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SOCIOECONOMIC FACTORS ASSOCIATED WITH DIARRHEA AMONG CHILDREN UNDER FIVE YEARS IN INDONESIA

Hubungan Faktor Sosial Ekonomi Dengan Diare Pada Anak Di Bawah Usia 5 Tahun Di Indonesia

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ABSTRACT

Background: The child mortality rate worldwide is still relatively high, with diarrhea being one of the leading causes. In Indonesia, diarrhea in children under five is still relatively high. **Purpose:** This study aimed to analyze the differences in socioeconomic factors associated with diarrhea cases in children under five. **Methods:** Secondary data from The Indonesia Demographic and Health Survey (IDHS) 2017 dataset were used. The sample for this study included 13,830 mothers aged 15-49 years. The dependent variable was the number of toddlers who experienced diarrhea. The independent variables measured were socioeconomic factors, especially wealth, husband/spouse's education, husband's occupation, number of family members, and number of children living with their parents. Data were analyzed using multiple logistic regression. **Results:** The current research showed that 14.72% of toddlers experienced diarrhea during the two weeks prior to the survey. Husbands/partners with middle education had 17% higher odds of having diarrhea than husbands/partners with higher education (AOR=1.17; 95%Cl=1.02–1.33; p=0.02). Toddlers with very poor (AOR=1.39; 95%Cl=1.12–1.73; p=0.00), poor (AOR=1.36; 95%Cl=1.11–11.67; p=0.00), and rich (AOR=1.24; 95%CI=1,01–1.52; p=0.04) family backgrounds had 39%, 36%, and 24% higher odds for their children to have diarrhea when compared to toddlers with wealthy family backgrounds. **Conclusion:** Husbands/partners with education and low socioeconomic status have a higher risk of developing diarrhea. Improving economic welfare, quality of education, and public knowledge, especially regarding children's health, is needed to prevent and control diarrhea.

ABSTRAK

Latar belakang: Angka kematian balita di dunia masih tergolong tinggi dimana salah satu penyebab utamanya adalah diare. Di Indonesia, angka

*kejadian diare pada balita juga masih cukup tinggi. **Tujuan:** Tujuan penelitian ini adalah untuk menganalisis hubungan antara faktor sosial ekonomi keluarga dengan diare pada anak berusia di bawah 5 tahun. **Metode:** Penelitian ini menggunakan data sekunder yang diambil dari dataset Survei Demografi Kesehatan Indonesia tahun 2017. Sampel dari penelitian ini adalah 13.830 ibu yang berusia 15-49 tahun. Variabel terikat dalam penelitian ini adalah balita yang mengalami diare dua minggu sebelum survey dilakukan. Variabel kovarian yang diukur adalah usia anak, jenis kelamin, usia ibu, status tempat tinggal, dan provinsi. Data dianalisis menggunakan chi square dan multiple regresi logistic. **Hasil**: Hasil penelitian menunjukkan bahwa ada 14,72% balita mengalami diare dua minggu sebelum survey dilakukan. Suami/pasangan dari ibu yang berpendidikan sedang memiliki odds 17% lebih tinggi untuk anaknya mengalami diare dibandingkan dengan suami/pasangan yang berpendidikan tinggi (AOR=1,17; 95%Cl=1,02–1,33; p=0,02). Balita dengan latar belakang keluarga sangat miskin (AOR=1,39; 95%Cl=1,12–1,73; p=0,00), miskin (AOR=1,36; 95%Cl=1,11–11,67; p=0,00), dan kaya (AOR=1,24; 95%CI=1,01–1,52 p=0,03) juga memiliki 39%, 36%, 24% odds lebih tinggi untuk anaknya mengalami diare jika dibandingkan dengan balita dengan latar belakang keluarga sangat kaya. **Kesimpulan:** Suami/pasangan dengan pendidikan rendah dan status sosial ekonomi rendah memiliki risiko lebih tinggi untuk anaknya terkena diare. Peningkatan kesejahteraan ekonomi, kualitas pendidikan dan pengetahuan masyarakat khususnya mengenai kesehatan anak sangat diperlukan dalam upaya pencegahan dan pengendalian diare.*

INTRODUCTION

Health is one of the most critical aspects of life. Health is a relative condition in which the body can function physically, spiritually, mentally, and socially (1). Based on the concept of health, the WHO has decided on several determinant factors of health, namely the physical environment, social environment, economy, and the characteristics and behavior of each individual (2). If a problem occurs with one of the four determinant factors, it increases the risk of the emergence of the illness, one of which is diarrhea (3).

