

How is the Effect of Health Services on Toddler Diarrhea?: Ecological Analysis in Indonesia

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Abstract

Background: About 4 billion cases of toddler diarrhea occur worldwide each year. As many as 70% of toddler deaths in the world were caused by diarrheal infections. This study was intended to analyze the relationship of health services factors on the prevalence of diarrhea of infants in Indonesia.

Methods: Ecological analysis was conducted using secondary data from the Ministry of Health of the Republic of Indonesia report in 2018. All provinces were taken as samples. Apart from prevalence of children under five with diarrhea, 4 other variables analyzed as independent variables were, the availability of health workers, the coverage of diarrhea services and the coverage of oralit services to the patients, the coverage of zinc services to the patients, and the poverty factors in each provinces. Data were analyzed using cross-tabulation and spearman test.

Results: The results show from 34 provinces, the highest prevalence of toddlers is in the Papua Province. The results showed that the higher the percentage of poor people in the province, the higher the prevalence of diarrhea in toddlers ($r=0.363$). While the low availability of health resources, coverage of oralit use, and coverage of zinc use in patients were mostly occurring in provinces that had a high prevalence of toddler diarrhea. This means that there was an inverse relationship between the availability of health resources ($r=-0.430$), the coverage of oralit use ($r=-0.149$) and the coverage of zinc use in patients ($r=-0.013$) with the prevalence of diarrhea in toddlers.

Conclusion: It was concluded that according to bivariate analysis on the prevalence of diarrhea of toddlers showed that increasing availability of health resources in the provinces can help to reduce the prevalence of toddlers by assuming other variables remain.

Keywords: ecological analysis, secondary data, diarrhea, toddlers, good health, well-being

Background

Diarrheal disease is one of the most common diseases affecting children around the world including

developing countries such as Indonesia. This is due to its high morbidity and mortality. Diarrhea in children can cause fatal things if not balanced with good fluid and nutritional inputs or sudden diarrhea occurs and does not get proper treatment by caregivers, otherwise diarrhea actually also includes mild illnesses if the sufferer gets adequate care. Diarrhea is defecation with a more fluid feces consistency with a frequency

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of >3 times a day, except in neonates (infants < 1 month) who get breast milk usually defecate with a frequency more often (5-6 times a day) with good consistency is considered normal¹.

An estimated 4 billion cases diarrhea occur each year in toddlers worldwide. Every year 1.5 million toddlers die from diarrhea. Diarrhea leads to faster deaths in children than adults due to dehydration and malnutrition. Based on data released by WHO almost 1 trillion and 2.5 billion deaths from diarrhea in the first 2 years of life. Diarrhea also causes 70% of the deaths of the toddlers in the world. A record proved, 1.8 billion die each year from diarrhea, many of which have complications such as malnutrition, growth retardation and immune abnormalities². Although mortality from diarrhea can be lowered by rehydration/ fluid therapy programs, the pain rate remains high. The death rate due to diarrhea was 3.8 per 1000 per year, the overall incidence median in children under 5 years of age was 3.2 episodes of children per year³.

The prevalence rate of diarrhea in Indonesia is still fluctuating. The period of diarrhea prevalence in Indonesia is currently 6.8% higher than in 2013 (3.5%) but smaller than the Basic Health Research (Riskesmas) 2007 which is 9.0%. This high decrease in prevalence period is possible due to unequal sampling times between 2018, 2013, and 2007¹. On the other hand, through the SDGs program the government can improve and improve the quality of the health in toddlers, as contained in the target SDGs program until 2030, in the third goal is to target the reduction of deaths in the number of newborns to 12 per 1000 live baby births and the death of toddlers 25 per 1000 live toddler births⁴.

The target coverage of services for toddlers who come to health facilities of 20% of the estimated number of diarrhea sufferers (Incidence of Diarrhea toddlers multiplied by the number of toddlers in one work area within one year). In 2018 the number of diarrhea sufferers of toddlers served in health facilities as much as 1,637,708 or 40.90% of the estimated

diarrhea in health facilities⁵.

Control of diarrhea disease itself has long been attempted by the Indonesian government to suppress the incidence of diarrhea. Efforts made by the government such as the provision of clean water and total community-based sanitation programs with the aim of improving the quality of life of the community and lowering deaths caused by diarrheal disease. However diarrheal disease is still the highest cause of death in toddlers after Acute Respiratory Tract Infection⁶.

