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Sociodemographic, Household, and Environmental Determinants of Recent Diarrhea Among Under-Five Children in Indonesia: Evidence from the 2017 IDHS

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ABSTRACT

Background: Diarrhea remains a health problem in Indonesia. Despite various prevention programs, the prevalence of diarrhea in children in Indonesia remains relatively high. **Objective:** This study aimed to analyze factors associated with recent diarrhea among children under five years of age in Indonesia. **Methods:** This study used a cross-sectional design based on secondary data from the 2017 Indonesian Demographic and Public Health Survey (PJS). A total of 13,756 weighted mother-child pairs were included in the analysis. Sampling weights were applied prior to statistical analysis to account for the complex survey design. Data were analyzed using the chi-square test and binary logistic regression analysis was performed to identify factors associated with recent diarrhea. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported. **Results:** The prevalence of recent diarrhea in children under five years of age was 14.9%. Maternal age, maternal education, husband/partner's education level, province, household wealth index, and child gender were significantly associated with diarrhea incidence. Children from poor households were more likely to experience diarrhea compared to children from wealthier households. Boys were more likely to experience diarrhea than girls (AOR=1.19; 95% CI=1.08–1.31). Regional differences were also observed, particularly among children living outside Java–Bali. **Conclusion:** Strengthening maternal education, improving household socioeconomic conditions, and reducing regional differences are crucial to support childhood diarrhea prevention programs in Indonesia.

Keywords: childhood diarrhea; under-five children; sociodemographic factors; sanitation; Indonesia

Background

Diarrhea remains one of the major public health problems affecting children under five years old worldwide, particularly in low- and middle-income countries. According to the World Health Organization, diarrheal disease continues to be among the leading causes of morbidity and mortality in children, contributing substantially to preventable childhood deaths each year. Recurrent diarrhea not only increases the risk of dehydration and mortality but also contributes to malnutrition, impaired growth, and cognitive development disorders in children. Diarrhea remains highly prevalent among children under five years old in Southeast Asian countries, including Indonesia, despite the implementation of various preventive and curative interventions. Inadequate access to safe drinking water, poor sanitation conditions, poverty, and insufficient hygiene practices continue to contribute substantially to the burden of childhood diarrhea in developing countries (1–3). In Indonesia, diarrhea among children under five years old remains an important health concern. Data from the Indonesian Demographic and Health Survey (IDHS) showed that diarrhea prevalence among children under five has remained relatively high over the last decade. Furthermore, diarrhea among Indonesian children under two years old remains closely associated with sociodemographic and environmental factors (4)(5). In addition, Socioeconomic inequality remains an important contributor to diarrhea occurrence among Indonesian children under five years old (6).

Previous studies have identified several determinants associated with childhood diarrhea, including maternal education, household wealth, sanitation access, drinking water quality, environmental hygiene, and child characteristics. In particular, poor environmental conditions and low socioeconomic status were significantly associated with an increased likelihood of diarrhea among children under five years old in India (7). Furthermore, inadequate sanitation facilities and unsafe child feces disposal practices were also

strongly associated with childhood diarrhea in Ethiopia (8)(9). Several studies conducted in Indonesia have also examined factors related to diarrhea among children. For instance, maternal age, maternal education, toilet facilities, breastfeeding status, and bottle-feeding practices were identified as important determinants of diarrhea among children under two years old in Indonesia (5). In addition, greater emphasis has also been placed on diarrhea management and treatment practices among Indonesian children in previous studies (10)(11). However, previous studies in Indonesia were generally limited to specific determinants, younger age groups, diarrhea management practices, or selected socioeconomic indicators. In addition, several earlier studies did not comprehensively examine the combined contribution of sociodemographic, household, and environmental sanitation factors using nationally representative weighted DHS data. This indicates that evidence regarding multidimensional determinants of childhood diarrhea in Indonesia remains limited and requires further investigation.

