# FACTORS ASSOCIATED WITH DIARRHEA AMONG CHILDREN UNDER FIVE YEARS OF AGE IN BANTEN PROVINCE, INDONESIA

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**ABSTRACT:** The data from Indonesian National Socio-economic Survey 2007 and Basic Health Research 2007 was used to examine the factors associated with diarrhea among children under-five years of age in Banten Province, Indonesia. A two stage sampling was done using probability proportional to the household's number. Data analysis was done using Pearson's Chi-square test and binary logistic regression. The prevalence of diarrhea among under-five old children was found to be 18.9%. The highest risk was in age group 6-11 months, low education mother (p-value = 0.001) and without gender influences. Mother's defecation place (p-value < 0.001) and hand washing behavior (p-value <0.001) were found to be significant. Teenage mothers were found to have high risk of having children with diarrhea (p-value =0.042) and the highest percentage of never practiced hand washing with soap (15.8%). Unsafe drinking water source and poor physical quality of drinking water were associated with diarrhea in children (p-value <0.001 and 0.005) as well as the household which shared drinking water source and latrine, used open water container, open liquid drainage channel, and did not use septic tank for feces landfills. Exclusive breast feeding, good nutrition, vitamin A supplementation, measles immunization were not enough to prevent under-five old children from diarrhea. Health education, postpone young marriage, use of safe drinking water source and latrine, are recommended. Longitudinal study is needed to identify confounding factors, causal relationships and seasonal differences in the epidemiology of diarrhea.

**Keywords:** factors, diarrhea, children, Indonesia

## INTRODUCTION

Diarrhea is one of main mortality and morbidity causes, especially in children younger than 5 years of age. In the world, as many as 6 million children die each year from diarrhea, where most deaths occur in developing countries [1]. Many studies around the world have found the factors associated with diarrhea. Diarrheal diseases can be caused by numerous pathogens and transmitted through multiple vehicles. Persons living in developing countries with poor access to safe water, sanitation, and worse hygiene behavior have increased risk of exposure to viral, bacterial, and parasitic pathogens that can cause diarrheal diseases [2, 3]. Another study evaluated maternal behavior as related predictors of diarrheal disease [4].

In Indonesia, the death rate from diarrhea has declined sharply, but morbidity remains high and replaced pneumonia as leading cause of children death. Prevalence of diarrhea in children was increase from 11% to 14% according Indonesia Demographic Health Survey 2002-2003 and 2007. [5]. Indonesia was accounting for three-quarters of death due to diarrhea in developing region of the world. The highest mortality due to diarrhea in Indonesia occurred in Nusa Tenggara Timur (East Southeast Nusa) and Banten Province [6]. This study objective was to find out which factors and interventions are related with diarrhea in children in Indonesia.

## MATERIALS AND METHODS

National Socio-economic Survey 2007 was conducted by Statistic Center Board, Indonesia on July to August 2007 which collected household and individual economic data. Whereas Basic Health Research 2007 was conducted by Research and Development Board, MoH of Indonesia on August to December 2007 which collected information about health status and health determinant.

Banten Province was chosen as the study area because it is one that has highest mortality due to diarrhea other than East Nusa Tenggara Province. Banten also has a varied area in terms of demographic and geographic conditions (urban, rural, industrial, beach and mountainous area). Data of related variables from those surveys in Banten were used to examine factors associated with diarrhea among under-five years old. A two stage sampling was done using probability proportional to the number of households in district/city. There were 303 census blocks selected by random

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sampling which each block consist of 150 households. Then, from each census block 16 households randomly selected as the sample of household. Each household member became respondent of primary data collection.

Data from two surveys were merged and analyzed using SPSS version 17. Every child has unique identification number as well as their household which equal in National Economic Survey 2007 and Basic Health Research 2007. This identification number was used as key variable to merged children health and individual socio-economic data then with household economic data. As the result, there were data of 1655 children under-five years of age from 1487 households along data of their mothers and households included in analysis.

Data of diarrhea was obtained by asked "In the past 1 month, was [NAME] ever diagnosed as diarrhea by a health provider (doctor/nurse/midwife)?" And "In the past 1 month, had [NAME] ever had watery/smooth stool more than 3 times a day?" Bivariate analysis was done with Pearson's Chi-square test, and multivariate analysis being done using binary logistic regression at ≤ 0.05 significant level and 95% confidence interval.