Diarrhea is a condition in which the body experiences an increase in the frequency of bowel movements. Generally, diarrhea occurs when someone defecates three times or more in a day with a consistent stool that is more watery than usual (4). Everyone must have experienced diarrhea in their life, at least once, and sometimes it is not infrequent that diarrhea could lead to death if not handled properly. Age and sex were not considered in the diagnosis of diarrhea. The toddler group has a high risk of developing diarrhea, which could lead to death (5,6).

In the toddler phase, children undergo a period of growth and development, both physically and psychologically. According to the WHO, a toddler is a children between 0-59 months or under five years old (7). During this phase, children are susceptible to disease because their immune condition is lower than that of children older than five (8).

In 2016, 15,000 children under five years old died daily. Diarrhea is one of the primary causes of death in toddlers (7). The death rate of toddlers increased in 2019, with a total of 370,000 toddlers (9). In Indonesia, the number of diarrhea cases in toddlers is quite high. There are 4,003,786 cases from the total population of toddlers, which is 23,729,583 toddlers (6). This indicates that there are still many cases of diarrhea or death caused by diarrhea in toddlers in Indonesia. The risk factors related to diarrhea in toddlers vary. These factors originate from multidimensional factors and not only from health. One of the main factors related to diarrhea in toddlers is socioeconomic status (10). Socioeconomic factors can be seen in the social, educational, and knowledge levels of each individual.

The income per capita of a country influences policymaking and implementation. It also influences the fulfillment of people's welfare, especially in the health sector (11). Problems

related to social status, such as poverty or the economic level of the lower middle class, have an impact on poor sanitation, lack of clean water, persistent poverty, and low education level (10,12,13). Parents' lack of knowledge about diarrhea, the prevention method, and treatment of diarrhea still become one of the causes of the increase in the number of cases and deaths caused by diarrhea in toddlers (14).

In several countries, including Nigeria, other risk factors, such as mother's education, occupation, and minimal domestic wastewater treatment, combined with poor environmental health, can also influence diarrhea cases in children under five years of age (15). The mother's education factor is related to diarrhea in toddlers, and the mothers' knowledge and family's low financial status also influence the increase in diarrhea cases in toddlers (10). It does not only occur in Ethiopia.

The prevalence of diarrhea is higher in toddlers with a low economic background, which is as much as 32.2% compared to toddlers with higher economic backgrounds (13.60%) (16). A similar study was conducted in Indonesia in 2020 using data from the Indonesia Demographic Health Survey (IDHS) on the relationship between women's empowerment and diarrhea in children under two years of age. The results show that the level of mothers' knowledge is significantly related to diarrhea in children under two years old (17).

A study that focuses on economic equality by looking at all regions of Indonesia still needs to be conducted. Therefore, the researcher is interested in analyzing the differences in socioeconomic factors, including wealth, education of spouse/husband, husband's occupation, number of family members, and number of children under five years old who live with their parents with diarrhea cases in Indonesia. The results of this study are expected to help the government decrease the number of diarrhea cases and reduce socioeconomic inequality in Indonesia.

METHODS

This study used secondary data from the 2017 Indonesian Demographic Health Survey (IDHS). The data were obtained from the kid's recode dataset (KR). The number of samples used in this study was 13,830 mothers aged–15-49 with inclusion criteria of mothers who were interviewed entirely, who had toddlers under five years old,

were the last children, and children who lived with their mothers and were still alive.