Another important gap is that several previous studies focused predominantly on environmental sanitation factors without adequately considering regional disparities and household socioeconomic characteristics simultaneously. Indonesia has substantial geographical, economic, and infrastructural inequalities across provinces, which may influence childhood diarrhea occurrence differently between regions. Furthermore, environmental and socioeconomic inequalities continue to be major contributors to the burden of childhood diarrhea in low- and middle-income countries (2). In addition, the integration of household, environmental, and demographic characteristics is considered important when analyzing determinants of childhood diarrhea in Southeast Asia (1)(12). Although the Indonesian Demographic and Health Survey provides nationally representative data, limited studies have comprehensively explored the relationship between maternal characteristics, paternal education, household wealth, environmental sanitation, residential setting, and regional variation in relation to diarrhea among Indonesian children under five years old using weighted multivariable analysis. Moreover, evidence examining these factors simultaneously in the context of Indonesia remains scarce in recent literature. Therefore, further analysis is needed to provide stronger evidence for public health policy and childhood diarrhea prevention strategies in Indonesia.

This study provides several important contributions to the existing literature. First, this study utilized nationally representative data from the 2017 Indonesian Demographic and Health Survey with weighted analysis to account for the complex sampling design, thereby improving the generalizability of the findings at the national level. Second, this study comprehensively analyzed sociodemographic, household, and environmental sanitation factors simultaneously to identify determinants associated with recent diarrhea among children under five years old in Indonesia. Third, this study explored regional disparities in childhood diarrhea occurrence, which has been less emphasized in previous Indonesian studies. Therefore, this study aimed to analyze factors associated with recent diarrhea among children under five years old in Indonesia using data from the 2017 Indonesian Demographic and Health Survey. The findings are expected to provide evidence-based information for policymakers and healthcare professionals in developing targeted interventions to reduce childhood diarrhea and improve child health outcomes in Indonesia.

Methods

This study employed a quantitative analytical approach using a cross-sectional design based on secondary data obtained from the Demographic and Health Surveys Indonesian Demographic and Health Survey (IDHS) 2017 dataset (IDIR71FL). The study utilized nationally representative data collected through the 2017 Indonesian Demographic and Health Survey conducted across all provinces in Indonesia. The target population in this study consisted of women of reproductive age (15–49 years) who had children under five years old in Indonesia. The study sample was derived from the children's recode dataset of the 2017 IDHS.

Samples included in the analysis were mothers who were married and had complete information on the variables examined in this study. After data cleaning and screening procedures, a total weighted sample of 13,756 respondents was included in the final analysis. The IDHS applied a stratified two-stage cluster sampling design to ensure national representativeness. Sampling weights provided in the DHS dataset were applied prior to analysis to account for unequal probabilities of selection and complex survey design (13)(14).

The dependent variable in this study was recent diarrhea among children under five years old,

categorized as “Yes” or “No” based on maternal reports regarding whether the child had experienced diarrhea during the two weeks preceding the survey. Independent variables included maternal age, maternal education level, husband/partner educational attainment, maternal occupation, husband/partner occupation, place of residence, province, household wealth index, child sex, number of under-five children, number of living children, source of drinking water, type of toilet facility, and time required to obtain water sources.

Data were obtained from the 2017 IDHS standardized questionnaires developed by the DHS Program. Sociodemographic characteristics, household information, child characteristics, and environmental sanitation variables were collected through face-to-face interviews conducted by trained enumerators using structured questionnaires. The outcome variable, recent diarrhea, was measured based on mothers’ responses to whether their child had experienced diarrhea within the last two weeks before the interview. Maternal and household characteristics were self-reported during the interview process. Environmental and sanitation variables, including drinking water sources and toilet facilities, were classified according to DHS standard definitions for improved and unimproved facilities.

Sampling weights were applied to adjust for the complex sampling design and ensure nationally representative estimates. Descriptive statistics were used to summarize respondents’ characteristics and were presented as frequencies and percentages. Bivariate analysis using the chi-square test was performed to examine associations between independent variables and recent diarrhea among children under five years old. Variables with statistical significance in the bivariate analysis were further included in binary logistic regression analysis to estimate crude odds ratios (COR) and adjusted odds ratios (AOR) with 95% confidence intervals (CI). Statistical significance was determined at $p < 0.05$.