Five Steps To Resolve Diarrhea Program recommends that all diarrhea sufferers should get oralit then the target of using oralit is 100% of all cases of diarrhea that get services in puskesmas and cadres. In 2018 nationally the use of oralit of all ages is still below the target of 90.48%. The achievement is still lacking because the service providers in puskesmas and cadres have not provided oralit in accordance with the standard of governance that is as much as 6 packs/ diarrhea sufferers.

Zinc is a micronutrient that serves to reduce the length and severity of diarrhea, reduce the frequency of defecation, reduce the volume of stool and decrease the recurrence of diarrhea incidence in the next three months. The use of zinc for 10 days in a row when the toddler diarrhea is diarrhea therapy toddlers. In 2018, the coverage of zinc administration in diarrhea toddlers was 93.23%⁵.

Indonesia is a country of low health. This is due to health care factors, one of which is the lack of availability of health worker⁷. The placement of health workers in the village is expected to increase the coverage of health services and reduce the incidence of diarrhea⁸. The previous study have shown that families with high poverty rates are more at risk of having children with diarrhea than families with low poverty rates⁹. Therefore, this study is intended to identify the association of diarrhea prevalence in infants in Indonesia with poverty factors, availability of health workers, and the use of zinc and oralit.

Materials and Methods

Study Design

This study used an ecological analysis approach. Ecological studies focus on comparisons between groups, not individuals. The data analyzed is aggregated data in certain groups or levels, which in this study is the provincial level. Variables in ecological analysis can be aggregate measures, environmental measures, or global measures^{10,11}.

Data Source

This study was carried out by utilizing secondary data from reports of the 2018 Indonesia Basic Health Survey and the 2018 Data and Information of Indonesia Health Profile. The two reports were officially issued by the Ministry of Health of the Republic of Indonesia. The variable prevalence of diarrhea in children under five were obtained from the 2018 Indonesia Basic Health Survey⁵. Whereas, the other variables were obtained from the 2018 Data and Information of Indonesia Health Profile¹. The unit of analysis in this study is the province. All provinces in

Indonesia were analyzed, as many as 34 provinces.

Data Analysis

Data were analyzed to be univariate and bivariate. Univariate analysis were obtained to identify variable statistical description. While other variables will be categorized into 2 strata with statistically the same cut of points (by the mean of each variable). Bivariate analysis were obtained by using cross-tabulation to identify the number of distributions between two variables dan spearman test to identify the value of the relationship and the direction of the relationship between the two variables. Because the data processed was a total sample of the entire province, it was not necessary to see the level of significance. All analysis processes utilized software SPSS 21.

Results

Table 1 shows a fairly wide disparity in the prevalence of toddlers diarrhea in Indonesia 2018. It was recorded that Papua Province had the highest prevalence of toddlers diarrhea at 15.80%. While the lowest prevalence of toddlers diarrhea was in Riau Islands Province at 6.00%.

Table 1. Descriptive statistics variables of prevalence of toddler diarrhea and other related variables in Indonesia

	Prevalence of Toddler Diarrhea	Coverage of Toddler Diarrhea Services	Coverage of Patients Receiving Zinc	Coverage of Patients Receiving ORS	Poor Population	Availability of Health Workers
N	34	34	34	34	34	34
Mean	11.37	37.93	89.78	88.89	10.61	72.25
Median	10.85	37.37	95.53	93.48	8.90	51.70
Mode	9.70	9.77	100.00	100.00	3.55	16.30
Std. Deviation	2.57	14.01	18.45	18.33	5.70	61.06
Variance	6.59	196.26	340.49	336.03	32.523	3728.49
Range	9.80	66.11	100.00	100.00	23.88	321.34
Minimum	6.00	9.77	.00	.00	3.55	16.30
Maximum	15.80	75.88	100.00	100.00	27.43	337.64

Source: The 2018 Indonesia Basic Health Survey and The 2018 Indonesia Health Profile

Table 2. Prevalence of toddler diarrhea according to the coverage of toddler diarrhea services

Coverage of Toddler Diarrhea Services	Prevalence of toddler diarrhea				Total	
	Low		High			
	n	%	n	%	n	%
Low	12	66.7	6	33.3	18	100.0
High	7	43.8	9	56.3	16	100.0

