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The Risk of Diarrhea Among Underfive Children In Java Island Indonesia (Data Analysis of Indonesian Family Life Survey 2014)

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Abstract: **Diarrhea is the second leading cause of death among children under five year. Therefore, it is important to determine the factors associated with diarrhea, especially children under five year. Objective: aim of this study was to determine the incidence of diarrhea in children aged 6-59 months in Java Island. Material and methods: Data of 2.238 children on Java Island, Indonesia was obtained from the 2014 Indonesian Family Life Survey which was collected by the RAND Corporation. The study applied cross-sectional designed and data was analysed using *chi-square* statistical analysis. Result: The Results of the interaction test showed no interaction between Age and stunting, age and father's education, age weight at birth, age and receive vitamin A, and type floor towards the incidence of diarrhea in children. Age was the dominant factor contributing towards the incidence of in children in Java Island after controlling for variables of the stunting, father's education, weight at birth, receive vitamin A, and type of floor. Conclusion: On Java Island – Indonesia, Risk of diarrhea consist of age (6 – 23 months), low maternal education level, children with LBW, children who did not recieved vitamin A supplements, besides throwing trash in a place/ trashcan/ transported by officers, and poor liquid waste disposal. Children age 6-23 months had risk of diarrhea 1.15 times higher among children age 6-59 months**

Keywords: **diarrhea, children, nutrition.**

I. INTRODUCTION

Diarrhea remains the second leading cause of death among children under five year in globally [1]. The majority factor of death in children with diarrhea are fluid loss and dehydration [2]. Diarrhea in children can cause unsteady growth, malnutrition, and impaired cognitive development in resource-limited countries [3].

More than a quarter (26·93%) of diarrhoeal deaths occurred among children younger than 5 years, and about 90% (89·37%) of diarrhoeal deaths occurred in south Asia and sub-Saharan Africa [4]. In indonesia Fourteen percent of children under five had diarrhea in the 2 weeks. Five per 1,000 children suffer from diarrhea accompanied by blood. Diarrhea with blood indicates cholera or other diseases that require different treatment from diarrhea without blood [5].

Diarrheal disease is not purely medical, but most of this must be traced back to social-economic, environmental and family behavioral aspects.,cultural factors, low coverage and effectiveness of health services. Socioeconomic factors such as population density and low maternal education, poor sanitation, contaminated water, failure to continue breastfeeding until one year of age, using baby bottles that are difficult to clean, storing food at room temperature, failure to wash hands, failure to breastfeed dispose hygienic feces that do not condense food hygiene are associated with a high incidence of diarrheal disease [6] [7]. This study aimed to determine the risk factors of diarrhea in children under five years on Java Island.

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II. METHODS

This study applied a cross-sectional design based on the Indonesian Family Life Survey (IFLS) data from RAND Corporation, conducted in 2014 specifically for Java Island. This study has acquired approval from RAND Corporation. The target population of this study was female and male child aged 6 – 59 months living on Java Island, a total of 2.238 children.

Independent variables consisted of living area, age, sex, weight at birth, nutritional status (anthropometry), parents' demographics (both parents' education level), complete basic immunization, vitamin A, environmental factors (drinking water, latrine, garbage, liquid waste disposal, type of floor, and livestock). Data of nutritional status was measured in accordance to standardized procedure; data diarrhea socio-demographic characteristic and environmental factors was obtained through interview using IFLS questionnaire.

Diarrhea, was obtained if child has had diarrhea for the past 4 weeks and diarrhea, at least 3 times a day. The nutritional status variable was categorized into Z-scores <- 2 SD for height-for-age (HAZ) reflecting stunting, weight-for-height (WHZ) reflecting wasting, and weight-for-age (WAZ) reflecting undernutrition , education level categorized into 'low' or 'high', weight at birth was categorized 'low birth weight (< 2,5 kgs) or normal (≥ 2,5 kgs), received vitamin A 'yes' or 'no', type of floor was categorized 'ceramic/tiles/terazzo' or 'others'.

Statistical analyses consisted of univariate, bivariate and multivariate statistical analyses. Bivariate analysis in the form of chi-square test determined the realationship between independent variables and our main dependent variable of diarrhea. Multivariate analysis in the form of multiple logistic regression tests was performed to determine the most dominant independent variable associated with diarrhea. A p-value of <0.05 was considered statistically significant. Multivariate analysis was performed using multiple logistic regression test. Variables that could be included in the early model were age, nutritional status, parents educational, weight at birth, received vitamin A, complete basic immunization, and environmental factors. Then, one by one, variables with a p-value > 0.05 were exclude from the modeling. If there was change in OR > 10% after variable was exclude, the variable was then put back in the modeling. However, if the change in OR was < 10%, the variable could still be excluded. After the modeling was perfomed fouthty times, the final modeling of multivariate analysis was obtained

Table 1: Difference of diarrhea proportion based on variables among children on Java Island (data analysis Indonesian Family Life Survey year 2014)

