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ORIGINAL ARTICLE

SOCIOECONOMIC INEQUALITIES, WATER, SANITATION, HYGIENE AND DIARRHEAL DISEASE AMONG CHILDREN UNDER FIVE YEARS IN INDONESIA

Ketimpangan Sosial Ekonomi, Air, Sanitasi, Kebersihan dan Penyakit Diare Pada Anak di bawah Lima Tahun di Indonesia

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ABSTRACT

Background: Diarrheal diseases are still a serious digestive tract infection in Indonesia. The geographical areas with lower socioeconomic inequalities and water, sanitation and hygiene (WASH) contribute to incline diarrheal disease among children under 5 years old. **Purpose:** This study aimed to map the distribution of diarrheal diseases among children under 5 years old and identify areas with higher risk in socioeconomic status and WASH. **Methods:** This study used secondary spatial data repository from Indonesia Demographic Health Survey 2017. This study used ecological approach to provide visual geographic distribution of diarrheal diseases among children under 5 years old, as well as to identify the risk based on the socioeconomic inequalities and WASH. The map production was performed by GIS software. **Results:** We found that provinces with higher percentage of diarrheal diseases in children also had higher percentage of population with the lowest socioeconomic status. Additionally, the provinces which had higher unimproved drinking water sources, unimproved sanitation facility, and limited handwashing facility, had the higher percentage of diarrheal disease among children under 5 years. **Conclusion:** The percentage of the lowest socioeconomic status and unimproved WASH might contribute to incline the percentage of diarrheal disease among children under 5 years. The government needs to consider the geographical area to decrease the diarrheal diseases among children under 5 years.

ABSTRAK

Latar Belakang: *Penyakit diare masih merupakan penyakit infeksi saluran pencernaan yang serius di Indonesia. Wilayah geografis dengan kesenjangan*

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sosial ekonomi dan air, sanitasi dan kebersihan (WASH) yang lebih rendah berkontribusi terhadap peningkatan penyakit diare pada anak di bawah 5 tahun. ***Tujuan:*** *Oleh karena itu, penelitian ini bertujuan untuk memetakan sebaran penyakit diare pada anak di bawah 5 tahun dan mengidentifikasi wilayah yang memiliki risiko lebih tinggi dalam status sosial ekonomi dan WASH.* ***Metode:*** *Penelitian ini menggunakan data spasial sekunder dari Survei Demografi Kesehatan Indonesia 2017. Penelitian ini menggunakan pendekatan ekologi untuk memberikan gambaran visual sebaran geografis penyakit diare pada anak di bawah 5 tahun, serta mengidentifikasi risiko berdasarkan kesenjangan sosial ekonomi dan WASH. Visualisasi peta dilakukan oleh perangkat lunak GIS.* ***Hasil:*** *Kami menemukan bahwa provinsi dengan persentase penyakit diare pada anak yang lebih tinggi juga memiliki persentase penduduk dengan status sosial ekonomi terendah yang lebih tinggi. Selain itu, provinsi yang memiliki sumber air minum yang tidak layak, fasilitas sanitasi yang belum baik, dan fasilitas cuci tangan yang terbatas memiliki persentase penyakit diare yang lebih tinggi pada anak di bawah 5 tahun.* ***Simpulan:*** *Persentase status sosial ekonomi terendah dan WASH yang tidak membaik dapat berkontribusi terhadap peningkatan persentase penyakit diare pada anak dibawah 5 tahun. Pemerintah perlu mempertimbangkan wilayah geografis untuk mengurangi penyakit diare pada anak di bawah 5 tahun*

INTRODUCTION

Children under 5 years old are the age group susceptible to get diseases, including diarrheal diseases. Diarrheal disease is a major public health problem in some parts of the world. The World Health Organization in 2024 reported that diarrheal disease was responsible for killing 443,832 children under 5 every year. Additionally, it was the second leading cause of death in children under 5 years old. Furthermore, every year there are 1,7 billion cases of childhood diarrheal diseases (1).