The sampling method used by the IDHS is two-stage sampling. The samples are chosen randomly from each cluster formed based on the complete list of sample units stratified by urban or rural areas, which includes the entire population sample. The samples were chosen randomly through a complete list of sample units stratified based on the urban or rural areas covering the entire sample population.

The first step involved forming a survey cluster based on Primary Sampling Units (PSUs) chosen through the Probability Proportional to Size (PPS) in each stratum, as previously determined. Complete household data collection was then performed in each cluster. The second stage is determining permanent households randomly selected from each cluster based on the complete list of households collected previously. Typically, each cluster consists of 25-30 selected households. IDHS already has ethical clearance approved by the Institutional Review Board (IRB) https://dhsprogram.com/methodology/Protecting-the-Privacy-of-DHS-Survey-Respondents.cfm, and typically by an IRB in the host country.

The dependent variable in this study was diarrhea within the last two weeks before the study. Diarrhea in children can be divided into two categories. The first patient had diarrhea within the last two weeks before the survey, and the other patient did not have diarrhea within the last two weeks before the survey. The independent variable measured was socioeconomic factors. This was observed in wealth, husband/spouse's education, husband's occupation, family members, and children living with their parents.

The covariant variables measured were the age of the children, sex, age of mothers, status of residence, and province. Children's ages were 0-5 months, 6-11 months, 12-23 months, 24-35 months, and >35 months. The sex of the children included male and female. The age of mothers was categorized into 15-19 years old, 20-24 years old, 25-29 years old, 30-34 years old, 35-39 years old, 40-44 years old, and 45-49 years old. Place of residence was categorized into two categories: urban or rural. The province of residence is categorized into eastern and western regions.

The data were analyzed by univariate, bivariate, and multivariate analyses using STATA version 14. Univariate analysis was used to determine the distribution and frequency of all variables studied. Bivariate analysis was

performed using the chi-squared test. Multivariate analysis was performed using multiple logistic regression. The multivariate model will include variables with a p-value of <0.25 on the bivariate analysis. After inclusion in the multivariate model, a confounding check will be performed.

RESULTS

The analysis showed that 14.72% of the mothers had children with diarrhea in the last two weeks before the survey was conducted. Based on the children factor, 35.18% of the children were above 35 months (age range of 35-39 months). As many as 48.99% were female, and 51.01% were male. Based on the mothers' characteristics, 25.89% of the toddlers' mothers were aged–30-34 years old, and 1.72% were aged–45-49 years old. As many as 51.84% live in rural areas, and 48.16% live in urban areas. 84.25 Of the toddlers, 84.25% lived in the western region, and 15.75% lived in the eastern region (Table 1).

Based on socio-economic factors, 7.55% of the education of toddlers' fathers belonged to the category of low education, 20.22% and 19.39% of children under five came from low-income families, respectively, and 51.32% of the parents' occupations were in agriculture. Furthermore, 87.18% of the family members were equal to or more than four people, and 70.33% of the children in the household were 1-2 people (Table 1).

Table 1
Distribution of Characteristic of Respondent

Variable	n	%
Had Diarrhea Recently		
Yes	2,035	14.72
No	11,794	85.28
Age Of Child (months)		
0-5	1,489	10.77
6-11	1,564	11.31
12-23	3,128	22.62
24-35	2,783	20.13
>35	4,865	35.18
Sex Of Child		
Male	7,055	51.01
Female	6,775	48.99

(Continue)

Table 1
Continued

Variable	n	%
Age Of Mother (Years)		
15-19	319	2.31
20-24	2,257	16.32
25-29	3,517	25.43
30-34	3,581	25.89
35-39	2,783	20.12
40-44	1,134	8.20
45-49	238	1.72
Residence		
Urban	6,660	48.16
Rural	7,169	51.84
Province		
West	11,652	84.25
East	2,178	15.75
Socioeconomic Factor		
Wealth Quintile		
Poorest	2,682	19.39
Poorer	2,797	20.22
Middle	2,902	20.98
Richer	2,857	20.66
Richest	2,592	18.74
Husband/Partner's Educational Attainment		
Incomplete Primary Education/None	1,044	7.55
Complete Primary or Some Secondary	6,288	45.47
Completed Secondary or Higher	6,497	46.98
Husband/Partner's Occupation		
Agricultural	7,097	51.32
Non-Agricultural	6,733	48.68
Number Of Households Members (Listed)		
Household<4	1,772	12.82
Household>=4	12,057	87.18
Number of Living Children		
1-2	9,727	70.33
3-4	3,548	25.65
5+	555	4.02
Total		13,830