Results

Table 1. Sociodemographic, Household, and Environmental Characteristics of Respondents

Variable	Frequency (n)	Percent (%)
Mother Age (Years)		
35–49	2,391	17.4
25–34	7,084	51.5
15–24	4,281	31.1
Mothers Education Level		
No education	169	1.2
Primary	3,409	24.8
Secondary	7,792	56.6
Higher	2,386	17.3
Husband/Partner’s Educational Attainment		
Incomplete Primary Education/None	1,207	8.8
Complete Primary or Some Secondary	5,717	41.6
Completed Secondary or Higher	6,832	49.7
Mothers Occupation		
Not Working	6,477	47.1
Unskilled labor	6,111	44.4
Professional	1,168	8.5
Husband/partner's Occupation		

Agricultural	3,483	25,3
Non Agricultural	10,273	74,7
Residence		
Urban	6,833	49.7
Rural	6,923	50.3
Province		
Java–Bali	4,466	32.5
Sumatra	3,641	26.5
Other	5,649	41.1
Wealth index combined		
Poorest	3,493	25.4
Poorer	2,726	19.8
Middle	2,639	19.2
Rich	2,513	18.3
Richest	2,385	17.3
Sex of Child		
Male	7,059	51.3
Female	6,697	48.7
Number of Under-5 children		
≤2	13,227	96.2
>2	529	3.8
Number of Living Children		
1–2	8,965	65.2
3–4	3,958	28.8
>5	833	6.0
Environmental and Sanitation Factors		
Source of Drinking Water		
Improved	8,134	59.1
Not Improved	5,622	40.9
Type of Toilet Facility		
Improved	11,876	86.3
Not Improved	1,880	13.7
Time to Get Water Source		
On premises(Min)	11,557	84.0
1–30	2,049	14.9
31–60	103	0.7
Others	47	0.3
Had Diarrhea Recently		
No	11,700	85.1
Yes	2,056	14.9

Table 1 describes the sociodemographic, household, and environmental characteristics of the study participants. Of the 13,756 respondents included in the analysis, more than half of the mothers were aged 25–34 years (51.5%), while 31.1% were aged 15–24 years and 17.4% were aged 35–49 years. Most mothers had completed secondary education (56.6%), followed by primary education (24.8%) and higher education (17.3%), while only a small proportion had no formal education (1.2%). Similarly, almost half of the husbands or partners had completed secondary or higher education (49.7%), while 41.6% had

completed primary or part of secondary education. Regarding employment status, almost half of the mothers were unemployed (47.1%), while 44.4% were engaged in unskilled labor and 8.5% worked in professional fields. In contrast, most husbands or partners worked in the non-agricultural sector (74.7%). The distribution of respondents by residence was relatively balanced between rural (50.3%) and urban (49.7%) areas. Geographically, respondents were located in provinces outside Java–Bali and Sumatra (41.1%), followed by Java–Bali (32.5%) and Sumatra (26.5%). Across household wealth categories, the largest proportion fell into the poorest quintile (25.4%), while the remaining respondents were relatively evenly distributed across the poorest (19.8%), middle (19.2%), rich (18.3%), and richest (17.3%) quintiles.

Boys accounted for 51.3% of the sample. Nearly all households had two or fewer children under the age of five (96.2%), and approximately two-thirds had one to two living children (65.2%). In terms of environmental conditions, 59.1% of households had access to improved drinking water sources, and the majority reported using improved toilet facilities (86.3%). Access to water was generally good, with 84.0% of households having a water source within their yards. The prevalence of recent diarrhea among children was 14.9%, while 85.1% did not experience diarrhea during the reference period.

Table 2. Bivariate Analysis of Factors Associated with Recent Diarrhea Among Under-Five Children in Indonesia

Variable	Had Diarrhea Recently		p-value
	No	Yes	
	N	(%)	
Mother Age (Years)			<0.001
35–49	1,917(13.9)	474(3.4)	
25–34	6,054(44.0)	1,030(7.5)	
15–24	3,729(27.1)	552(4.0)	
Mothers Education Level			<0.001
No education	135(1.0)	34(0.2)	
Primary	2,842(20.7)	567(4.1)	
Secondary	6,620(48.1)	1,172(8.5)	
Higher	2,103(15.3)	283(2.1)	
Husband/Partner's Educational Attainment			<0.001
Incomplete			
Primary	999(7.3)	208(1.5)	
Education/None			
Complete Primary			
or Some	4,779(34.7)	938(6.8)	
Secondary			
Completed			
Secondary or	5,922(43.1)	910(6.6)	
Higher			
Mothers Occupation			0.086
Not Working	5,510(40.1)	967(7.0)	
Unskilled labor	5,172(37.6)	939(6.8)	
Professional	1,018(7.4)	150(1.1)	
Husband/partner's occupation			0.162
Agricultural	2,937(21.4)	546(4.0)	