Diarrheal diseases are still a serious digestive tract infection in Indonesia. Basic Health Research in 2018 stated that the prevalence of diarrheal disease for all age groups was 8% and the prevalence rate for children under five was 12.30%. According to the latest data from the 2020 Indonesian Nutrition Status Survey, the prevalence of diarrheal diseases was at 9.80%. Diarrheal diseases were found closely related to the occurrence of stunting cases. Repeated cases of diarrheal in babies and toddlers can cause stunting (2).

Unimproved Water, Sanitation, and Hygiene (WASH) was proven to be the main cause of diarrheal diseases. It was responsible for deaths among children under 5 years old (3). Some researchers reported that improved WASH can be used to reduce diarrheal diseases (4–6). However, access to WASH still becomes a high problem. Water demand is increasing due to rapid population growth, urbanization, and other needs. Therefore, it is predicted that, by 2030, billions of people will lack access to clean water unless progress is made fourfold, even though access to clean water and sanitation is one of the goals of SDG number 6 (7). In addition to the WASH issue, socioeconomic disparities also contribute to an increase in diarrheal diseases (8,9).

The importance of location in preventing infectious diseases is such that it may be utilized to comprehend the natural history of disease. Geographic Information System (GIS) has been used to investigate diseases related to environmental issues (10). Furthermore, disease mapping would aid in the development of hypotheses, the identification of high-risk regions for public health surveillance, and the formulation of policy implications (5,11). According to a study, Indonesia has the highest geographical inequality among all the countries (5). Therefore, this study aimed to map the distribution of diarrheal diseases among children under 5 years old and identify areas with higher risk in socioeconomic status and WASH.

METHODS

Study design

This study used an ecological approach to map the distribution of diarrheal diseases among children under 5 years old, socioeconomic inequalities, and WASH (water, sanitation, and hygiene). The researchers used provinces as a unit of analysis.

Data Sources

This study used a secondary spatial data repository from the Indonesia Demographic Health Survey 2017. The IDHS 2017 marks the eighth demographic survey in Indonesia carried out under the Demographic and Health Survey program. This data are nationally representative. Data can be accessed on this website: https://spatialdata.dhsprogram.com/home/.

Variables and Data Managements

Diarrheal disease variables were measured from the percentage of children born in the five years preceding the survey who had diarrhea in the two weeks preceding the survey.

WASH was measured from three components: 1) the percentage of households whose main source of drinking water is unimproved; 2). Percentage of households with an unimproved sanitation facility; 3). Percentage of households with a limited handwashing facility, lacking soap and/or water. Socioeconomic inequalities were measured by the percentage of the de jure population in the lowest wealth quintile.

Data Analysis

Data were analyzed descriptively. Choropleth mapping was generated to provide a visual geographic distribution of diarrheal diseases among children under 5 years old, as well as to identify the risk based on the socioeconomic inequalities and WASH. The map production was performed by GIS software.

RESULTS

Distribution of diarrheal disease among children under 5 years old

Figure 1 reveals the percentage of children under 5 years who had diarrheal diseases in the two weeks preceding the survey. The provinces with the highest percentage of diarrheal disease were South Kalimantan, Central Kalimantan, East Kalimantan, North Kalimantan, Bengkulu, Gorontalo, North Maluku, South Sulawesi, and North Sumatra. In the map, these areas are shown in dark red color.

Based on Table 1, the highest proportion of diarrheal disease was in South Kalimantan, accounting for 19.80%. Whereas, Yogyakarta experienced the lowest proportion of diarrheal diseases, hitting at 5.60%.