National socio-economic survey 2007 was done based on Government Regulation No. 51 1999 and No. 7 2008 about the organization and working procedures of the Central Statistics Board. Basic Health Research ethical consideration was obtained from Health Research Ethical Committee, Ministry of Health of Indonesia, whereas this secondary data analysis approved by Ethical Committee College of Public Health Sciences, Chulalongkorn University.

**RESULTS**

Prevalence of diarrhea among children under-five years of age children in Banten was 18.9% (132 out of 1655). Children at the age of 6 – 11 months have high percentage of diarrhea cases than another age, but there was no significant difference of diarrhea case in boys and girls. Children who ever had breastfed have higher percentage of diarrhea cases (19.8%) than never (4.5%). While the duration of having only breastfeeding (exclusive breastfeeding) had no effect to diarrhea in children.

There was no association between children's health care and diarrhea. The children who had routine body weighing, complementary feeding, vitamin A supplementation within last 6 months and measles immunization have same probability of having diarrhea with the children did not had those health care. There was no significant association between children nutritional status and diarrhea in children. The children who had normal nutritional status have diarrhea almost as much as the children who suffered from severe underweight, severe stunting and severe waste.

There was no association between overall age of mother and diarrhea in children, however prevalence of diarrhea was significantly higher in children from teenage mothers compare to older mothers. Numbers of children in the household has no association with risk of having diarrhea in children.

Mother's education level has association with diarrhea in children. Percentage of children with diarrhea was gradually decrease in increasing of mother education, although there was a slightly increase among children with bachelor degree or higher education mother (16.7%). While, mother occupation, wealth index quintile, health financing source, and health expenditures, health services utilization, out-patient and in-patient services utilized have no association with diarrhea in children.

There was different incidence of diarrhea in different district. The highest was in Pandeglang district (25.7%) followed by Lebak district. Teenage mothers also found mostly (31.6%) in Pandeglang district. It was also consistent with the type of area. Rural area has more children with diarrhea than urban area.

The analysis revealed that there was association between mother's behavior and diarrhea in children. There was gradual decrease of diarrhea in children if the mothers practiced more hand washing actions. The highest percentage of mother whose never wash their hand with soap was teenage mothers (15.8%). Also, mothers who defecate at latrine have fewer children with diarrhea than mothers who defecate at other places. (Table 1)

**Table 1** Association between children and mother factors and diarrhea

| Factors | p-value |
|---|---|
| Children age in month (n=1655), *Mean (SD) = 28.74 (16.42)* | 0.014 |
| Ever breastfed (n=1446) | 0.002 |
| Mother educational level (n=1410) | 0.001 |
| Residence by Pandeglang district, Lebak district, Cilegon city, Serang district, Tangerang district and Tangerang City (n=1655) | < 0.001 |
| Urban and rural area (n=1655) | 0.008 |
| Hand washing behavior (n=1410)* | <0.001 |
| Defecation place: latrine, pond /wetland/ gutter, river/sea/lake, ground hole/beach/ field/garden /courtyard /others (n=1410) | <0.001 |

*Hand washing actions were never or out of four that can be practiced (before eating, before preparing food, after defecation/clean up baby stool and after touching animals)

**Table 2** Association between environment factors and diarrhea

| Factors | p-value |
|---|---|
| Safe or unsafe drinking water source (n=1655) | <0.001 |
| Drinking water source ownership, belong to household, sharing, public facility or there was no water source (n=1387) | 0.010 |
| Ease or difficult at dry season or all year round of getting drinking water (n=1655) | 0.001 |
| Buy or did not buy of drinking water (n=1655) | 0.007 |
| Without, open or closed water container type (n=1655) | 0.027 |
| Good or not good water physical quality (n=1655) | 0.005 |
| Latrine ownership, belong to household, sharing, public facility or there was no latrine (n=1655) | < 0.001 |
| Landfills of feces: septic tank, pond/wetland/river/lake/sea, others (ground hole/beach /yard/garden, etc.) (n=1655) | 0.001 |
| Open, closed, or without liquid drainage channel (n=1655) | 0.017 |