Non Agricultural	8,763(63.7)	1,510(11.0)	
Residence			<0.001
Urban	5,903(42.9)	930(6.8)	
Rural	5,797(42.1)	1,126(8.2)	
Province			<0.001
Java–Bali	3,883(28.2)	583(4.2)	
Sumatra	3,059(22.2)	582(4.2)	
Other	4,758(34.6)	891(6.5)	
Wealth index combined			<0.001
Poorest	2,889(21.0)	604(4.4)	
Poorer	2,275(16.5)	451(3.3)	
Middle	2,244(16.3)	395(2.9)	
Richer	2,159(15.7)	354(2.6)	
Richest	2,133(15.5)	252(1.8)	
Sex of Child			<0.001
Male	5,863(43.0)	1,117(8.2)	
Female	5,726(42.0)	915(6.7)	
Number of Under–5 children			0.026
≤2	11,268(81.9)	1,959(14.2)	
>2	432(3.1)	97(0.7)	
Number of Living Children			0.217
1–2	7,591(55.2)	1,374(10.0)	
3–4	3,398(24.7)	560(4.1)	
>5	711(5.2)	122(0.9)	
Environmental and Sanitation Factors			
Source of Drinking Water			0.006
Improved	6,975(50.7)	1,159(8.4)	
Not Improved	4,725(34.3)	897(6.5)	
Type of Toilet Facility			<0.001
Improved	10,156(73.8)	1,720(12.5)	
Not Improved	1,544(11.2)	336(2.4)	
Time to Get Water Source (Min)			0.001
On premises	9,886(71.9)	1,671(12.1)	
1–30	1,685(12.2)	364(2.6)	
31–60	87(0.6)	16(0.1)	
Others	42(0.3)	5(0.0)	

Note: p-values were obtained using the chi-square test. Statistical significance was defined at $p < 0.05$.

Table 2 presents the bivariate analysis of sociodemographic, household, and environmental factors associated with recent diarrhea among children under five years old. Maternal age was significantly

associated with diarrhea occurrence ($p < 0.001$). Children of mothers aged 25–34 years accounted for the largest proportion of diarrhea cases, followed by those aged 15–24 years and 35–49 years. Maternal educational attainment showed a significant relationship with diarrhea incidence ($p < 0.001$). Higher proportions of diarrhea were observed among children whose mothers had primary and secondary education, whereas lower proportions were found among those whose mothers had higher education. A similar pattern was identified for husband or partner educational attainment ($p < 0.001$), indicating that lower parental education was associated with greater proportions of childhood diarrhea. No significant association was identified between maternal occupation and diarrhea occurrence ($p = 0.086$). Likewise, husband or partner occupation was not significantly related to recent diarrhea among children ($p = 0.162$). Residence was significantly associated with diarrhea incidence ($p < 0.001$), with rural areas reporting a higher proportion of diarrhea cases compared with urban areas. Significant regional differences were also observed across provinces ($p < 0.001$), with the highest proportion of diarrhea cases reported in provinces categorized as “Other regions.” Household wealth index demonstrated a significant association with diarrhea occurrence ($p < 0.001$). The proportion of diarrhea was higher among children from poorer households, particularly those in the poorest wealth quintile, and gradually decreased among wealthier households.

Child sex was significantly related to diarrhea incidence ($p < 0.001$), with male children experiencing diarrhea more frequently than females. The number of children under five years old in the household was also significantly associated with diarrhea occurrence ($p = 0.026$). However, the total number of living children did not show a statistically significant relationship with diarrhea incidence ($p = 0.217$). Environmental and sanitation characteristics were significantly associated with diarrhea occurrence. Source of drinking water was significantly related to diarrhea incidence ($p = 0.006$), while type of toilet facility also demonstrated a significant association ($p < 0.001$). In addition, time required to access water sources was significantly associated with diarrhea occurrence ($p = 0.001$).