Table 1
Distribution of Diarrheal Diseases According to Provinces

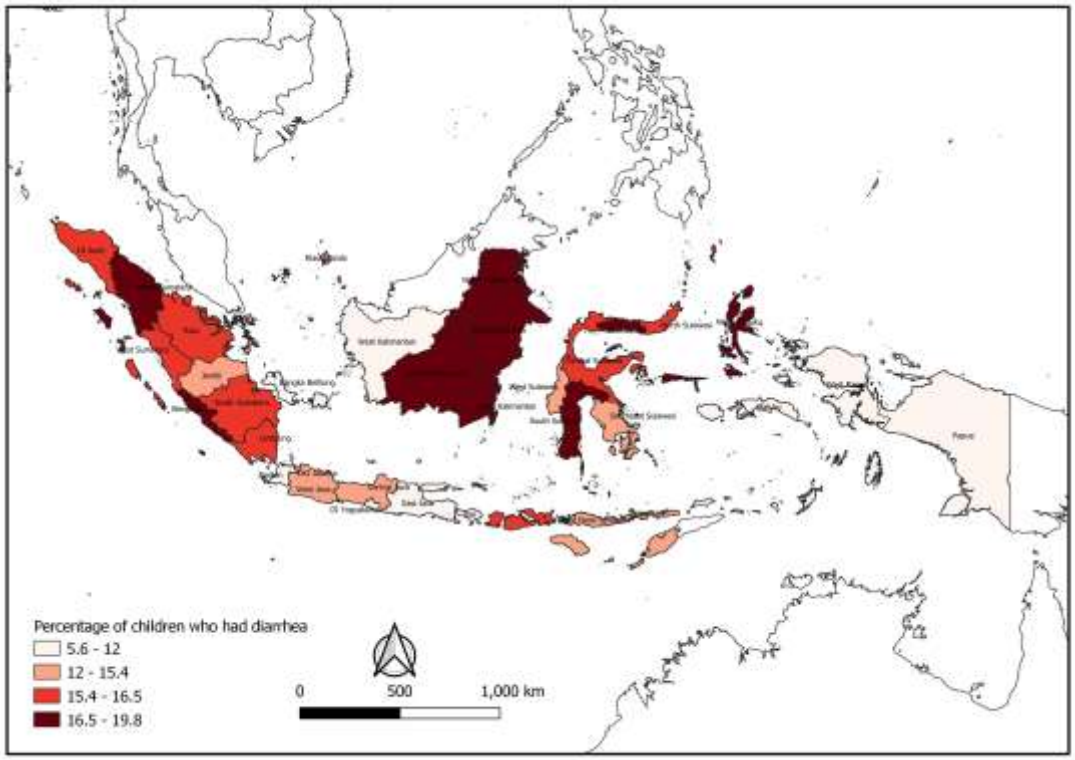
Provinces	Percentage of Diarrheal Diseases
DI Aceh	15.40
Bali	10.50
Banten	10.70
Bengkulu	19.20
DI Yogyakarta	5.60
DKI Jakarta	12.70
Gorontalo	17.30
Jambi	13.40
West Java	15.10
Central Java	12.40
East Java	11.80
West Kalimantan	11.20
South Kalimantan	19.80
Central Kalimantan	19.30
East Kalimantan	18.60
North Kalimantan	16.90
Bangka Belitung	8.70
Lampung	15.90
Maluku	10.30
North Maluku	18.20
West Nusa Tenggara	15.80
East Nusa Tenggara	13.30
Papua	9.70
West Papua	11.20
Riau	16.10
Riau Islands	12.70
West Sulawesi	15.30
South Sulawesi	16.70
Central Sulawesi	15.40
Southeast Sulawesi	15.20
North Sulawesi	15.80
West Sumatera	15.90
South Sumatera	15.60
North Sumatera	17.20

Bivariate map of diarrheal disease among children under 5 years and socioeconomic status

Figure 2 explains the bivariate map of the percentage of diarrheal disease among children under 5 years and the percentage of the de jure population with the lowest socioeconomic status. Provinces with a higher percentage of diarrheal diseases in children also had a higher percentage of the population with the lowest socioeconomic status. They can be found in the Central Kalimantan, South Kalimantan, Bengkulu, North Sumatra, North Maluku, Gorontalo, South Sulawesi, West Nusa Tenggara, and East Nusa Tenggara.