The distribution of diarrhea cases based on socioeconomic factors and their characteristics is shown in Table 2. Using the chi-square test, the socioeconomic factors related to diarrhea in children under five years of age were family

wealth (p = 0.00), husband/spouse education (p = 0.00), and husband/spouse occupation (p = 0.03). The number of family members and children living with their parents did not have a significant relationship (p > 0.05) (Table 2).

After analysis using multiple logistic regression, husbands/spouses of moderately educated mothers had 17% higher odds of their child having diarrhea compared to husbands/spouses of highly educated mothers after controlling for other variables (AOR=1.17;

95%Cl=1.02 –1.33; p=0.02). Toddlers with impoverished family backgrounds (AOR=1.39; 95%Cl= 1.12–1.73; p=0.00), poor (AOR=1.36; 95%Cl= 1.11–11.67; p=0.00), and wealthy (AOR=1.24; 95% CI=1.01–1.52; p=0.04) also had 39%, 36%, and 24% higher odds, respectively, for their child to have diarrhea when compared to toddlers with affluent family backgrounds after controlling for other variables (Table 3).

Table 2
Distribution of Diarrhea based on Socioeconomic Factors and Characteristics of Children and Mothers

Variables	n	No %	No Cl	Yes %	Yes Cl	p value
Age of Children (years old)						
0-5	1,489	91.42	[89.59,92.96]	8.58	[7.04,10.41]	<0.001
6-11	1,564	80.09	[77.49,82.45]	19.91	[17.55,22.51]	
12-23	3,128	80.37	[78.59,82.03]	19.63	[17.97,21.41]	
24-35	2,783	84.18	[82.45,85.77]	15.82	[14.23,17.55]	
>35	4,865	88.86	[87.70,89.92]	11.14	[10.08,12.30]	
Sex of Child						
Male	7,055	84.64	[83.53,85.68]	15.36	[14.32,16.47]	0.05
Female	6,775	85.95	[84.87,86.97]	14.05	[13.03,15.13]	
Age of mother						
15-19	319	77.22	[70.98,82.45]	22.78	[17.55,29.02]	<0.001
20-24	2,257	80.70	[78.58,82.65]	19.30	[17.35,21.42]	
25-29	3,517	85.23	[83.71,86.64]	14.77	[13.36,16.29]	
30-34	3,581	86.47	[84.98,87.83]	13.53	[12.17,15.02]	
35-39	2,783	87.08	[85.48,88.53]	12.92	[11.47,14.52]	
40-44	1,134	87.75	[85.41,89.76]	12.25	[10.24,14.59]	
45-49	238	89.68	[83.88,93.55]	10.32	[6.45,16.12]	
Residence						
Urban	6,660	86.55	[85.51,87.76]	13.45	[12.31,14.58]	<0.001
Rural	7,169	83.99	[82.89,85.22]	16.01	[14.82,17.21]	
Province						
	11,652					0.04
West		85.39	[84.48,86.35]	14.61	[13.75,15.67]	
East	2,178	84.69	[83.43,86.01]	15.31	[14.03,16.69]	
Socioeconomic Factor						
Wealth Quintile						
Poorest	2,682	83.15	[81.46,84.72]	16.85	[15.28,18.54]	<0.001
Poorer	2,797	83.46	[81.70,85.08]	16.54	[14.92,18.30]	
Middle	2,902	85.47	[83.83,86.96]	14.53	[13.04,16.17]	
Richer	2,857	85.70	[83.90,87.34]	14.30	[12.66,16.10]	
Richest	2,592	88.78	[87.13,90.25]	11.22	[9.75,12.87]	

