Does Drinking Water Sources, Knowledge and Hygiene Behavior of Mother Influence the Quality of Drinking Water for Toddlers?

Septia Rini Rizki[1], Ema Hermawati[2], Ukik Agustina[1], Febri Hardiyanti[1]

[1]Researcher, [2]Tutor, Department of Environmental Health, Faculty of Public Health, University of Indonesia

Abstract

Background : Clean water is one of the vital needs for human. The low availability of clean water has a bad impact on all sectors, including health. Around 3,800 children die every day due to diseases related to unhygienic drinking water access. Cholera, ringworm, diarrhea, or typhus are a small number of diseases that may arise from consuming unhygienic water. Even unsafe drinking water, poor sanitation, and hygiene behavior contribute to 88% of child deaths due to diarrhea worldwide[1]. According to World Health Organization data, nearly 1.7 billion cases of diarrhea occur in children and kill around 525,000 children under five every year in the world[2]. While in Indonesia, there was an outbreak of diarrhea in 2018 with the number of children under five as sufferers as many as 1,637,708 (40.90%). One of cities that has the highest diarrhea cases in Indonesia is Depok, more specifically in Tapos Sub-district with 1,274 diarrhea cases[3]. Diarrhea in toddlers is closely related to the quality of drinking water consumed and maternal care factors. This study aims to determine whether maternal hygiene knowledge and behaviors affect the quality of toddler drinking water.

Method : This study was an observational with cross sectional design. This research used questioner and the sample are mothers who have toddler who consume drinking water in Tapos Sub-district, Depok, in period of November to December 2019. The quality of drinking water is known through measurements of *Total Coliform* and *Escherichia coli*. The data analysis using *Chi-square* test.

Result: The respondents are 100 samples, there are 62 families using groundwater (62.0%) and 38 families using refill drinking water as a drinking water sources. The results of bivariate analysis between drinking water sources and drinking water quality is 0.247 (OR 0.458-34.284), knowledge of mother and drinking water quality is 1.000 ($p>0.05$), while hygiene behavior of mother and drinking water quality is 0.594 ($p>0.05$).

Conclusion: None of drinking water sources, knowledge and hygiene behavior of mother influence the quality of drinking water for toddlers.

Keywords*: Hygiene knowledge, Hygiene behavior, Mother, Drinking water, Diarrhea, Toddler*

Introduction

Water is a natural resource that has a very important function in life, both in terms of quality and quantity. Most of human body (60%-80%) consists of water, so if there is a lack of fluids, then a person will become dehydrated or attacked by other diseases[4]. But the problem today is quality of drinking water in big cities in Indonesia still being a concern. The government has regulated the requirements for drinking water quality inside Minister of Health Regulation No. 492/Menkes/PER/IV/2010. It explains that drinking water must be free of inorganic and organic materials. Drinking

Corresponding Author:
Ema Hermawati:
ema_her@ui.ac.id

water quality parameters are directly related to health, i.e.related to microbiology, like *Total Coliform* and *Escherichia coli*[5].

The results of Indonesia Basic Health Research in 2010 showed that the highest percentage of clean water facilities used for domestic use are dug well water (27.9%), drilled wells (24.7%), tap water (14.2%), and deep well/pump (14%). Rationally, 90% of the physical quality of drinking water in Indonesia is included in good category. However, there are still households with poor drinking water quality, characterized by turbid water (6.9%), color (4.0%), flavorful (3.4%), foamy (1.2%) and smelly (2.7%)[6]. Poor water quality can affect health, especially in toddlers. One of them is a risk of suffering from diarrhea. In 2018, West Java Province, specifically in Depok, was recorded as one of the provinces experiencing outbreaks of diarrhea and the Sub-district which has the highest diarrhea cases was Tapos (1,274 cases)[7]. Several studies have shown a significant relationship between poor drinking water quality and the incidence of diarrhea. One study conducted in fifty villages from all villages in Bangladesh that showed a positive relationship between *Escherichia coli* contamination in drinking water with the incidence of diarrhea in toddlers with PR = 1.26 (95% CI 1.00- 160)[8]. Toddlers drinking water quality is influenced by several factors including drinking water sources, knowledge and hygiene behavior of mother of proper drinking water treatment.

Based on an initial survey in Tapos Sub-district, Depok, data were obtained that most of toddler mothers were under the age of 25 years and their final education did not reach senior high school. So based on this background, researchers are interested in finding out whether there is a relationship between water sources, knowledge and hygiene behavior of mother with the quality of drinking water for toddlers in Tapos Sub-district, Depok.

Methods

The research method was used cross sectional. The population consisted of 72,388 households and the samples are 100 mothers who have toddlers who consume drinking water in Tapos Sub-district, Depok, in the period of November to December 2019. Tapos Sub-district has 7 villages, that is Tapos, Leuwinanggung, Sukamaju Baru, Cilangkap, Jatijajar, Sukatani, and Cimpaeun. Sampling in each villages was calculated using the Slovin formula so that 6 samples were obtained in Tapos, 22 samples in Leuwinanggung, 12 samples in Sukamaju Baru, 19 samples in Cilangkap, 12 samples in Jatijajar, 17 samples in Sukatani, and 12 samples in Cimpaeun and were conducted in simple random sampling.

