

## MAPPING OF DIARRHEA IN TODDLERS WITH OPEN DEFECATION FREE (ODF) STATUS IN TUBAN REGENCY

Izza Mahendra<sup>1</sup>, Khuliyah Candraning  
Diyanah<sup>1\*</sup>, Moch. Irfan Hadi<sup>2</sup>, Sigit Ari  
Saputro<sup>3\*\*</sup>, Syahrul Afifa Ratna Sari<sup>4</sup>

<sup>1</sup>Departemen of Environmental Health, Faculty of Public Health, Universitas Airlangga, Surabaya 60115, Indonesia

<sup>2</sup>Faculty of Psychology and Health Science, Universitas Islam Negeri Sunan Ampel Surabaya, Surabaya 60237, Indonesia

<sup>3</sup>PhD Student in Data Science in Healthcare and Clinical Informatics, Department of Clinical Epidemiology and Biostatistics, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok 10400, Thailand

<sup>4</sup>District Health Office of Tuban, Ministry of Health of Republic Indonesia, Tuban 62317, Indonesia

### Corresponding Author:

\*) [k.c.diyana@fkm.unair.ac.id](mailto:k.c.diyana@fkm.unair.ac.id)

\*\*) [sigitari.sap@student.mahidol.edu](mailto:sigitari.sap@student.mahidol.edu)

### Article Info

Submitted : 18 February 2021  
In reviewed : 26 March 2021  
Accepted : 16 April 2021  
Available Online : 30 April 2021

**Keywords :** ODF, Diarrhea, Toddlers, CBTS, OD

**Published by** Fakultas Kesehatan Masyarakat  
Universitas Airlangga

### Abstract

**Introduction:** The Tuban Regency Health Profile in 2019 stated that the villages with ODF status had reached 64 villages (19.5%) out of 328 total villages, while the villages reported having implemented Community-Based Total Sanitation (CBTS) have reached 100%. The low ODF status achieved indicates that most people still defecate openly, which will increase health risks due to environmental pollution. This study aimed to determine the distribution map of diarrhea in toddlers in each district of Tuban Regency in 2019. **Methods:** This study was an observational research type supported by mapping through an application with a cross-sectional research design. This study was all districts in Tuban Regency. Data were obtained from secondary data, which were the Tuban Regency Health Profile in 2019. **Results and Discussion:** The percentage of latrine ownership was 71.15%, the open defecation was 70%, the percentage of children under five was not more than 14.69%, and cases of diarrhea among toddlers were relatively diverse in each district with the lowest number of cases was 0, and the highest number of cases was 841. **Conclusion:** Diarrhea in toddlers was commonly distributed in the Eastern and Southeastern Tuban Regency, directly adjacent to the Bengawan Solo River. There was a strong possibility that the occurrence of diarrhea was related to the water quality of Bengawan Solo River that was consumed for daily household activities.

## INTRODUCTION

Sanitation is an essential factor in achieving the success of a country in carrying out health development. In the SDGs, this goal is included in goal 6, ensuring availability and sustainable management of water and sanitation for all. Based on the goals of the SDGs, Indonesia is targeting the availability of access to safe, affordable, and evenly distributed drinking water for all people by 2030 (1). Sanitation is one of the efforts to control all human environmental factors that harm physical, health, and human survival (2). Sanitation problems encountered by many countries, including Indonesia are still relatively high, proving that Indonesia is indeed a country with the second-largest number of people having open defecation (3). Based on a report from the Indonesian Health Profile in 2016, it was reported that the population who still carried out open defecation was 16,209,333 (24.03%) heads of the family out of 67,453,504.

Open Defecation Free (ODF) is a community condition that requires each individual not to defecate openly. Based on the East Java Health Profile in 2019, the status of ODF villages in East Java was 4,940 villages (58.13%) out of 8,498 total villages, while access to sanitation in East Java had reached 91.99% (4). The Tuban Regency Health Profile in 2019 stated that the villages with ODF status have reached 64 villages (19.5%) out of 328 total villages, while the villages reported having implemented Community-Based Total Sanitation (CBTS) have reached 100% (5). The low ODF status achieved will cause an increase in health risks due to diseases based on environmental.