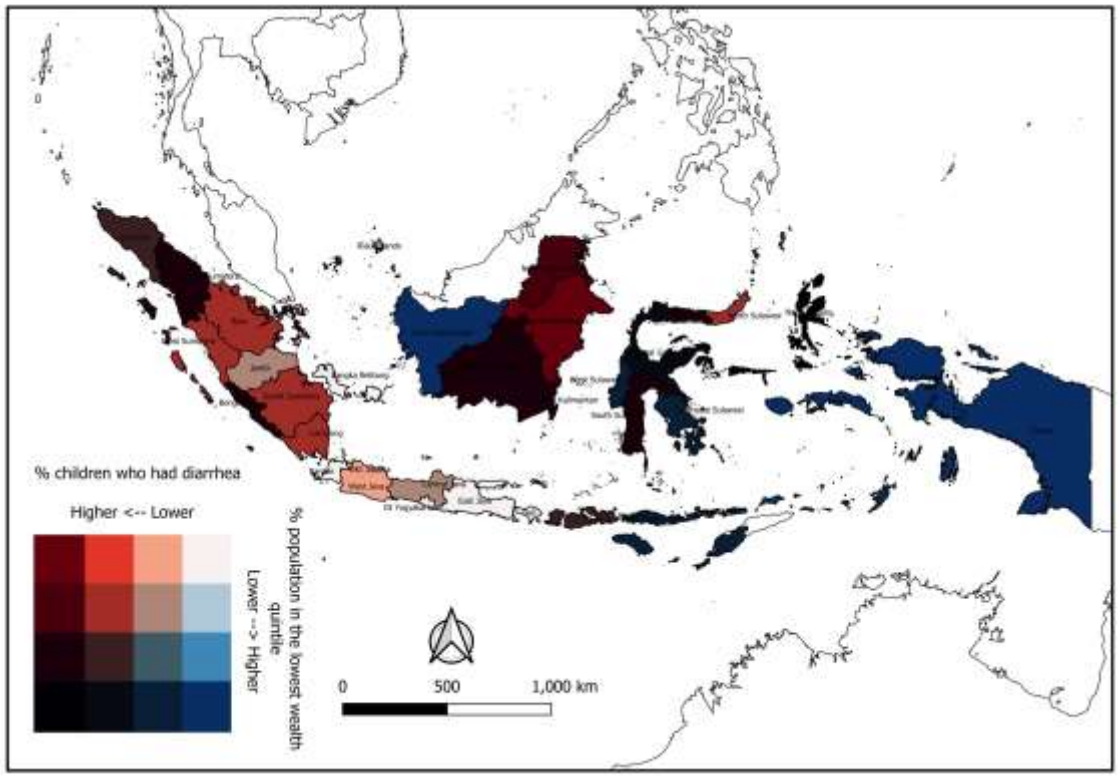
Bivariate map of diarrheal disease among children under 5 years and water, sanitation, and hygiene

Figure 3-5 depict the bivariate map of the percentage of diarrheal disease among children under 5 years and the percentage of unimproved water, sanitation facility and hygiene. The maps show that provinces that had higher unimproved drinking water sources, unimproved sanitation facilities, and limited handwashing facility, had the higher percentage of diarrheal disease among children under 5 years. They were in North Kalimantan, East Kalimantan, North Sumatra, Bengkulu, North Maluku, South Sulawesi, Gorontalo, and other provinces.