Variable	Diarrhea n (%)	Non-Diarrhea n (%)	OR (95% CI)	P-Value
Living Area (n = 2233)				
Urban	266 (17.8%)	1232 (82.2%)	0.886	0.320
Rural	144 (19.6%)	591 (80.4%)	(0.707– 1.110)	
Age (n = 2233)				
6-23 Months	173 (23.0%)	579 (77.0%)	1.568	0.000*
24-59 Months	237 (16.0.2%)	1244 (84.0%)	(1.259-1953)	
Sex (n= 2233)				
Male	223 (19.5%)	918 (80.5%)	1.176	0.155
Female	187 (17.1%)	905 (82.9%)	(0.948 – 1.458)	
Underweight (n = 2233)				
WAZ (<-2SD)	104 (18.3%)	464 (81.7%)	0.995	1.000
WAZ (≥-2SD)	306 (18.4%)	1359 (81.6%)	(0.778 – 1.273)	
Wasting (n = 2233)				
WHZ (<-2SD)	37 (20.7%)	142 (79.3%)	1.174	0.464
WHZ (≥-2SD)	373 (18.2%)	1681 (81.8%)	(0.804 – 1.715)	
Stunting (n = 2225)				
HAZ (<-2SD)	128 (20.3%)	504 (79.7%)	1.191	0.158
HAZ (≥-2SD)	280 (17.6%)	1313 (82.4%)	(0.943 – 1.503)	
Father's Education (n = 1611)				
Low	88 (19.0%)	375 (81.0%)	1.246	0.144
High	182 (15.9%)	966 (84.1%)	(0.940 – 1.650)	
Mother's Education (n = 2105)				
Low	126 (22.4%)	437 (77.6%)	1.422	0.005*

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Variable	Diarrhea n (%)	Non-Diarrhea n (%)	OR (95% CI)	P-Value
High	260 (16.9%)	1282 (83.1%)	(0.862 – 1.741)	
Birth Weight Status (n = 2013)				
LBW	44 (23.8%)	141 (76.2%)	1.459	0.048*
Normal	322 (17.6%)	1506 (82.4%)	(1.019 – 2.090)	
Basic Immunization (n = 2233)				
Non-Complete	378 (18.0%)	1759 (82.0%)	0.612	
Complete	23 (26.4%)	64 (73.6%)	(0.375 – 0.998)	0.065
Receive Vitamin A (n = 1365)				
No	38 (26.2%)	107 (73.8%)	1651	0.018*
Yes	216 (17.7%)	1004 (82.3%)	(1.108 – 2.458)	
Drinking Water (n= 1884)				
Not Good	65 (18.8%)	280 (81.2%)	0.996	1.000
Good	291 (18.9%)	1248 (81.1%)	(0.739 – 1.342)	
Latrine (n = 2231)				
Not Good	109 (20.7%)	417 (79.3%)	1.219	0.127
Good	301 (17.7%)	1404 (82.3%)	(0.954 – 1.558)	
Household Throw Garbage (n = 2231)				
Other	268 (20.1%)	1066 (79.9%)	1.337	0.013*
In a place/trash can/ transported by officers	142 (15.8%)	755 (84.2%)	(1.069 – 1.672)	
Liquid Waste Disposal (2231)				
Poor	179 (20.9%)	676 (79.1%)	1.313	0.014*
Good	231 (16.8%)	1145 (83.2%)	(1.056 – 1.631)	
Type of Floor (n = 2233)				
ceramic/tiles/terazzo	101 (20.9%)	382 (78%)	0.1233	0.117
others	309 (17.7%)	1441 (82.3%)	(0.959 – 1.585)	
Poultry (n = 695)				
Yes	41 (14.2%)	248 (85.8%)	0.957	0.328
No	70 (17.2%)	336 (82.2%)	(0.794 – 0.522)	
Livestock other than poultry (n = 695)				
Yes	29 (13.7%)	185 (86.3%)	0.775	0.111
No	82 (17.0%)	401 (83.0%)	(0.490 – 1.225	

***significant (p<0.05)**

Child and Family Characteristics

The overview of health and nutrition characteristic among children and families describe in table 1. The incidence of diarrhea in children aged 6-59 months in Java Island was mostly in the group 6 – 23 months, low maternal education level mother , children with LBW, children who not received vitamin A, besides throwing trash in a palce/ trashcan/ transported by officers, and poor liquid waste disposal

Diarrhea Risk in Children Age 6-59 Months.

From the analysis of stastical variable that associated with the incidence of diarrhea were age, mother's education, birth weight status, receive vitamin A, household throw garbage, and liquid waste disposal.

The proportion of diarrhea in age group 6-23 months (23%). The analysis also concluded that there were correlation between the age group with diarrhea (p<0.05) was higher in the group 6-23 months. Children in the age group 6-23 months had risk diarrhea with OR 1.15 (95% CI 1.25 – 1.95), which means that children in the age 6-23 months had a high risk of diarrhea 1.15 times than children in the age 24-59 months. Research conducted study in India, the high prevalence diarrhea (40,7%) in the group 7-12 months and (32.1%) in the group 13-24 months [8] This can be due to protective effect of exclusive breast feeding for very young children of 0–6 months of age and less exposure of children to contaminated environmental agent. On the other hand, the frequency of diarrhea peaks at the age 6- 12 months when the child is exposed to different types of infections due to eating foods that are prepared un-hygienically, in unclean water and unhealthy environment [9].