Diarrhea is a condition of defecating stools continuously and having liquid stools (6). Disease outbreaks of diarrhea occurred 21 times in 2017 in many provinces and 17 times in several regencies/cities with 1,725 patients and 34 deaths (7). Diarrhea patients in general at all ages in Tuban Regency in 2019 reached 14,328 cases (45.3%) of 31,665 estimated cases of diarrhea at all ages, while cases of diarrhea in children under five reached 6,072 cases (63%) of 9,639 estimated cases of toddlers. Diarrhea can occur due to factors such as the host factor, agent factor, and environmental factor. The host factor is a factor from inside the people that supports a disease, such as lack of hygiene behavior. The agent factor is a causative factor that can support diseases such as an infectious microorganism, malabsorption factor due to ineffective and efficient absorption of food by the body, and food factor. Meanwhile, the environmental factor is a factor from the environment that can support a disease such as

poor environmental sanitation conditions (8). The host, agent, and environment must be in a balanced state because there is no gap between the three factors. There will be problem when there is a gap between the three factors, there will be problems/diseases, one of which is diarrhea, including diarrhea in children under five (9).

The prevention of diarrhea is categorized into 3 categories: primary prevention, secondary prevention, and tertiary prevention (8). Primary prevention aims to eliminate the microorganisms, improve nutritional status, immunization, provision of clean water, defecate in the latrine, provide exclusive breast milk, and wash hands with soap. Secondary prevention is provided to people who have been infected in the form of diarrhea medication, which is chemotherapeutic (eliminates the cause of diarrhea due to microorganisms), obstipans (relieves symptoms of diarrhea), and spasmolytics (eliminates spasms in the abdominal part). Meanwhile, tertiary prevention is an action taken to the patients do not experience disability or death caused by diarrhea. Rehabilitative efforts are also carried out at this stage of prevention to restore the patient's condition both physically and psychologically.

Intervention in the form of elimination of open defecation can reduce the number of diarrhea (10). Several studies in Indonesia and Ethiopia showed that the prevalence of diarrhea among children under five in areas still open defecation was higher than in areas with ODF (11-12). One of the sources of the spread of diarrheal diseases is human waste caused by the habit of open defecation. Besides the practice of open defecation, ownership of a latrine (8,12), measures such as immunization for children, availability of clean water in households, and disposal of waste also showed statistically significant results with diarrhea in areas with open defecation (12). Other studies suggested a relationship between latrine ownership (13) and latrine conditions with diarrhea in children under five (8,13). The spread of diarrhea can be through various ways, including through hands, water, contaminated soil, or through food contaminated by disease-carrying vectors (8). The Geographical Information System (GIS) will make it easier to display and compare the distribution of a case of diarrhea in children under five and help show the causes, particularly the sanitation factor. This study aimed to determine the distribution map of diarrhea cases in children under five and the distribution map of ODF status in each district in Tuban Regency in 2019 so that handling of diarrhea in children under five can be carried out optimally due to sanitation factors.

**METHODS**

This study was an observational study supported with mapping with a cross-sectional research design. The population in this study represents all districts in the Tuban Regency of East Java Province. This study used a total sampling technique where the number of samples was the same as that of the population. The independent variables studied were latrine ownership, malnourished toddlers, and open defecation. The dependent variable in this study was the case of diarrhea in toddlers. The data sourced from secondary data from Tuban Regency Health Profile in 2019. The data on latrine ownership, open defecation habits, malnourished toddlers, and diarrhea cases were grouped by area per district. The data was mapped using the Quantum Geographic Information System (QGIS) 3.10 application to describe the distribution of cases. The analysis was carried out qualitatively, which was by describing the conditions in the field using mapping.