The knowledge of respondent was considered good if it gets a value ≥70 in the questionnaire given. While the hygiene behavior of respondent was considered good if they always boiled water for drinking and kept it in clean and closed containers. The quality of drinking water is known through measurements of *Total Coliform* and *Escherichia coli* in Indonesian University Public Health Laboratory using the Most Probable Number (MPN) method. The exclusion criteria from this research were heads of families who have toddlers who only consume breast milk (do not consume drinking water). The data analysis using *Chi-square* test.

Results

Univariate Analysis

Distribution of Respondents According to The Source of Drinking Water Used

The distribution of respondents who used drinking water sources came from ground water was 62 respondents (62%), while 38 others (38%) used drinking water sources from refilled drinking water. In meeting the eligibility standards for consumption, more than 90% (93%) of drinking water in Tapos Sub-district, Depok, was declared ineligible after undergoing laboratory testing.

Table 1. Distribution of Respondents According to The Source of Drinking Water Used and The Status of Drinking Water in Meeting Eligibility Requirements for Consumption

Drinking Water Resource	Frequency	Percentage (%)	Status of Qualify / Not Qualify				Total	
			Qualify		Not Qualify			
			n	%	n	%	n	%
Ground water	62	62	6	9.7	56	90.3	62	100
Refill Drinking Water	38	38	1	2.6	37	97.4	38	100
Total	100	100						

Distribution of Respondents According to Hygiene Knowledge and Hygiene Behavior

Hygiene knowledge in this research is about the requirements for proper drinking water, also the good and the right way to process and store drinking water, so it will be free from pathogenic bacteria and safe to drink by toddlers. While hygiene behavior was a habit of mother to cook drinking water that will be consumed by toddlers and storing it in a clean and closed containers.

Table 2. Distribution of Respondents According to Hygiene Knowledge and Hygiene Behavior

The Variables	Frequency	Percentage (%)	Total
The Knowledge of Respondents about Hygiene			
Good knowledge	96	96	100
Poor Knowledge	4	4	
Hygiene Behavior of Respondents			
Good Hygiene Behavior	84	84	100
Poor Hygiene Behavior	16	16	

Based on table 2, the distribution of hygiene knowledge most of the respondents was good. Respondents who have good hygiene knowledge were 96 people (96%), while 4 other respondents (4%) have a poor hygiene knowledge. Then the distribution of respondents who have implemented good hygiene behavior was 84 respondents (84%), while 16 other respondents (16%) haven't implemented.

Bivariate Analysis

Cross-tabulation results of the relationship between drinking water sources, hygiene knowledge and hygiene behavior of mother and the quality of drinking water for toddlers are shown in table 4.

Table 4. Cross-tabulation of The Relationship Between Drinking Water Sources, Hygiene Knowledge, and Hygiene Behavior of Mother and Drinking Water Quality For Toddlers in Tapos Sub-district, Depok

The Variables	Drinking Water Quality Based on Measurement of *Total Coliform* and *Escherichia coli*				Total		OR (95% CI)	P Value
	Qualify		Not Qualify					
	n	%	n	%	n	%		
Drinking Water Resource								
Ground Water	6	9.7	56	90.3	62	100	3.964	0.247
Refill Drinking Water	1	2.6	37	97.4	38	100	0.458-34.284	
Hygiene Knowledge of Mother								
Good Hygiene Knowledge	7	7.3	89	92.7	96	100		1
Poor Hygiene Knowledge	0	0	4	100	4	100		
Hygiene Behavior of Mother								
Good Hygiene Behavior	7	8.3	77	91.7	84	100		0.594
Poor Hygiene Behavior	0	0	16	16	16	100		

Table 4 shows the analysis result of the relationship between drinking water sources and the quality of drinking water for toddlers. There was only 6 respondents (9.7%) who used ground water and met the requirements for drinking water quality that was suitable for toddlers. While respondents who used refill drinking water sources and met the requirements was 1 respondent (2.6%). Chi-square test results obtained p value = 0.247 and OR = 3.964, it can be concluded that there is no significant relationship between drinking water sources and drinking water quality for toddlers.

The analysis result of the relationship between maternal hygiene knowledge and drinking water quality for toddlers found that there were 7 respondents (7.3%) who had good hygiene knowledge and qualify for drinking water quality for toddlers. While the respondents who have poor knowledge and had qualify drinking water quality for toddlers are none. Chi-square test results obtained p = 1, it can be concluded that there is no significant relationship between maternal hygiene knowledge and drinking water quality for toddlers.