**Table 3** Multivariate analysis of significant factors

| Variables | B | Adjusted OR | 95% CI | | p-value |
|---|---|---|---|---|---|
| | | | Lower | Upper | |
| Children age [a] | -0.015 | 0.985 | 0.977 | 0.994 | 0.001* |
| Mother hand washing behavior [d] | -0.237 | 0.789 | 0.707 | 0.881 | <0.001* |
| Drinking water source [e] | 0.440 | 1.552 | 1.152 | 2.091 | 0.004* |
| Physical quality of drinking water [f] | 0.339 | 1.404 | 1.008 | 1.955 | 0.045* |
| Constant | -0.806 | 0.447 | | | 0.001 |

a) children age as continuous data

b) never wash hand with soap compare with 1, 2, 3, and 4 actions

c) safe compare with unsafe

d) good compare with not good

Children have more diarrhea at household which used unsafe drinking water source, did not have their own drinking water source, or did not buy drinking water and the most diarrhea case (28.6%) was among children who drunk water from rainfall . Difficult access of drinking water also was found as significant factor. Small distance of drinking water source to water pollution sources (< 10 m) and amount of water consumption per person/day for all purpose were not have a significant effect to occurrence of diarrhea in children. While, not good physical quality of drinking water and open water container have a significant association with diarrhea. Good physical quality of drinking water originated from safe drinking water source, vice versa (p-value < 0.001).

There was no association between diarrhea and type of latrine. The factors that statistically significant were latrine ownership and feces landfills. Diarrhea case was higher at household without latrine or used public facility or sharing with neighborhood, and at the household which not used septic tank for feces landfills. Open or without liquid waste drainage was association with diarrhea, while there was no association between solid waste management, earthen floor and overcrowded house. (Table 2)

Multivariate analysis was done using modeled binary logistic regression. After controlling other variables, 4 variables maintained significant association with diarrhea; children age, mother hand washing behavior, drinking water source and physical quality of drinking water. (Table 3)

**DISCUSSION**

Diarrhea prevalence was higher in children age 6 – 11 months, similar with diarrhea prevalence all over Indonesia [5], study in Bangladesh, and result of Eritrea Demographic and Health Survey (EDHS) 1995 [7, 8]. This reinforces the knowledge that the risk of having diarrhea increases at the time the child starts moving around the house and starts weaned other than breast feeding [7]. Prevalence of diarrhea was not different between boys and girls, it was means gender was not influential or not reflects sex-specific child-care practices.

Children who ever had breastfed 95.4% but only 20% until 6 months, almost half of children had breastfed less than 3 months. Children who ever breastfed have more risk of diarrhea than those who never breastfed and exclusive breast feeding had no association with diarrhea prevalence. This could be explained because exclusive breast feeding can only prevent diarrhea as long as the children is exclusively breast fed. Older children have no protection from diarrhea even if they ever had breastfed up to six months. The effect that breastfeeding has on decreasing the rotavirus infection only lasts for as long as the child is breast fed [9].When breastfeeding stops, infants are exposed to food-borne bacteria and lose the protection of breastfeeding's anti-infective properties [4, 10]. This is consistent with previous research in Lalitpur district of Nepal in [11] and a study in Congo [12].

This study found there was no association between

measles immunization and diarrhea in under-five children. This can be explained by the fact that the protective effect of measles immunization on diarrhea morbidity is limited to 'with-measles' diarrhea (1week pre-rash-onset and 4 weeks post-rash-onset), and 'post-measles diarrhea' (4-26 weeks post-rash-onset) [13] while our survey covered prevalence of diarrhea in all under-five children outside a period of measles epidemic. Similar with a study in India reporting that attack rates of diarrhea in immunized children were no different to that in the non- immunized [14]. There was no association between nutritional status (weight for age, height for age and weight for height) and diarrhea in children. There is also a hypothesis that nutritional status will predict the duration of diarrhea, such as severity but not the incidence [15].

Teenage mothers have strong association with developing diarrhea in children, also who never practiced hand washing with soap. Another study found that maternal age < 20 years increased the risk of rotavirus diarrhea [16, 17]. Maximum number of children living in the household was 5 and no association with diarrhea. Study in Eritrea, however, revealed that there was significant association with this variable. The probability of having diarrhea was about 30 and 60% higher if there were 3-5 and 6 or more children respectively in the household [8].

A Strong effort to reduce diarrhea in children in Indonesia is still needed, such as providing health educations for mothers especially teenage mother, postponing the marriage of women until at least 20 years old, encouraging the family to have own latrine and promote the use of safe drinking water source, specific intervention for rural area with difficulties to get drinking water source, and water supply, liquid waste disposal, and feces landfills should take into account when make urban planning.

The limitations of this study were different time on data collection of these two surveys, therefore different conditions on some seasonal diseases may not be linked between the two surveys. For future research, urban congested areas (slums) should record differently with normal urban areas.

## ACKNOWLEDGMENTS

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