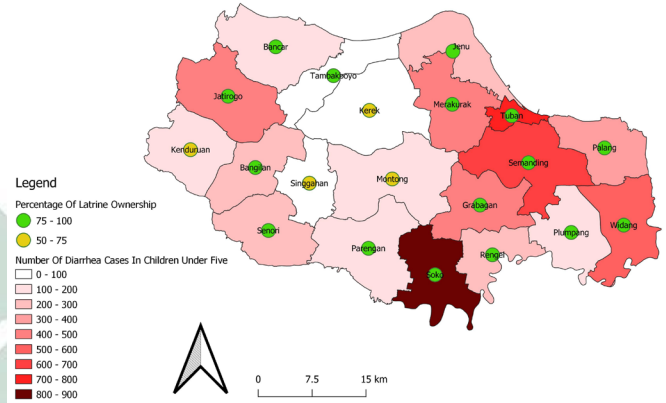
was carried out for the distribution of latrine ownership percentage, the distribution of the open defecation percentage, the distribution of the malnourished toddlers' percentage, and the distribution of diarrhea cases among toddlers in Tuban Regency in 2019.

**RESULTS**

Based on Figure 1, the percentage of latrine ownership was fairly even in each district, and the details of percentage of heads of family who had proper latrines in each district had a minimum value of 71.15%, which indicates that most of the households in Tuban Regency had access to proper latrines (Table 1). Based on Figure 2, the percentage of people who still practiced open defecation (OD) in each district was still evenly distributed, and the number was relatively high. The smallest percentage of the practice of open defecation in each sub-district was 70%, which indicates that most people still had a habit of open defecation (Table 2). Based on Figure 3, it can be seen that the percentage of malnourished toddlers was relatively low and evenly distributed in each district. The highest percentage of malnourished toddlers was 14.69%, which indicates that most of the children under five in Tuban Regency had a good nutritional status, so it was rare to find toddlers with malnutrition status in each district (Table 3).

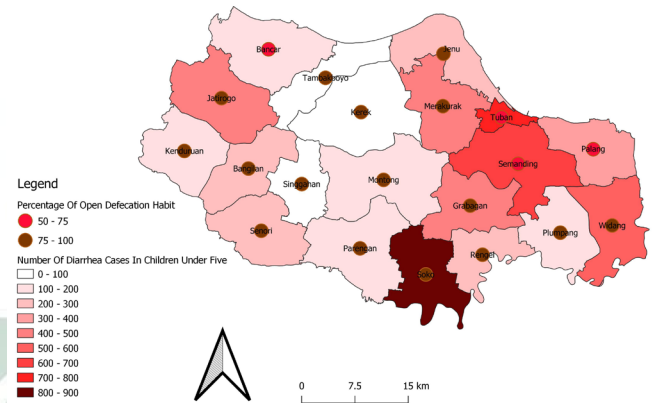
Based on Figure 1, Figure 2, Figure 3, and Table 4, it can be seen that the number of diarrhea cases in toddlers in Tuban Regency was relatively high and the distribution was quite evenly distributed, especially in the Eastern to the Southeastern region with the highest score of 841 cases in Soko District. However, in the Northern areas such as Singgahan, Kerek, and Tambakboyo District, there were no cases of diarrhea. Based on data from Table 1, Table 2, Table 3, and Table 4, the mapping

Percentage Map Of Latrine Ownership And Diarrhea For Children Under Five In Tuban Regency 2019



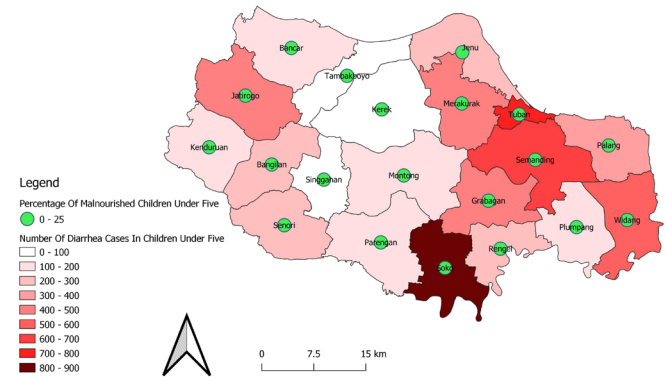
**Figure 1. Percentage Map of Latrine Ownership and Diarrhea for Children Under Five**

Percentage Map Of Open Defecation Habits And Diarrhea For Children Under Five In Tuban Regency 2019



**Figure 2. Percentage Map of Open Defecation Habits and Diarrhea for Children Under Five**

Percentage Map Of Children Under Fives With Undernutrition And Diarrhea For Children Under Fives In Tuban Regency 2019



