterology anak. Jakarta: Sagung Seto; 2007. Indonesian.
11. Apriyanti M, Ikob R, Fajar NA. Faktor-faktor yang berhubungan dengan kejadian diare pada anak usia 6-24 bulan di wilayah kerja puskesmas swakelola 11 Ilir Palembang tahun 2009 [Tesis]. Palembang: Universitas Sriwijaya; 2009. Indonesian.
12. Pusat Penelitian Kesehatan Universitas Indonesia. Survey rumah tangga tentang perilaku kesehatan ibu dan anak serta pola pencarian pengobatan di tingkat masyarakat di propinsi NTB dan NTT. Jakarta: GTZ; 2007. Indonesian.
13. Badan Pusat Statistik (BPS). Survei demografi dan kesehatan Indonesian 2004. Jakarta: BPS; 2004. Indonesian.
14. Darmawan IM, Utami LA, Handayani RA, Nurcahyo AD, Maretawati E. Laporan penelitian: gambaran faktor-faktor yang berhubungan dengan tingginya diare pada balita di Kelurahan Krian, Kecamatan Krian, Kabupaten Sidoarjo (studi kasus). Surabaya: Universitas Wijaya Kusuma; 2008. Indonesian.
15. Adisasmitho W. Faktor risiko diare pada bayi dan balita di Indonesia: systematic review penelitian akademik bidang kesehatan masyarakat. *Makara kesehatan*. 2007;11(1):1–10. Indonesian.
16. Listiono. Faktor-faktor yang berhubungan dengan kejadian diare di wilayah kerja Puskesmas Lebakwangi Kecamatan Cigudeg Kabupaten Bogor tahun 2009. Jakarta: Universitas Indonesia; 2009. Indonesian.