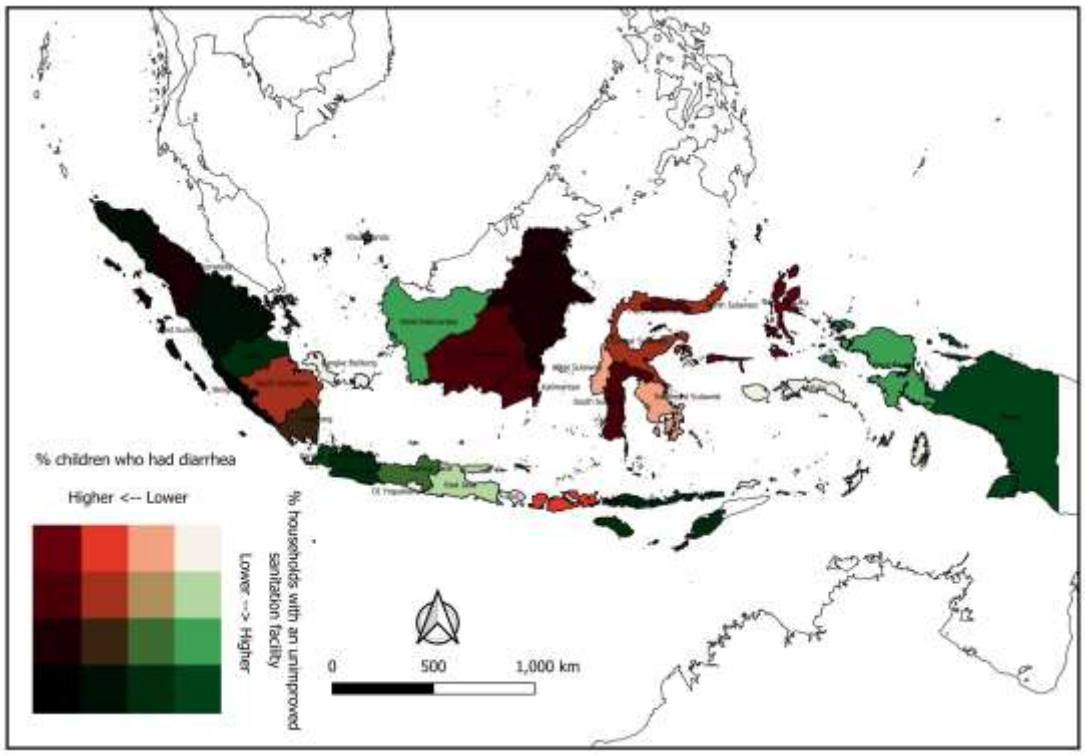
Source: IDHS, 2017

Figure 1. Percentage of Children Born in the Five Years Preceding the Survey who Had Diarrhea in the Two Weeks Preceding the Survey