Table 3. Crude and Adjusted Logistic Regression Analysis of Factors Associated with Recent Diarrhea Among Under-Five Children in Indonesia

Variables	Model 1(log)	Model 2
	COR(95% CI)	AOR(95% CI)
Mother Age (Years)		
35–49	Reference	Reference
25–34	0.68(0.61-0.77)***	0.71(0.62-0.80)***
15–24	0.59(0.52-0.68)***	0.60(0.51-0.71)***
Mothers Education Level		
No education	1.87(1.26-2.78)**	1.54(0.99-2.39)
Primary	1.48(1.27-1.72)***	1.28(1.04-1.58)*
Secondary	1.31(1.14-1.51)***	1.16(0.98-1.39)
Higher	Reference	Reference
Husband/Partner’s Educational Attainment		
Incomplete Primary Education/None	1.35(1.14-1.59)***	1.12(0.92-1.36)
Complete Primary or Some Secondary	1.27(1.15-1.41)***	1.12(1.00-1.26)*
Completed Secondary or Higher	Reference	Reference
Mothers Occupation		
Not Working	Reference	Reference
Unskilled labor	1.03(0.93-1.14)	1.10(0.99-1.21)
Professional	0.84(0.69-1.01)	1.15(0.92-1.44)

Husband/partner's occupation		
Agricultural	1.07(0.97-1.20)	0.85(0.75-0.97)*
Non Agricultural	Reference	Reference
Residence		
Urban	Reference	Reference
Rural	1.23(1.12-1.35)***	1.05(0.94-1.18)
Province		
Java-Bali	Reference	Reference
Sumatra	1.26(1.11-1.43)***	1.23(1.08-1.41)***
Other	1.24(1.11-1.39)***	1.15(1.01-1.30)*
Wealth index combined		
Poorest	1.77(1.51-2.07)***	1.33(1.08-1.64)**
Poorer	1.67(1.42-1.97)***	1.34(1.11-1.62)**
Middle	1.49(1.25-1.76)***	1.65(1.05-1.51)*
Richer	1.38(1.16-1.64)***	1.25(1.05-1.50)*
Richest	Reference	Reference
Sex of Child		
Male	1.19(1.08-1.30)***	1.19(1.08-1.31)***
Female	Reference	Reference
Number of Under-5 children		
≤2	Reference	Reference
>2	1.29(1.03-1.61)*	1.22(0.97-1.54)
Number of Living Children		
1-2	1.05(0.86-1.28)	1.02(0.81-1.29)
3-4	0.96(0.77-1.18)	1.02(0.82-1.27)
>5	Reference	Reference
Environmental and Sanitation Factors		
Source of Drinking Water		
Improved	Reference	Reference
Not Improved	1.14(1.03-1.25)**	1.09(0.98-1.20)
Type of Toilet Facility		
Improved	Reference	Reference
Not Improved	1.28(1.13-1.46)***	1.03(0.89-1.20)
Time to Get Water Source		
On premises(Min)	Reference	Reference
1-30	1.27(1.12-1.44)***	1.09(0.95-1.25)
31-60	1.08(0.63-1.85)	0.85(0.49-1.48)
Others	0.70(0.27-1.78)	0.56(0.21-1.42)

Note: COR = Crude Odds Ratio; AOR = Adjusted Odds Ratio; CI = Confidence Interval. Reference categories are indicated as "Reference." Statistical significance was set at *p<0.05, **p<0.01, and ***p<0.001.

Table 3 presents the results of binary logistic regression and multivariable logistic regression analyses examining factors associated with recent diarrhea among children under five years old. After adjustment for potential confounders, maternal age remained significantly associated with diarrhea occurrence. Compared with mothers aged 35–49 years, children of mothers aged 25–34 years were less likely to experience diarrhea (AOR=0.71; 95% CI: 0.62–0.80), as were those whose mothers were aged 15–24 years (AOR=0.60; 95% CI: 0.51–0.71). Maternal educational attainment demonstrated a significant relationship with childhood diarrhea in the adjusted model. Children of mothers with primary education