Source: The 2018 Indonesia Basic Health Survey and The 2018 Indonesia Health Profile

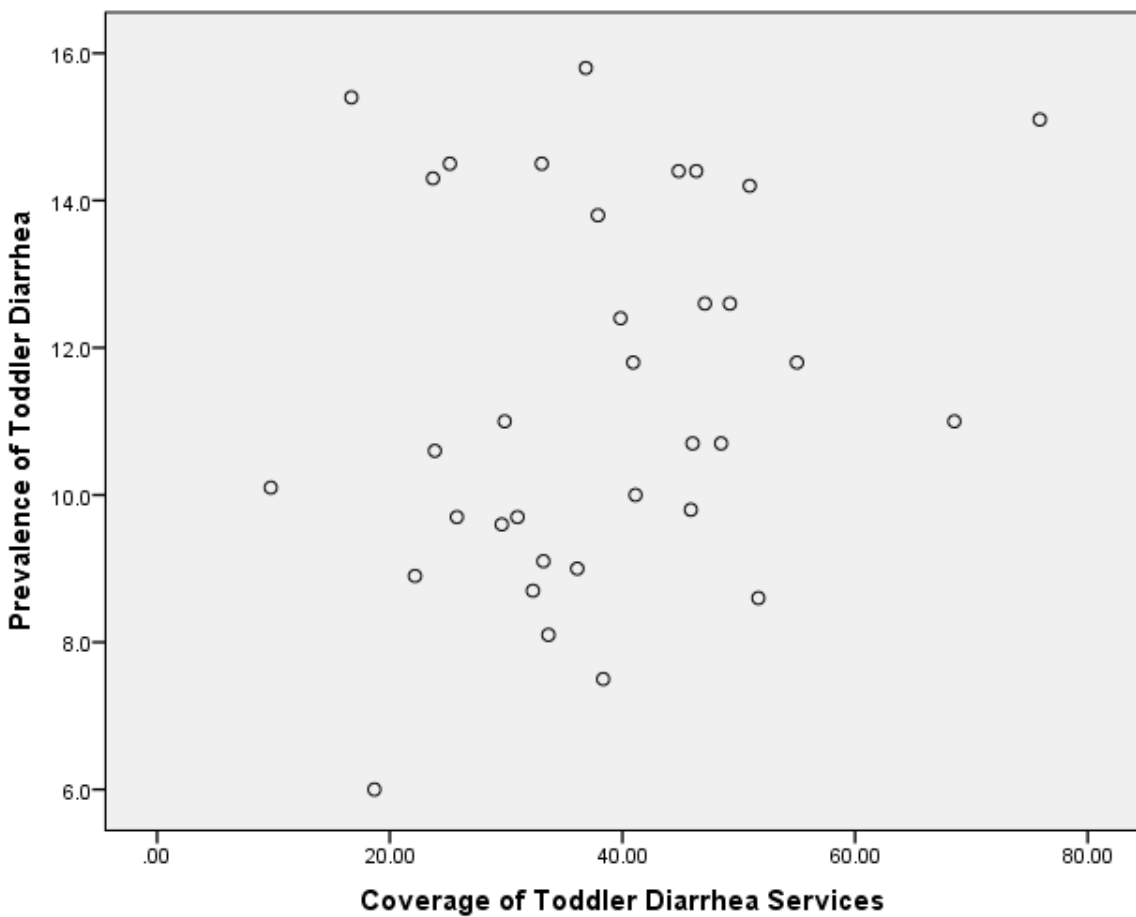


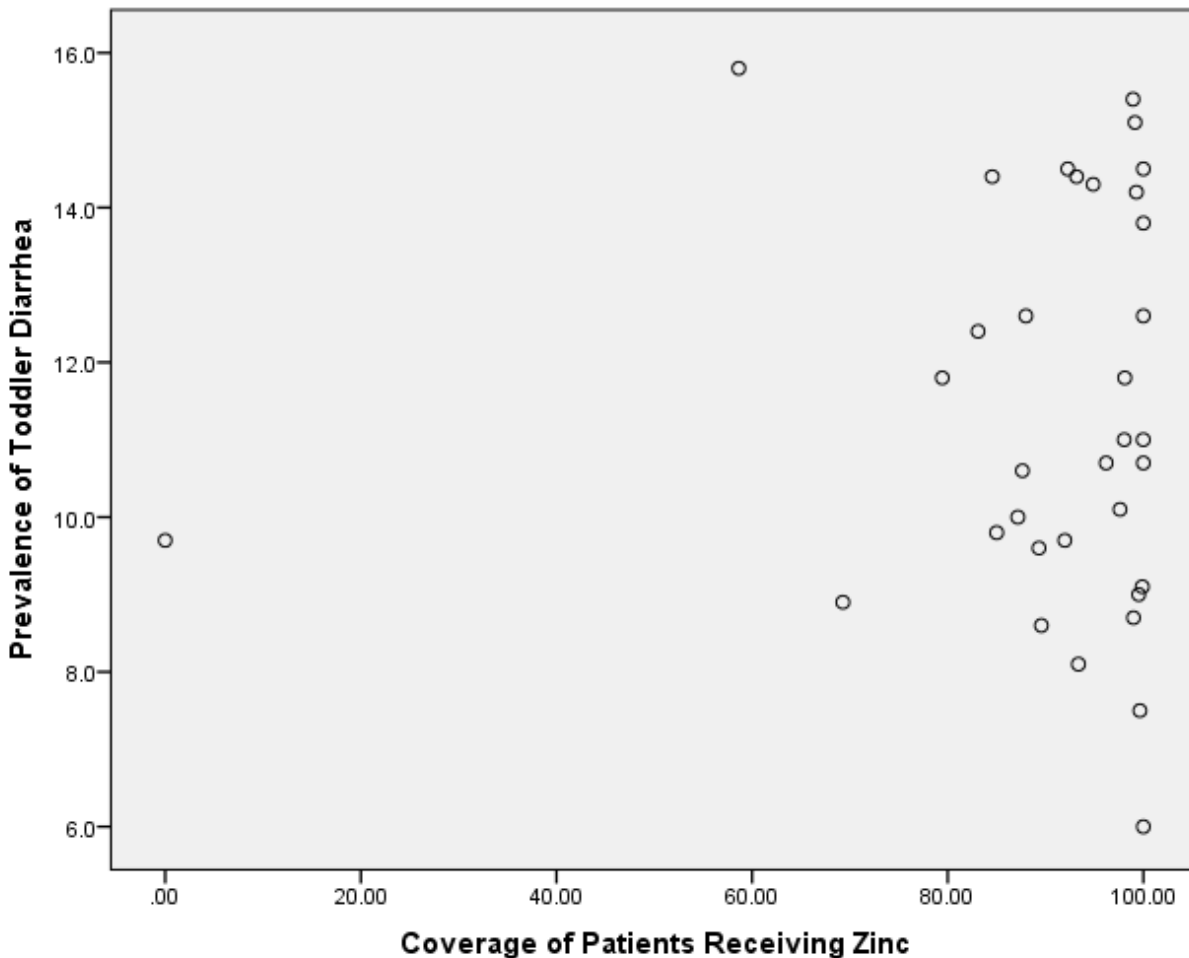
Figure 1. Scatter Plot of Coverage of Toddler Diarrhea Services and Prevalence of Toddler Diarrhea in Province of Indonesia 2018.

Based on Table 2, it can be seen that the prevalence of diarrhea is high, many occur in provinces with high diarrhea service coverage, which is 56.3% compared to provinces with low service coverage. Scatter plot

results show that the higher the health care coverage and prevalence, the higher the prevalence of diarrhea of toddlers with $r = 0.208$ (Figure 1).

Table 3. Prevalence of toddler diarrhea according to the coverage of patients receiving zinc

Coverage of Patients Receiving Zinc	Prevalence of toddler diarrhea				Total	
	Low		High			
	n	%	n	%	n	%
Low	7	58	5	42	12	100
High	12	55	10	46	22	100



Source: The 2018 Indonesia Basic Health Survey and The 2018 Indonesia Health Profile