**Figure 3 Percentage Map of Children Under Fives With Undernutrition and Diarrhea for Children Under Fives**



**Table 1. Households with Proper Latrine Ownership**

Districts	Households with Proper Latrine Ownership		
	Number of Households	Number of Households with Proper Latrines	Percentage of Households with Proper Latrines (%)
Kenduruan	7,948	5,655	71.15
Bangilan	16,273	14,747	90.62
Senori	12,969	12,010	92.61
Singgahan	13,497	8,193	60.70
Montong	14,002	10,050	71.78
Parengan	8,708	7,971	91.54
Soko	27,793	25,059	90.16
Rengel	17,717	15,475	87.35
Grabagan	11,946	9,625	80.57
Plumpang	21,375	19,252	90.07
Widang	15,943	15,016	94.19
Palang	25,349	23,925	94.38
Semanding	33,005	28,527	86.43
Tuban	23,278	21,213	91.13
Jenu	17,134	14,560	84.98
Merakurak	17,535	14,775	84.26
Kerek	39,277	22,704	57.80
Tambakboyo	12,036	9,706	80.64
Jatirogo	27,124	21,140	77.94
Bancar	6,670	5,141	77.08

**Table 2. Villages with Open Defecation Habits**

Districts	Villages with Open Defecation Habits		
	Number of Villages	Number of OD Villages	Percentage of OD Villages (%)
Kenduruan	9	8	88.89
Bangilan	14	12	85.71
Senori	12	10	83.33
Singgahan	12	12	100
Montong	13	11	84.62
Parengan	18	14	77.78
Soko	23	21	91.30
Rengel	16	14	87.50
Grabagan	11	11	100
Plumpang	18	15	83.33
Widang	16	13	81.25
Palang	19	14	73.68
Semanding	17	12	70.59
Tuban	17	12	70.59
Jenu	17	16	94.12
Merakurak	19	17	89.47
Kerek	17	13	76.47
Tambakboyo	18	14	77.78

**Villages with Open Defecation Habits**

Districts	Number of Villages	Number of OD Villages	Percentage of OD Villages (%)
Jatirogo	32	28	87.50
Bancar	10	7	70

**Table 3. Malnourished Toddlers**

Districts	Malnourished Toddlers		
	Number of Toddlers Weighed	Number of Malnourished Toddlers	Percentage of Malnourished Toddlers (%)
Kenduruan	1,437	155	10.79
Bangilan	3,061	342	11.17
Senori	2,224	320	14.39
Singgahan	2,330	264	11.33
Montong	3,104	241	7.76
Parengan	3,342	274	8.20
Soko	4,894	562	11.48
Rengel	3,735	174	4.66
Grabagan	2,208	129	5.84
Plumpang	4,904	514	10.48
Widang	2,768	197	7.12
Palang	4,832	279	5.77
Semanding	6,039	409	6.77
Tuban	5,676	97	1.71
Jenu	3,803	390	10.26
Merakurak	3,510	290	8.26
Kerek	3,214	230	7.16
Tambakboyo	2,212	325	14.69
Jatirogo	4,538	448	9.87
Bancar	2,238	244	10.90

**Table 4. Number of Diarrhea in Toddlers**

Districts	Diarrhea in Toddlers		
	Number of Toddlers	Number of Diarrhea in Toddlers	Prevalence (%)
Kenduruan	1,796	106	5.9
Bangilan	3,098	272	8.78
Senori	2,856	206	7.21
Singgahan	2,770	0	0
Montong	3,361	122	3.63
Parengan	3,515	110	3.13
Soko	5,186	841	16.22
Rengel	4,010	201	5.01
Grabagan	2,203	453	20.56
Plumpang	5,463	171	3.13
Widang	3,313	562	16.96

Districts	Diarrhea in Toddlers		
	Number of Toddlers	Number of Diarrhea in Toddlers	Prevalence (%)
Palang	6,048	353	5.84
Semanding	7,430	621	8.36
Tuban	6,276	775	12.35
Jenu	3,808	203	5.33
Merakurak	3,647	434	11.9
Kerek	3,802	0	0
Tambakboyo	2,817	0	0
Jatirogo	6,080	460	7.57
Bancar	1,244	182	14.63