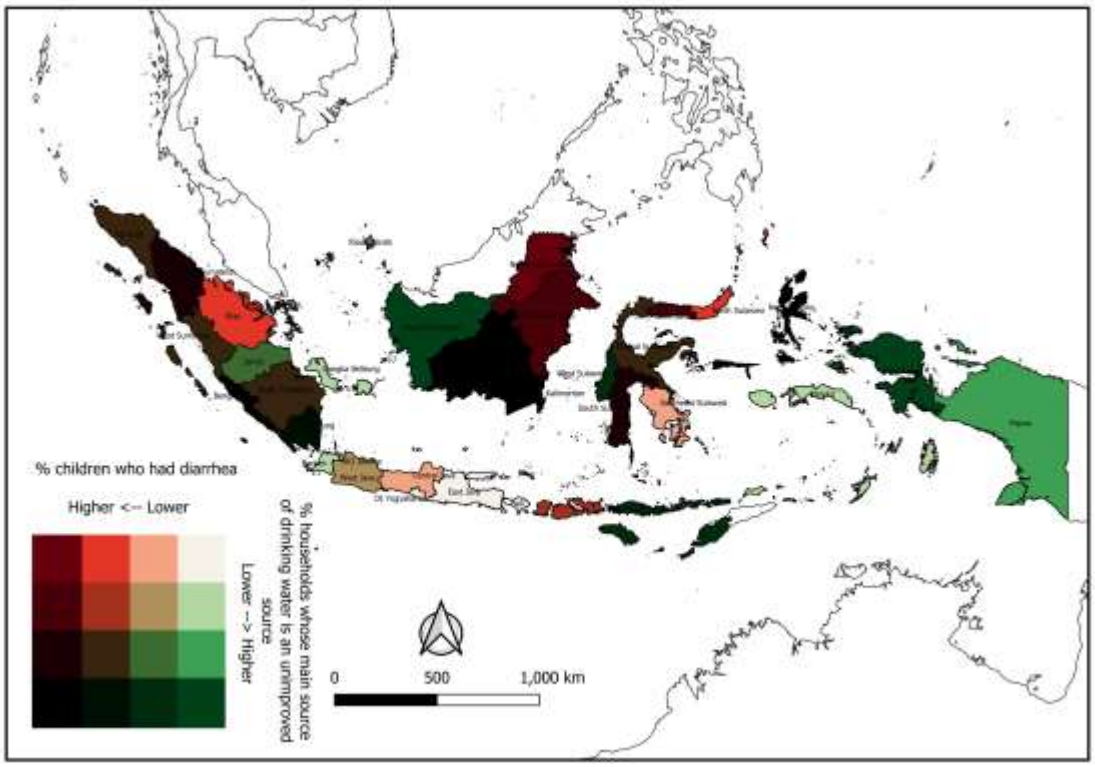
Source: IDHS, 2017

Figure 2. Bivariate Map of Percentage of Diarrheal Disease among Children Under 5 Years and Percentage of the De Jure Population with the Lowest Socioeconomic Status