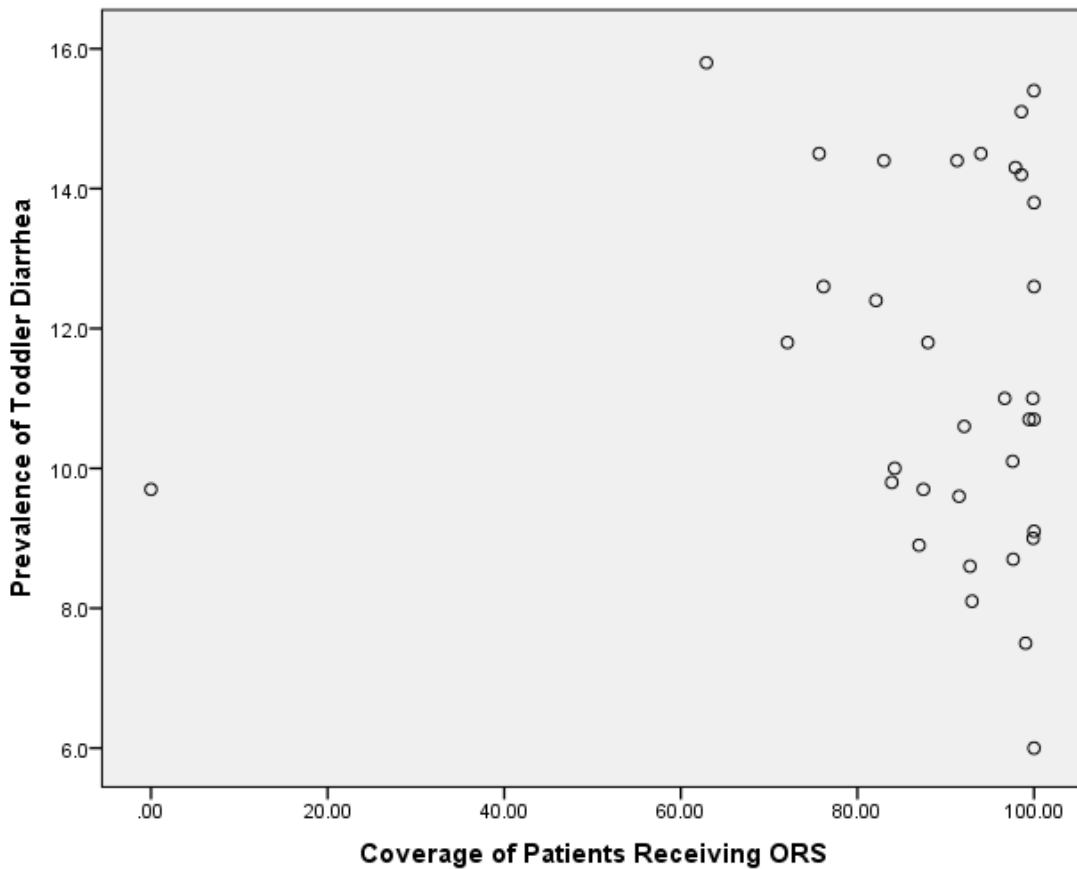
Figure 2. Scatter Plot of Coverage of patients receiving zinc and Prevalence of Toddler Diarrhea in Province of Indonesia 2018.

Based on Table 3, it can be seen that the prevalence of diarrhea is high, many occur in provinces with high zinc coverage, which is 46% compared to provinces

with low zinc coverage. Figure 2 also shows that the lower the coverage of sufferers getting zinc the higher the prevalence of diarrhea in toddlers ($r = -0.013$).

Table 4. Prevalence of toddler diarrhea according to the coverage of patients receiving ORS

Coverage of Patients Receiving ORS	Prevalence of toddler diarrhea				Total	
	Low		High			
	n	%	n	%	n	%
Low	5	41.7	7	58.3	12	100.0
High	14	63.6	8	36.4	22	100.0



Source: The 2018 Indonesia Basic Health Survey and The 2018 Indonesia Health Profile

Figure 3. Scatter Plot Coverage of Patients Receiving ORS and Prevalence of Toddler Diarrhea in Province of Indonesia 2018.