had higher odds of diarrhea compared with those whose mothers had higher education (AOR=1.28; 95% CI: 1.04–1.58). Although increased odds were also observed among mothers with no formal education and secondary education, these associations were not statistically significant after adjustment. Regarding paternal educational attainment, children whose fathers or partners had completed primary or partial secondary education were more likely to experience diarrhea than those whose fathers had completed secondary or higher education (AOR=1.12; 95% CI: 1.00–1.26). In contrast, maternal occupation was not significantly associated with diarrhea occurrence in the final model. Children from households in which the husband or partner worked in the agricultural sector showed lower odds of diarrhea compared with those employed in non-agricultural occupations (AOR=0.85; 95% CI: 0.75–0.97). Meanwhile, the association between place of residence and diarrhea was no longer statistically significant after controlling for other variables. Regional disparities remained evident in the multivariable analysis. Compared with children living in Java–Bali, those residing in Sumatra had 1.23 times higher odds of experiencing diarrhea (AOR=1.23; 95% CI: 1.08–1.41). Similarly, children from provinces categorized as “Other regions” also demonstrated increased odds of diarrhea (AOR=1.15; 95% CI: 1.01–1.30). Household economic status was consistently associated with childhood diarrhea. Children from the poorest households were more likely to experience diarrhea compared with those from the richest households (AOR=1.33; 95% CI: 1.08–1.64). Elevated odds were also identified among poorer, middle, and richer households, indicating a socioeconomic gradient in diarrhea occurrence.

Sex of the child remained a significant predictor in the adjusted model. Male children had higher odds of diarrhea than female children (AOR=1.19; 95% CI: 1.08–1.31). Although households with more than two children under five years old initially showed increased odds in the crude analysis, the association did not remain statistically significant after adjustment. Among environmental and sanitation variables, source of drinking water, type of toilet facility, and time required to obtain water were significant in the crude analysis; however, these associations diminished after adjustment for sociodemographic and household factors.

Discussion

The present study identified several sociodemographic, household, and environmental factors associated with recent diarrhea among children under five years old in Indonesia. The prevalence of diarrhea in this study remained relatively high, indicating that diarrhea continues to be an important public health problem among children in low- and middle-income countries. Furthermore, diarrhea remains one of the leading causes of morbidity and mortality among children under five years old in Southeast Asia, particularly in Indonesia (1). In addition, diarrhea continues to contribute substantially to childhood mortality in developing countries due to poor sanitation, unsafe drinking water, and socioeconomic inequalities (2)(15). Maternal age remained an important predictor of childhood diarrhea after adjustment for potential confounders. Children born to mothers aged 15–24 years and 25–34 years had 40% and 29% lower odds of experiencing diarrhea, respectively, compared with those born to mothers aged 35–49 years (AOR=0.60 and AOR=0.71). Although the magnitude of these associations can be considered moderate, they suggest that maternal age may influence childcare practices, health-seeking behavior, and household management related to child health. From a public health perspective, these findings indicate that older mothers may require additional support and health education to strengthen diarrhea prevention practices within the household. Furthermore, maternal age has been reported to influence diarrhea management and child health outcomes in Indonesia and other low- and middle-income countries (1)(11)(16).

The educational level of husbands or partners was significantly associated with diarrhea occurrence in this study. Children whose fathers had lower educational attainment showed higher odds of diarrhea compared with those whose fathers had secondary or higher education. Although the effect size was relatively modest (AOR=1.12), paternal education remains important because it may influence household resource allocation, access to health information, and health-seeking behavior, all of which can affect children's risk of diarrhea. Similar findings have been reported in Indonesia and other developing countries. Similarly, lower paternal education was associated with increased diarrhea incidence among children under five years old in Indonesia (6). Furthermore, caregiver education has also been identified as an important determinant of childhood diarrhea in Kenya and other developing countries (16)(17).

Household economic status remained significantly associated with childhood diarrhea in the

adjusted model. Children from poorer households experienced higher odds of diarrhea compared with those from wealthier households. Limited economic resources may reduce access to safe drinking water, sanitation facilities, nutritious food, and healthcare services. Furthermore, low socioeconomic status contributes to inadequate environmental hygiene and increases exposure to diarrheal pathogens (1). Similarly, children from poor households in Indonesia were reported to have significantly higher odds of diarrhea compared with those from wealthier families (6,8).