(Continue)

Table 2
Continued

Variables	n	Had Diarrhea Recently				p value
		No		Yes		
		%	Cl	%	Cl	
Husband/Partner's Educational Attainment						
Incomplete Primary Education/None	1,044	85.03	[82.55,87.21]	14.97	[12.79,17.45]	<0.001
Complete Primary or Some Secondary	6,288	83.73	[82.43,84.95]	16.27	[15.05,17.57]	
Completed Secondary or Higher	6,497	86.82	[85.77,87.81]	13.18	[12.19,14.23]	
Husband/Partner's Occupation						
Agricultural	7,097	84.53	[83.46,85.54]	15.47	[14.46,16.54]	0.03
Non-Agricultural	6,733	86.07	[84.93,87.15]	13.93	[12.85,15.07]	
Number Of Household Members						
Household<4	1,772	84.21	[81.99,86.20]	15.79	[13.80,18.01]	0.25
Household>=4	12,057	85.44	[84.57,86.27]	14.56	[13.73,15.43]	

Table 3
The Relationship between Socioeconomic Factors and Diarrhea in Children under 5 Years Old

Variables	AOR	SE	95%CL		p-value
			Lower	Upper	
Age of Children					
0-5	Ref				
6-11	2.75***	(0.36)	2.13	2.13	<0.001
12-23	2.74***	(0.32)	2.17	2.17	<0.001
24-35	2.13***	(0.26)	1.68	1.68	<0.001
>35	1.46**	(0.17)	1.16	1.16	<0.001
Sex of Child					
Male	Ref				
Female	0.90	(0.05)	0.80	1.00	0.05
Age of Mother					
15-19	2.25**	(0.70)	1.22	4.13	0.01
20-24	1.85*	(0.51)	1.08	3.18	0.02
25-29	1.42	(0.38)	0.83	2.41	0.20
30-34	1.29	(0.35)	0.75	2.21	0.35
35-39	1.24	(0.34)	0.72	2.13	0.44
40-44	1.21	(0.34)	0.70	2.11	0.49
45-49	Ref				
Wealth Quintile					
poorest	1.39**	(0.16)	1.12	1.73	0.00
poorer	1.36**	(0.14)	1.11	1.67	0.00
middle	1.22	(0.13)	0.99	1.51	0.06
richer	1.24*	(0.13)	1.01	1.52	0.04
richest	Ref				

Table 3
Continued

Variables	AOR	SE	95%CL		p-value
			Lower	Upper	
Husband/partner's educational attainment					
Incomplete Primary Education/None	1.07	(0.12)	0.86	1.32	0.56
Complete Primary or Some Secondary	1.17*	(0.08)	1.02	1.33	0.02
Completed Secondary or Higher	Ref				
Constant	0.05***	(0.01)	0.03	0.09	<0.001
Observations	14,002				
Population Size	1,3830				

seEform in parentheses; *** p<0.001, ** p<0.01, * p<0.05

DISCUSSION

General Findings

The results of the study showed that there is a significant relationship between lower family economic status and a lower level of education of husband/wife and cases of diarrhea in children under five years after controlling for several other factors, such as the age of a toddler, gender of a toddler, and mother's age. Husbands/spouses of mothers with moderate education have a higher risk for their children to have diarrhea than husbands/spouses with higher education. Toddlers from poorer families have a higher risk of diarrhea than wealthy children.

Comparison with Other Studies and Possible Mechanism

Toddlers with a low family background have a higher risk of developing diarrhea. A similar result was also found in a study performed in a country with a small landlock in Central-East Africa, Rwanda, in 2015. The study results show a significant relationship between low economic status and diarrhea in toddlers compared to toddlers from a family with a low-class economic background (10). Another study also showed socioeconomic factors related to diarrhea cases in toddlers (18,19). A significant result was also obtained for the factor of low economy with diarrhea in toddlers (16). The other finding was obtained from a study performed in Nigeria in 2018 that showed a higher significant result in toddlers from lower economy classes or low-income families than toddlers from wealthy families (20). A similar study was performed in Indonesia, which is located in Makassar. The results show that socioeconomic factors influence diarrhea cases in toddlers in Makassar (3). Another

study was conducted in 2019, specifically in Deli, Serdang, which stated that toddlers from low-income mothers had a higher risk of developing diarrhea than children from high-income mothers (21).