Based on Table 4, it can be seen that the prevalence of diarrhea is high, many occur in provinces with low coverage of oralit, which is 58.3% compared to provinces with low coverage of oralit (36.4%). Based on the results of the scatter plot it can be known that the lower the coverage of patients getting oralit the

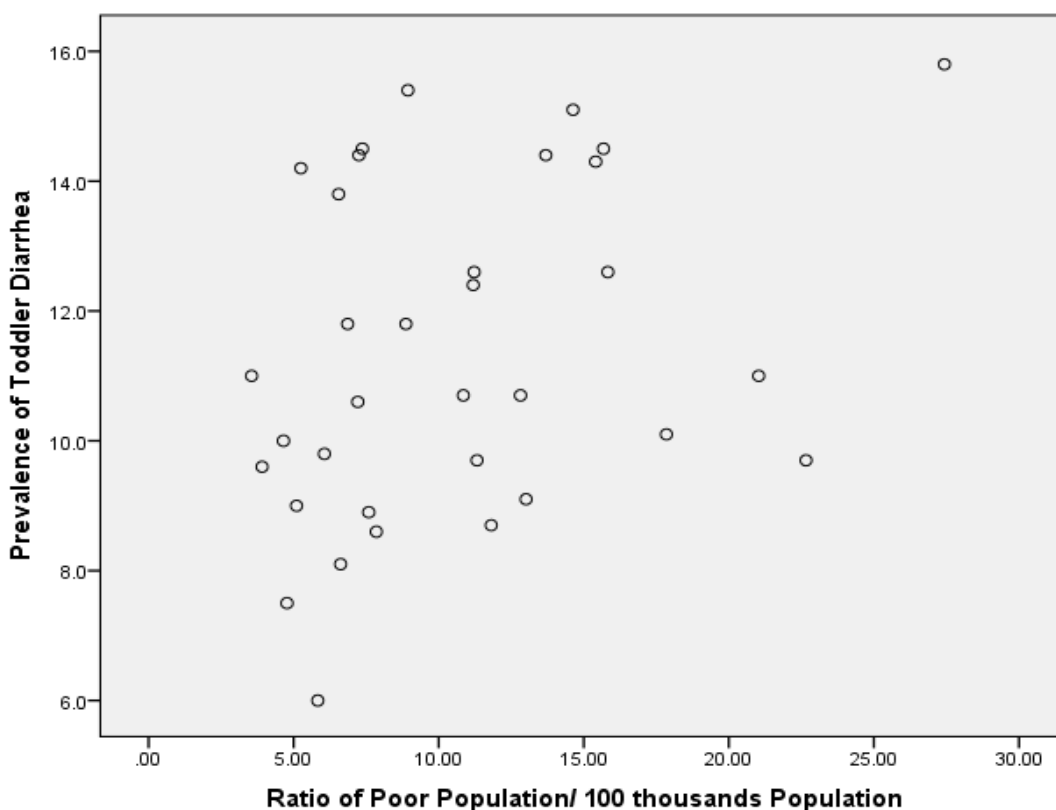
higher the prevalence of diarrhea of toddlers ($r = -0.149$) (Figure 3).

Based on Table 5, it can be seen that the prevalence of diarrhea is high, many occur in provinces with a high percentage of poor people, which is 50% compared to provinces with low service coverage. Based on the

results of the scatter plot it can be known that the higher the percentage of poor people in the province the higher the prevalence of diarrhea of toddlers with $r = 0.363$ (Figure 4).

Table 5. Prevalence of toddler diarrhea according to the poor population

Poor Population	Prevalence of toddler diarrhea				Total	
	Low		High			
	n	%	n	%	n	%
Low	11	61.1	7	38.9	18	100
High	8	50.0	8	50.0	16	100



Source: The 2018 Indonesia Basic Health Survey and The 2018 Indonesia Health Profile

Figure 4. Scatter Plot Poor population and Prevalence of Toddler Diarrhea in Province of Indonesia 2018.

Table 6. Prevalence of toddler diarrhea according to the availability of health workers

Availability of Health Workers	Prevalence of toddler diarrhea				Total	
	Low		High			
	n	%	n	%	n	%
Low	9	43	12	57.1	21	100
High	10	77	3	23.1	13	100

Source: The 2018 Indonesia Basic Health Survey and The 2018 Indonesia Health Profile

Based on Table 6, it can be seen that the prevalence of diarrhea is high, many occur in provinces with a low number of workers per 100,000 inhabitants, which is 57.1%. Based on the results of the scatter plot it can be known that the lower the availability of health workers in the province the higher the prevalence of diarrhea of toddlers with $r = -0.430$ (Figure 5).