**DISCUSSION**

Ownership and availability of latrines are some of the primary prevention efforts closely related to the incidence of diarrhea (8,12). Based on Figure 1 and Table 1, it can be considered that most of the latrines used by the community were adequate and evenly distributed in each district. A good latrine has a septic tank that is used as a container tank of urine and feces. The septic tank should consist of a container tank and an infiltration area. This is because the feces are about to undergo chemical and biological processes, where the chemical process will by maintaining the septic tank atmosphere so that the bacteria can thrive by forming a layer of scum which comes from some substances that do not destroy with fat, while the biological process will take place the decomposition by anaerobic bacteria that have developed and increasing in number (8).

The CTBS achievement in Tuban Regency was very high, with a distribution of 100% in each village throughout 2019. Based on the Regulation of Ministry of Health Republic Indonesia No.3/MENKES/2014 about Community Based Total Sanitation, it is stated that stopping open defecation must be accompanied by the use of sanitary facilities in the form of healthy latrines. Sanitary is a condition of sanitation facilities that meet health standards in which they do not cause a direct spread of risky materials caused by human waste disposal and can avoid carrier vectors to spread disease in the surrounding area (14). The high CBTS achievement was not followed by the behavior of the community who practice open defecation. It can be seen in Figure 2 that the percentage of people who still practice open defecation was quite evenly distributed, and the percentage was relatively high in each district. The lack of awareness or a low understanding of hygiene and sanitation caused it.

Based on Figure 1 and Figure 2, this was not in line with a study in the community of Tanjung Pinang Village, West Muna Regency, which stated that latrine ownership was directly proportional to latrine use behavior (15). Economic factors can also trigger a lack of public awareness and understanding. A study in the working area of the Community Health Center of Tanjung Batu showed that the community would economically tend to fulfill their daily needs such as clothing and food. When this has been fulfilled, the community will fulfill their health needs, including meeting the need for healthy latrines (3). This indicates that the public's understanding still considers that health is not included in their daily needs while defecating is a routine activity carried out almost every day by humans.

By looking at Figure 1 and Table 1, it can be considered that latrine ownership and cases of diarrhea in children under five in Tuban Regency were directly proportional to the high percentage of latrine ownership followed by high cases of diarrhea in children under five as well.

Almost every district in Tuban Regency had a habit of open defecation (Figure 2). Some districts such as Soko, Semanding, and Tuban had quite high rates of diarrhea in children under five. The behavior of open defecation is one of the causes of the spread of disease because feces are a medium for developing germs, one of which is the bacteria that causes diarrhea (16). The failure to manage a safe disposal system will cause pollution due to germs and pollution carried by vectors (17). Provision of good sanitation facilities, provision of water that is safe from contamination, provision of healthy and sanitary latrines, an organized sewage system, and education on the importance of hygiene will reduce deaths from diarrhea (18). Based on a study conducted in Ethiopia, it is stated that the shared use of sanitation facilities, low hygiene of sanitation facilities, the distance between houses and sanitation facilities, as well as a garbage disposal in the residential area indicates a relationship with diarrhea in children under five (19).

A program such as Community-Based Total Sanitation (CBTS) will increase the latrine ownership of each household by at least twice the percentage, which was evident from a study conducted in Ghana and Tanzania. Likewise, based on the findings in Mali, there was a decrease of at least 24% for people who practice open defecation (20). Similar studies in Indonesia showed that in the CBTS program, especially the aspect of not practicing open defecation had a relationship with diarrhea (2,17). Besides, other aspects such as the provision of clean water, provision of latrines, provision of wastewater disposal facilities, and waste disposal

facilities also showed a significant relationship with diarrhea in children under five (21-22). Other aspects in CBTS, such as the community's behavior to wash their hands using soap and running water, are also an effort to reduce diarrhea. By considering the practice of open defecation in the Tuban Regency, the figures were still relatively high and quite evenly distributed in each region. However, by considering the cases of diarrhea in children under five, it can be seen that the cases were higher in the Eastern and Southeastern areas of the Tuban Regency.