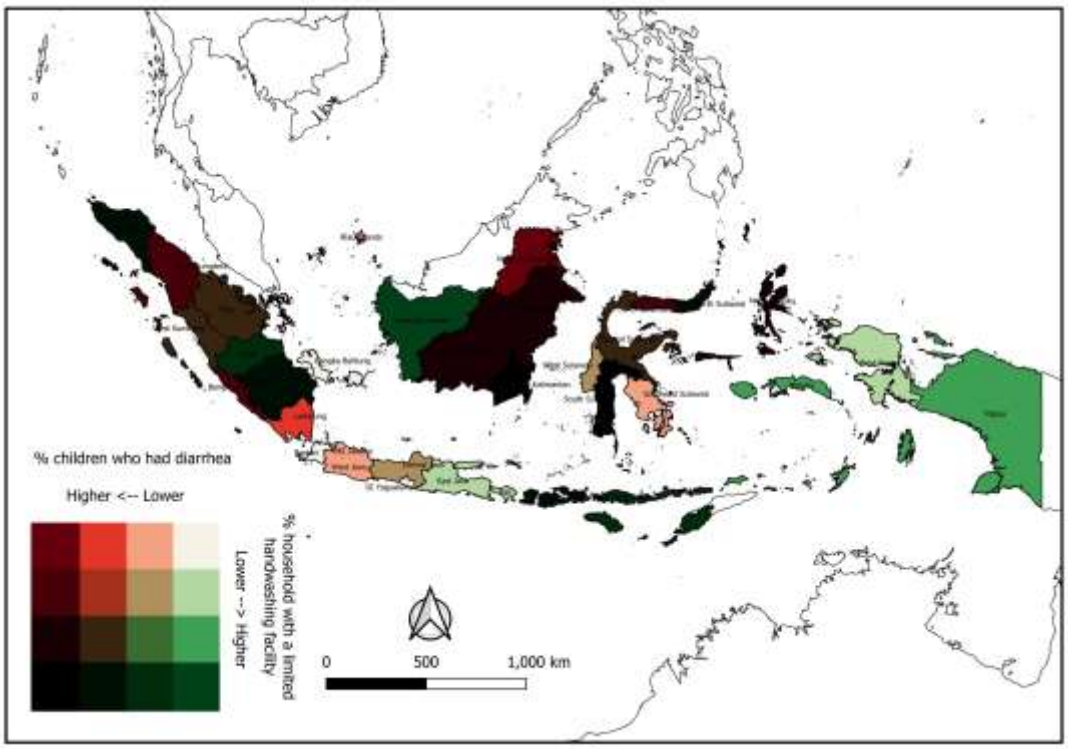
Source: IDHS, 2017

Figure 3. Bivariate Map of Percentage of Diarrheal Disease among Children Under 5 Years and Percentage of Household with the Unimproved Sanitation Facility



Source: IDHS, 2017

Figure 4. Bivariate Map of Percentage of Diarrheal Disease among Children Under 5 Years and Percentage of Household Whose Main Source of Drinking Water is Unimproved Source



Source: IDHS, 2017

Figure 5. Bivariate Map of Percentage of Diarrheal Disease among Children Under 5 Years and Percentage of Household with Limited Handwashing Facility

DISCUSSION

The study highlights that diarrheal disease has become a significant burden across provinces in Indonesia. This study found that some provinces had a higher percentage of diarrheal diseases among children under 5 years. Our result is in line with other studies that found that diarrheal diseases were higher in the same areas in India (11), Brazil (12), Ghana (13), and Ethiopia (14). The diarrheal disease was a multifactorial disease that caused differences in risk factors in each province, including characteristics, cultural beliefs, and perceptions (14).Additionally, this study found that provinces with a higher percentage of diarrheal diseases in children also had a higher percentage of the population with the lowest socioeconomic status. Socioeconomic status was one of the main causes of diarrheal diseases among children in China (15). A study also found that the diarrheal diseases are still a crucial public health, especially in the poorest areas (16,17). Poorly populated areas generally have poor waste disposal systems, unclean drinking water sources, and difficulty accessing health services, thereby increasing the incidence of diarrhea and gastrointestinal infections (16).

This study also found that unimproved drinking water sources, unimproved sanitation facilities, and limited handwashing facilities had a higher percentage of diarrheal disease among children under 5 years. Other studies have proven that improved water supply, water quality, hygiene, and sanitation facilities could reduce all diarrheal diseases (12,18). The most common diarrheal diseases were untreated water, poorly built households without sanitary facilities, and garbage collection that led to the transmission of diarrheal diseases (14,19,20). Furthermore, poor WASH was the main causes of the diarrheal diseases (21). Good WASH and adequate garbage collection helps to maintain health status (12).

South Kalimantan was the province in Indonesia which had the highest proportion of diarrheal diseases. The high prevalence of diarrheal disease aligned with other studies conducted in South Kalimantan (22,23). A study also found that the high incidence of diarrheal diseases in South Kalimantan was associated with the drinking water access (24).

Research Limitations

This study used descriptive analysis with ecological approach. The results of study cannot be used to analyze the association between explanatory and outcome variables. Additionally, we only measured the socioeconomic and WASH status and there might be other variables that contributed to incline the diarrheal diseases.

CONCLUSION

An increase in the prevalence of diarrheal diseases in children under five years old may be attributed to the proportion of children with the lowest socioeconomic status and inadequate WASH. The government needs to consider the geographical area to decrease diarrheal diseases among children under 5 years. Furthermore, the policy has to consider areas that have higher risk factors, including socioeconomic inequalities, and unimproved WASH. Additionally, since each area has different characteristics, involving geographical, culture etc., the government needs to consider these differences when implementing interventions. Therefore, the government-provided program to specific characteristics can effectively encourage the reduction of diarrheal diseases.

CONFLICT OF INTEREST

Authors declare that there is no conflict of interest

AUTHOR CONTRIBUTIONS

EA: Conceptualization, Methodology, Software, Data curation, Writing- Original draft preparation. TDT: Writing- Reviewing and Editing

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