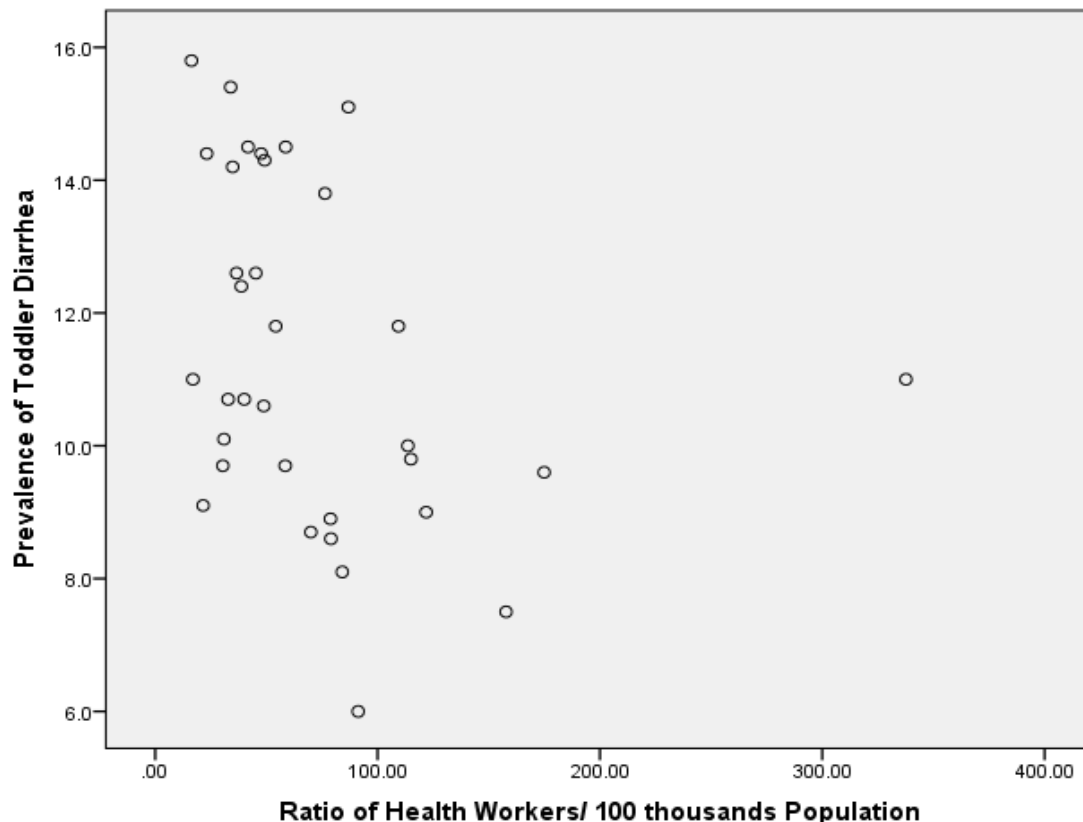


Figure 5. Scatter Plot Availability of Health Workers and Prevalence of Toddler Diarrhea in Province of Indonesia 2018.

Discussion

The prevalence of diarrhea in toddlers in Indonesia increased from 2013 to 2018 by 6.7% to around 11%. This figure increases compared to the prevalence in 2013 which is around 6.7%. However, the prevalence rate of diarrhea in Indonesia is still relatively low when compared to Ethiopia which reached 21.5%¹². In addition, research conducted by Gupta (2015) showed that the prevalence of diarrhea in India reached 22.36%. There were 57.69% cases of diarrhea in children in the 7-12 month age group, followed by 25.71% in the 13-24 months age group. With age, the

prevalence of diarrhea gradually decreases¹³. Based on Demographic and Health Surveys (DHSs) at 2001-2011 in 51 low- and middle-income countries, it is known that the overall prevalence of diarrhea reaches 14.3%. The prevalence of diarrhea varies widely between countries ranging from 4.5% in the Maldives to 26.2% in Bolivia¹⁴.

The average coverage of toddler diarrhea services in Indonesia in 2018 is 38%. This figure is very low compared to the coverage of toddler diarrhea services in Wolaitta and Soddo (Ethiopia) which is 95% and 86%¹⁵. However, the coverage of diarrhea health

services in Indonesia still meets the target of coverage of diarrhea services in Indonesia, which is more than 20%. Results showed the higher the coverage of diarrhea services of toddlers the higher the prevalence of diarrhea of toddlers. This happens because the more coverage of diarrhea services toddlers can detect the more diarrhea that toddlers experience. Not that the province needs to lower coverage to lower the prevalence of diarrhea in toddlers.