The Southeastern area of Tuban Regency is directly adjacent to the Bengawan Solo River, so that there was a strong possibility that the water used for hygiene sanitation came from the river, and there was also a strong possibility that the groundwater in the area had been contaminated. The community was still practicing open defecation in the river both in small rivers and large rivers, which eventually flew into the Bengawan Solo River so that the groundwater of Southeastern and Eastern areas of Tuban Regency became contaminated. There was a strong possibility that the people in that area consumed contaminated water from the river. Good management of food and beverages, such as using water that is boiled before consumption, using a closed water container/storage, and cleaning the drinking water container/storage at least once a week is proven to prevent diarrhea (16). In addition, food sanitation also needs to be considered because there is the possibility of transmission through food due to the lack of hygiene for food handlers, both from the storage temperature that does not meet standards, the use of less clean water to wash utensils, the use of clothes by handlers who lack hygiene, or the habit of not washing hands when taking food (23). Clean and Healthy Living Behavior (CHLB) in parents is also one factor that supports diarrhea in children under five (24-25). Besides, exclusive breastfeeding also plays an important role in preventing diarrhea, including diarrhea in children under five. Children under five who are given exclusive breastfeeding mostly do not suffer from diarrhea compared to those who are only given formula milk (26).

According to WHO, children under five who are provided non-exclusive breastfed milk have a 17 times greater chance of getting diarrhea than those exclusively breastfed. In addition, washing hands is also a factor in causing diarrhea in children under five. Based on a study, it is proven that children under five who did not wash their hands before eating had a 1,364 times greater risk of getting diarrhea than those who washed their hands before eating (26). Exclusive breastfeeding had also been

shown to increase the immunity of the baby, especially exclusive breastfeeding for the first six months of the life of the children under five, which had proven to be sufficient to meet the baby's needs to grow and develop (25). This increase in the immune system will certainly make children under five less susceptible to diseases, including diarrhea. Children under five who are provided exclusive breastfeeding, which is breastfeeding without being accompanied by the provision of other additional food and/or drinks except for supplements recommended by a doctor, is proven to prevent children under five from the dangers of bacteria or other organisms that can cause diarrhea in children under five (25).

Community belief may also be a motivating factor for the community to take precautions against diarrhea in children under five. Community belief is a significant predictor of family intentions to take precautions against diarrhea (27). The high percentage of latrine ownership (Figure 1) and the high percentage of people who practiced open defecation (Figure 2) may also come from the low motivation of parents in accustoming their families to defecating properly. However, several other factors may also influence this motivation, including intrinsic and extrinsic factors (28). Intrinsic factors affect an individual's motivation such as knowledge of health and literacy of health (27-28). Meanwhile, extrinsic factors affect an individual's motivation, including encouragement from family, relatives, friends, and health workers (27-28). Enhancement of motivation in parents can be done by providing education such as through leaflets, brochures, and information that motivates an individual (28).

## CONCLUSION

Diarrhea cases in children under five should be a concern for the government because the number of cases was relatively high and evenly distributed in each district. The success of a CBTS program certainly needs to be supported by other factors such as increased knowledge and public awareness, particularly the community's habit, one of which of not practicing open defecation, which is proven to be detrimental to others. The availability of facilities in the form of latrines was quite evenly distributed in each district, but the habit of open defecation was still high. Further studies and interventions need to be carried out, especially on the quality of groundwater in the Eastern and Southeastern Tuban Regency and the water quality of the Bengawan Solo River, which was strongly suspected of having been contaminated.