The higher risk of diarrhea in children under five from low-income families occurs because families with a low economic class have low self-efficacy related to preventing diarrhea in toddlers, one of which is in the sanitation hygiene they carry out (10,22). Poverty combined with the uncontrolled density of society often makes parents of toddlers pay less attention to the fulfillment of hygiene sanitation they own, resulting in diarrhea cases in toddlers (14,23). Poor environmental quality, air pollution, the limited supply of clean water, and the lack of fulfillment of nutrition, which is not a top priority for families with low economic status, can also increase the risk of diarrhea in toddlers (12,16,24). Many toddlers from families with low socioeconomic status are malnourished. Toddlers with malnutrition tend to experience infection easily; one of them is diarrhea because the body's immune system is not sufficiently strong (25,26).

In addition to economic factors, the other factor supporting the occurrence of diarrhea in toddlers is the parents' low education level. Toddlers with parents with low educational levels have a higher risk of developing diarrhea. Another study also showed that parents with non-formal education have a more significant relationship than toddlers from parents with formal education (10). Another finding can be found in a study performed in Nigeria in 2018 through the data analysis of the Nigeria Demographic and Health Survey (NDHS). The results show that diarrhea in toddlers shows a higher significant result in toddlers from parents who do not receive education than toddlers from

parents with education (20). A similar result can also be found in another study that shows parents' education, especially mothers, is also related to diarrhea cases in toddlers in several cities in the sub-Sahara (18). The same study also showed a significant difference between education and parents' knowledge, especially for mothers of toddlers with diarrhea (16,22).

Research results that do not prove a relationship between education level and cases of diarrhea in children under five are also common. One such study was conducted by Sumatra et al.. The results of this study did not find a significant relationship between the level of education of fathers and mothers with cases of diarrhea in children under five years of age on the island of Sumatra (27). The diarrhea cases that occurred in the toddlers of the parents with a low-level education happened because the parents of the toddlers have limitations in improving themselves in obtaining information related to the prevention of diarrhea in toddlers (16,17). Education also has a close relationship with knowledge of health sanitation in toddler families. The lower the education of the toddlers' families, the lower the awareness and knowledge of the transmission and prevention of diarrhea in toddlers (10,28). A study that was performed with a purpose to see the relationship between mothers' knowledge and diarrhea cases in toddlers shows that there is a significant relationship between diarrhea in toddlers and the level of mothers' knowledge (29).

Toddlers with mothers who have a sufficient level of knowledge are 29% less likely to suffer from diarrhea than toddlers with mothers with a poor level of knowledge (17). The education and knowledge level of the toddlers' parents are related to each other directly, in which, if the education level of the parents is good, then the level of knowledge about the prevention and dangers of diarrhea tends to be good as well (30).

Research Limitations

Studies of risk factors for diarrhea in children under five, which are conducted to see socioeconomic differences by observing all regions of Indonesia, are still rare, especially since this study used standardized IDHS data so that the validity and credibility of the data can be maintained. The weakness of this study is that the incidence of diarrhea in toddlers was asked to the mother by remembering so that bias could occur. Other weaknesses, such as the factors discussed, are still limited and focus on socioeconomic factors.

CONCLUSION

The increase in cases of diarrhea in children under five is closely related to the socioeconomic conditions of parents. This study proves that there is a relationship between several socioeconomic factors, such as low parental education and parents' low economic level, and the incidence of diarrhea in children under five years of age.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

AUTHOR CONTRIBUTION

MR: Conceptualization, Writing- Original draft preparation, Editing. EA: Data curation, Reviewing, Software, Data analysis

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