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The proportion of diarrhea mostly in children with low-education mother's (22.4%). The analysis shows that there was a significant relationship between children with low-education mother's and diarrhea in children. Children with mother's low education level had risk 1.42 times higher compared children with mother's high education level. The findings of this study regarding maternal education emphasizes that mothers with lower educational status put their children at higher risk for having diarrhea, which is in line with a community-based cross-sectional study in Ethiopia, Zimbabwe, Uganda, India and in a case control study done in Lesotho [10] Be that as it may, with regards to diarrhoea prevention, parents and caregivers can be informed and trained on hygienic practices and disease control regardless of their low education level [11].

The proportion of diarrhea mostly in children with low birth weight status (23.8%). The statistic analysis also showed a significant relationship between children with low birth weight status with diarrhea in children 6-59 months. Children with low birth weight had higher risk of diarrhea 1.45 times than children with normal birth weight. Similar finding was there in a study from Kumar R et al where risk of diarrhea in LBW children 1.38 times higher compared to child with normal birth weight [9] LBW infants suffer more episodes of common childhood diseases like diarrhea [12].

The proportion of diarrhea most of in children who did not receive vitamin A supplements (26.2%). The result of the analysis showed that there was significant relationship between children who did not receive vitamin A supplements and diarrhea. children who did not receive vitamin A supplements had a high risk of diarrhea 1.10 times higher than children who receive vitamin A. Imbad et al showed fifteen studies reported a 15% vitamin A has decrease in diarrhoea incidence, vitamin A reduces overall risk of death and death due to diarrhea by 12% [13].

The analisys also concluded that there were correlation between diarrhea in children with a hosehold who was not throwing trash in a palce/ trashcan/ transported by officers. Children with a household who was not throwing trash in a place/ trashcan/ transported by officers have a risk of diarrhea 1.33 times than children with a household who was throwing trash in a place. This study similar with Rindra research Children living in houses containing or surrounded by garbage were three times more likely to develop severe diarrhea than those living in garbage-free houses [14]. Less than half of the Brazilian population does not have garbage collection and only 38% of the sewage was not treated, which contributed to the 212,000 hospitalizations in 2011 due to diarrhea in children under five years of age in the country [7].

The proportion of diarrhea most in children with a household in poor liquid waste disposal (20.9%). The result of the anlaysis showed that there was significant relationship between children with a household in poor liquid waste disposal have a risk diarrhea 1.05 times than children with a housegold in good liquid waste disposal. Abdiwahab research found the absence of a drainage system for liquid waste disposal is significantly related to the occurrence of diarrhea. This could be the reason that the disposal of solid and liquid waste provides culture for various insects that can carry pathogenic diarrhea from waste to food and water. [6].

Table 2: Early and final modeling of multivariate analysis factors associated with diarrhea among children on Java Island year 2014

Variable	*p-value*	*OR*	*CI 95%*
Early Modeling			
Age	0.005	1.955	1.299 – 2942
Stunting	0.144	1.306	0.874 – 1950
Father's Education	0.129	1.473	0.933 – 2.328
Mother's Education	0.004	1.164	0.737 – 1.839
Weight at Birth	0.045	1.025	0.571 – 1.841
Receive Vitamin A	0.017	0.645	0.369 – 1.129
Complete Bsic Immunization	0.058	1.911	0. 811 – 4.507
Latrine	0.116	0.757	0.473 – 1.212
Garbage	0.010	0.831	0.533 – 1.293
Wastewater Disposal	0.014	1.356	0.895 – 2.054
Type of Floor	0.106	1.643	1.045 – 2.584
Final Modeling			
Age	0.003	1.819	1.223 – 2.705
Stunting	0.206	1,289	0.870 – 1.909
Father's Education	0.068	1.443	0.974 – 2.140
Weight at Birth	0.714	1.113	0.682 – 1.973
Receive Vitamin A	0.170	0.681	0.394 – 1.178
Type of Floor	0.035	1.578	1.032 – 2.411

The Results of the interaction test showed no interaction between Age and stunting, age and father's education, age weight at birth, age and receive vitamin A, and type floor towards the incidence of diarrhea in children. Age was the dominant factor contributing towards the incidence of in children in Java Island after controlling for variables of the stunting, father's education, weight at birth, receive vitamin A, and type of floor, as shown in table 2.

III. CONCLUSION

Diarrhea in children under five years on Java Island in 2014 was still high the results of this study reinforce the hypothesis that age is the most dominant factors of diarrhea in children under five years, after controlling for variables of the stunting, father's education, weight at birth, receive vitamin A, and type of floor. The risk of diarrhea is higher in children in age 6-24 months, mother's with low education level, low birth weight status, didn't receive vitamin A, household threw garbage not in palce, and poor liquid waste disposal.

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