## REFERENCES

1. Indonesian Ministry of National Development Planning. Draft of Technical Guidelines for the Preparation of Sustainable Development Plans and Actions (RAN TPB). Jakarta: Indonesian Ministry of National Development Planning; 2016. <https://www.bappenas.go.id/>
2. Syam S, Anisah UZ. Analisis Pendekatan Sanitasi dalam Menangani Stunting (Studi Literatur). *J Sulolipu*. 2020;3(1):30–52. <https://doi.org/10.32382/sulolipu.v2i20.1745>
3. Yulda A, Fajar NA, Utama F. Pengaruh Faktor Internal dan Eksternal Terhadap Perilaku Buang Air Besar di Jamban Pasca Pemicuan di Wilayah Kerja Puskesmas Tanjung Batu. *J Ilmu Kesehat Masy*. 2017;8(2):109–116. <https://doi.org/10.26553/jikm.2016.8.2.109-116>
4. Province Health Office of East Java. Health Profile of East Java Province in 2019. Surabaya: Province Health Office of East Java; 2019.
5. District Health Office of Tuban. Health Profile of Tuban District in 2019. Tuban: District Health Office of Tuban; 2019.
6. Hartati S, Nurazila N. Faktor yang Mempengaruhi Kejadian Diare pada Balita di Wilayah Kerja Puskesmas Rejosari Pekanbaru. *J Endur*. 2018;3(2):400-407. <http://ejournal.ildikti10.id/index.php/endurance/article/view/2962/1083>
7. Ministry of Health of Republic Indonesia. Indonesia Health Profile 2017. Jakarta: Ministry of Health of Republic Indonesia; 2018.
8. Rohmah N, Syahrul F. Relationship Between Hand-Washing Habit and Toilet Use With Diarrhea Incidence in Children Under Five Years. *J Berk Epidemiol*. 2017;5(1):95-106. <https://doi.org/10.20473/jbe.V5i12017.95-106>
9. Dwimawati E. Gambaran Status Gizi Berdasarkan Antropometri pada Mahasiswa Fakultas Ilmu Kesehatan Masyarakat Universitas Ibnu Khaldun Bogor. *Promotor*. 2020;3(1):50-55. <https://doi.org/10.32832/pro.v3i1.3144>
10. Njuguna J. Effect of Eliminating Open Defecation on Diarrhoeal Morbidity: An Ecological Study of Nyando and Nambale Sub-Counties, Kenya. *BMC Public Health*. 2016;16(1):2–7. <https://doi.org/10.1186/s12889-016-3421-2>
11. Marbun FT, Bakri S. Pengaruh Status Open Defecation Free ( ODF ) , Buffer Pelayanan Kesehatan terhadap Kejadian Diare pada Balita di Kabupaten Pringsewu, Lampung. *Thesis*. Lampung: Universitas Lampung; 2018
12. Ayalew AM, Mekonnen WT, Abaya SW, Mekonnen ZA. Assessment of Diarrhea and Its Associated Factors in Under-Five Children among Open Defecation and Open Defecation-Free Rural Settings of Dangla District, Northwest Ethiopia. *J Environ Public Health*. 2018;1(4271915):1-9. <https://doi.org/10.1155/2018/4271915>
13. Kasman, Ishak NI. Kepemilikan Jamban terhadap Kejadian Diare pada Balita di Kota Banjarmasin. *J Publ Kesehat Masy Indones*. 2020;7(1):28–33. <https://doi.org/10.20527/jpkmi.v7i1.8790>
14. Ministry of Health Republic Indonesia. Regulation of Ministry of Health Republic Indonesia No.3/ MENKES/2014 about Community Based Total Sanitation. Jakarta: Ministry of Health of Republic Indonesia; 2014. <http://stbm.kemkes.go.id/app/news/7558/permenkes-nomor-3-tahun-2014-tentang-stbm>
15. Kirana C, Suhadi, Yasnani. Analisis Perilaku Sanitasi Lingkungan pada Penggunaan Jamban Masyarakat Suku Bajo di Wilayah Pesisir Desa Tanjung Pinang Kecamatan Kusambi Kabupaten Muna Barat Tahun 2018. *J Ilm Mhs Kesehat Masy*. 2019;4(2):30–36. <http://dx.doi.org/10.37887/jimkesmas.v4i2.7603>
16. Monica DZ, Ahyanti M, Prianto N. Hubungan Penerapan 5 Pilar Sanitasi Total Berbasis Masyarakat (STBM) dan Kejadian Diare di Desa Taman Baru Kecamatan Penengahan Kabupaten Lampung Selatan. *Ruwa Jurai J Kesehat Lingkung*. 2020;14(2):71-77. <https://doi.org/10.26630/rj.v14i2.2183>
17. Pahmi L. Household Risk Factors for Diarrhoea Disease in Children Under Five Years Old in Indonesia. *J Ilmu Kesehat Masy*. 2019;10(1):50–58. <https://doi.org/10.26553/jikm.2019.10.1.50-58>
18. Yushananta P, Ahyanti M, Hasan A. Sanitasi Total Berbasis Masyarakat ( STBM ) di Desa Muara Putih Kecamatan Natar Kabupaten Lampung Selatan. *J Pengabdian Kpd Masy*. 2018;2(2):76–80. <https://doi.org/10.23960/jss.v2i2.79>
19. Adane M, Mengistie B, Kloos H, Medhin G, Mulat W. Sanitation Facilities, Hygienic Conditions, and Prevalence of Acute Diarrhea among Underfive Children in Slums of Addis Ababa, Ethiopia: Baseline Survey of a Longitudinal Study. *PLoS One*. 2017;12(8):1–18. <https://doi.org/10.1371/journal.pone.0182783>
20. Yeboah-Antwi K, MacLeod WB, Biemba G, Sijenyi P, Höhne A, Verstraete L, et al. Improving Sanitation and Hygiene through Community-Led Total Sanitation: The Zambian Experience. *Am J Trop Med Hyg*. 2019;100(4):1005–1012. <https://doi.org/10.4269/ajtmh.18-0632>
21. Aprilian R, Sety LOM, Fithria. Faktor Risiko Diare terkait Lingkungan dengan Kejadian Gizi Kurang pada Balita di Wilayah Kerja Puskesmas Nambo Kota Kendari. *J Kesehat Lingkung Univ Halu Oleo*. 2020;1(1):26–35. <https://doi.org/10.37887/ej.v1i1.16607>
22. Hatta H. Relationship History of Exclusive Assessment of Diarrhea Events Children in Limboto Public Health Center Gorontalo District. *J Dunia Gizi*. 2020;3(1):59–66. <https://doi.org/10.33085/jdg.v3i1.4656>
23. Mshida HA, Kassim N, Mpolya E, Kimanya M. Water, Sanitation, and Hygiene Practices Associated