Receiving zinc during diarrhea is proven to reduce the length and severity of diarrhea, reduce the frequency of defecation, reduce the volume of stool, and decrease the recurrence of diarrhea incidence in the next 3 months¹⁶. Similarly, research by Restuti (2019) which showed a significant relationship between zinc intake level and the incidence of diarrhea, namely zinc intake level with less category can be at risk of 3,095 times diarrhea compared to subjects with sufficient zinc intake level¹⁷.

The results of frequency distribution showed a high prevalence of diarrhea in infants in provinces with high zinc coverage. But the correlation value showed an inverse relationship between zinc administration coverage and the prevalence of infant diarrhea. This contradiction means that there was no meaningful relationship between zinc administration in toddlers suffering from diarrhea and the prevalence of diarrhea of toddlers, the correlation value also shows a very small number ($r = -0.013$). Another study conducted by Arnizam, et al (2013) showed similar results that there was no link between Zinc intake and the incidence of diarrhea in toddlers¹⁸.

Oralit is a drug in the form of salt powder to be liquefied as a substitute for minerals and fluids that come out due to vomiting or crackling. Oralit is administered as an intervention against impaired balance of sodium and potassium concentrations due to dehydration¹⁹. Based on the results of the analysis, showed that in the prevalence of diarrhea of toddlers are high, many occur in provinces that have coverage of sufferers get low oralit but not much different

compared to provinces that have coverage of patients getting high oralit. Prawati research, et al (2019) also showed that there is a link between taking oralit respondents and the incidence of diarrhea in the last 3 months²⁰. In addition, research by Puji and Yuniar (2017) showed that there is an effect of oralit 200 on the consistency of feces and decreased frequency of defecation in infants with acute diarrhea of mild-moderate dehydration²¹.

The results of the analysis showed that the higher the percentage of poor people, the higher the prevalence of diarrhea in the province. Previous research at Puskesmas Babakansari Bandung mentioned that there is a significant relationship between parental income and the incidence of diarrhea in toddlers²². The low family income makes individuals choose to use public latrines because of the lack of land to make latrines and the lack of funds to build family latrines that can affect individuals and family members²³. Poverty is a factor in parents reducing capacity to support good health care for children, less likely to have good hygiene and poor education²⁴.

This study shows that the lower the availability of health workers, the higher the prevalence of diarrhea in a province. Previous studies have also stated that the more the number of medical personnel and paramedics, the more qualified the available personnel²⁵. In line with research in West Sumatra, Indonesia shows where the better the support provided by posyandu will be lower morbidity of children to diarrheal infections²⁶. However, in contrast to the research conducted in the West Alas Subdistrict, Indonesia which stated that there was no meaningful relationship between the role of health workers and the incidence of diarrhea of toddlers²⁷. Health workers have an important role in the health service to improve the level of public health.

The study has limited recommendations for macro policy because the analysis used aggregate data at the provincial level. Therefore, further research is still needed to find out the factors that affect the incidence

of diarrhea in toddlers at the individual level both from the history of nutritional status of toddlers and parenting patterns. Future studies are expected to be used as the basis for more detailed policy decision making at the micro level.

Conclusions

Based on the results of the study, it can be concluded that the highest prevalence of diarrhea in Indonesia in 2018 is in the Papua Province. However, the distribution of high and low prevalence of toddlers is fairly evenly distributed throughout the island in Indonesia. Among the factors seen cross-tabulation distribution shows that the availability of health resources in the province is the most related factor in the prevalence of diarrhea of toddlers. Efforts to increase the availability of health resources are expected to reduce cases of diarrhea in the province in Indonesia.

Acknowledgments: The authors are grateful to the National Institute of Health Research and Development of the Republic of Indonesia for providing a report as material for analysis in this study and LPDP for financial support.

Conflict of Interest: None declared.

Source of Funding: Self-funded.

Ethical Clearance: This study was conducted by utilizing secondary data from published reports. For this reason, there is no need for ethical clearance in the implementation of this research.

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