Regional disparities were also observed in this study. Children living in Sumatra and other regions outside Java–Bali had higher odds of diarrhea compared with those residing in Java–Bali. Differences in sanitation infrastructure, population density, healthcare access, and socioeconomic development across regions may explain these findings. This finding may indicate that regional disparities in infrastructure, healthcare services, and socioeconomic conditions continue to influence childhood diarrhea occurrence in Indonesia. Similar patterns have been observed in other low- and middle-income countries, where geographical and environmental inequalities contribute substantially to differences in diarrhea burden among children (2) (7) (18).

Male children were more likely to experience diarrhea compared with female children. Biological vulnerability, behavioral exposure, and differences in childcare practices may contribute to this condition. Furthermore, child sex was significantly associated with diarrhea occurrence among Ethiopian children under five years old (9). Similarly, male children were reported to have a greater likelihood of experiencing diarrhea than female children (16).

Environmental sanitation factors showed significant associations in the bivariate analysis; however, these relationships became non-significant after adjustment for sociodemographic variables. This finding may suggest that socioeconomic conditions play a more dominant role in childhood diarrhea than sanitation factors alone. A possible explanation is that household wealth and parental education influence both access to improved sanitation and the ability to implement appropriate hygiene and childcare practices. Consequently, the observed effect of sanitation may be attenuated after these factors are taken into account. Nevertheless, sanitation and water quality remain important contributors to diarrheal disease transmission despite the loss of statistical significance in the final model. Furthermore, unimproved sanitation facilities and unsafe child feces disposal practices were reported to increase the risk of diarrhea among children under five years old in Ethiopia (9). Moreover, unsafe drinking water, poor sanitation, and inadequate hygiene practices continue to account for a substantial proportion of diarrhea-related mortality worldwide (2) (19).

The findings of this study highlight the importance of strengthening maternal education, improving household socioeconomic conditions, and reducing regional disparities to prevent childhood diarrhea in Indonesia. Therefore, integrated interventions focusing on sanitation improvement, health promotion, and equitable healthcare access are needed to reduce diarrhea incidence among children under five years old. Furthermore, cross-sector collaboration involving healthcare workers, nurses, and sanitation professionals has been recommended to address childhood diarrhea comprehensively (1). Similarly, targeted public health interventions and improved sanitation infrastructure are considered essential strategies to reduce the burden of childhood diarrhea in developing countries (7)(20).

This study has several limitations. First, the cross-sectional design of the IDHS dataset limits the ability to establish causal relationships between variables. Second, diarrhea occurrence was based on maternal self-report, which may introduce recall bias. Third, several behavioral factors such as handwashing practices, food hygiene, and breastfeeding behavior were not included in the analysis. Nevertheless, this study utilized nationally representative DHS data with weighted analysis, thereby strengthening the generalizability of the findings among Indonesian children under five years old.

Conclusions and Recommendations

This study demonstrated that several sociodemographic, household, and environmental factors were associated with recent diarrhea among children under five years old in Indonesia. Maternal age, maternal education, paternal education, household wealth status, province, and child sex remained significant determinants in the adjusted model. Children from socioeconomically disadvantaged households and those living outside Java–Bali had higher odds of experiencing diarrhea. These findings indicate that socioeconomic inequality and regional disparities continue to contribute to the burden of childhood

diarrhea in Indonesia. Efforts to reduce childhood diarrhea in Indonesia should focus on improving maternal education, strengthening household socioeconomic conditions, and reducing regional health disparities. Health promotion programs related to hygiene, sanitation, and diarrhea prevention should be strengthened, particularly among vulnerable households and rural communities. In addition, improving equitable access to clean water, sanitation facilities, and child healthcare services across all regions of Indonesia is essential to support diarrhea prevention among children under five years old.

Ethical Consideration and Competing Interest

The study utilized secondary data from the 2017 Indonesian Demographic and Health Survey, which is publicly available upon request through the DHS Program. The Institutional Review Board (IRB) approved the initial IDHS survey through the ICF IRB Review Board (FWA00000845). All respondents provided informed consent prior to participation in the original survey. No personal identifiers were included in the dataset used for this study.

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