- with Nutritional Status of Under-Five Children in Semi-Pastoral Communities Tanzania. *Am J Trop Med Hyg.* 2018;98(5):1242–1249. <https://doi.org/10.4269/ajtmh.17-0399>
24. Yanti PD, Afritayeni A, Amanda NF. Hubungan Perilaku Orang Tua dengan Kejadian Diare pada Balita di Puskesmas Rejosari Kota Pekanbaru Tahun 2018. *J Ilmu Kebidanan.* 2019;8(2):135–141. <https://doi.org/10.35328/kebidanan.v8i2.160>
  25. Irianty H, Hayati R, Riza Y. Hubungan Perilaku Hidup Bersih dan Sehat (PHBS) dengan Kejadian Diare pada Balita. *PromotJKesehatMasy.* 2018;8(1):1-10. <https://doi.org/10.31934/promotif.v8i1.224>
  26. Grafika D, Sabilu Y, Munandar S. Faktor Risiko Kurangnya Perilaku Hidup Bersih dan Sehat (PHBS) Tatanan Rumah Tangga terhadap Kejadian Diare pada Balita di Wilayah Kerja Puskesmas Benu-Benu Kota Kendari Tahun 2017. *J Ilm Mhs Kesehat Masy.* 2017;2(7):1–10. <http://dx.doi.org/10.37887/jimkesmas.v2i7.3421>
  27. Sufiati SD, The F, Soesanty. Gambaran Pengetahuan dan Sikap Ibu dalam Pencegahan Diare pada Balita. *Kieraha Med J.* 2019;1(1):24–30. <https://ejournal.unkhair.ac.id/index.php/kmj/article/view/1664>
  28. Febriana D, Arifarahmi A, Febrina R. Gambaran Motivasi dan Peran Orangtua Tentang Cuci Tangan Pakai Sabun pada Anak di SD Negeri 19 Kota Jambi Tahun 2019. *J Akad Baiturrahim Jambi.* 2019;8(2):206-217. <http://dx.doi.org/10.36565/jab.v8i2.173>