While the analysis results of the relationship between maternal hygiene behavior and drinking water quality for toddlers found that there were 7 respondents (7.3%) who implemented good hygiene behavior and had qualify drinking water quality for toddlers. While there were no respondents who did not apply good hygiene behavior and did not meet the quality of drinking water for toddlers. Chi-square test results obtained p = 0.594, it can be concluded that there is no significant relationship between maternal hygiene behavior and drinking water quality for toddlers.

Discussion

The source of drinking water doesn't have a significant relationship with the quality of drinking water for toddlers (p = 0.247). The source of drinking water is one of the factors that determine whether or not drinking water is suitable for consumption. Utilization of water for various needs must pay attention to water quality parameters in accordance with predetermined quality standards[9]. Based on regulation of the Minister of Health No. 736 of 2010, drinking water sources can be obtained from bottled water, water that is distributed through pipes for domestic use, and water that is distributed through water tanks. All types of drinking water sources must be qualified, seen from the physical, chemical, microbiological, and radioactive quality[10] Drinking water quality standards in Indonesia are regulated in the Regulation of the Minister of Health No. 492/MENKES/PER/IV/2010[5]. Even so, there is no guarantee that the quality of drinking water from a particular source will be better than other sources due to many other supporting factors, such as community behavior and environmental conditions around the water source[11]. This is in line with the results of research from the Faculty of Public Health, University of Indonesia, which states that drinking water sources do not have a significant relationship with drinking water quality (p = 0.720) with an OR value = 1.541 [95% CI: 0.350-6.790][12].

The availability of clean water sources is an effort to meet basic needs and improve public health status[13]. Environmental health is organized to create a healthy environment, which is a situation that is free from risks that endanger the health and safety of human life(4) Environmental health includes water sanitation, which is the security and determination of water quality for various needs and human life. Thus the water that is used for daily needs in addition to meeting or being sufficient in quantity must also meet the quality that has been determined. The importance of good quality water needs to be provided to meet basic needs in preventing the spread of infectious diseases through water[15].

Based on result of the study, most of respondents (96%) in Tapos Sub-district have good knowledge about the requirements for adequate drinking water, as well as a good and correct way to process and store drinking water, but percentage of the amount of quality drinking water that does not qualified is still many. Based on previous research, explaining that knowledge alone is not enough to form an attitude. Attitude is a reflection of various psychiatric symptoms such as desires, interests, knowledge, emotions, motivation, and willing[11]. In addition, research conducted by Aulia[16] linking community knowledge to well water quality also found that there was no significant relationship between the two. The water quality tested was turbidity (p = 0.181), odor (p = 0.504), taste (p = 0.653), and coliform (p = 0.855).

While the hygiene behavior of respondents towards drinking water, 84% of respondents had implemented

good hygiene behavior, including cooking and storing drinking water in clean and closed containers, but respondents who implemented good hygiene behavior and had good drinking water quality were only 8.3 %, and most of the rest have poor drinking water quality. This is actually quite confusing because good hygiene behavior should be followed by good drinking water quality, but returning to the concept that behavior is influenced by many factors, including factors outside of the respondent that can cause hygiene behavior cannot be carried out optimally[11].

In drinking water that is not treated properly will contain *Escherichia coli* bacteria that can be harmful to the health of toddlers[17]. *Escherichia coli* is a bacterium that can be used as an indicator of sanitation bacteria. Sanitary indicator bacteria are bacteria whose presence in food indicates that water or food has been contaminated by human waste. Indicators of sanitation are generally bacteria that are common and live in the human intestine, so that the presence of these bacteria, shows that in the stages of water or food treatment has been in contact with feces from the human intestine and may contain other dangerous pathogenic bacteria[18]. Humans are infected with Escherichia coli through the oral fecal pathway according to the F (fluid, finger, field, and food) diagram, mainly through consumption of contaminated food and drinking water[10].

Conclusions

Based on the analysis results of research conducted on 100 respondents in Depok City Tapos Sub-district about the relationship of drinking water sources, knowledge and hygiene behavior of mothers to the quality of drinking water for toddlers can be concluded as follows :

a. Most of the people (62%) use drinking water from ground water. While the other 38% uses refill drinking water.

b. Most respondents (96%) already have good hygiene knowledge.

c. Most respondents (84%) have implemented good hygiene behavior to maintain the quality of drinking water for toddlers.

d. There was no significant relationship between drinking water sources, knowledge and hygiene behavior of mothers with toddlers drinking water quality ($p = 0.247$ for drinking water sources, $p = 1{,}000$ for hygiene knowledge of mother, and $p = 0.594$ for hygiene behavior of mother).

Ethics Approval

The study protocol was approved by The Research and Community Engagement Ethical Committee Faculty of Public Health, University of Indonesia (Ket-07/UN2. F10.D11/PPM.00.02/2019).

Conflict of Interest

The authors declare that no conflict of interests, including of specific financial interest, relationships, and/or affiliations relevant to the subject matter or material included in this manuscript.

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