

The Effectiveness of The Handwashing Program with Soap (CTPS) In Preventing E. Coli Contamination on Elementary School Student, West Martapura South Kalimantan

Fauzan Muttaqien¹, Husnul Khatimah², Fakhurrrazy¹, Fidyah Rahmadhany Arganita³, Irfan Maulana⁴, Ida Yuliana⁵

¹Division of Fisiology, Department of Biomedic Faculty of Medicine, Universitas Lambung Mangkurat, Banjarmasin, Indonesia

²Division of Biology, Department of Biomedic, Faculty of Medicine, Universitas Lambung Mangkurat, Banjarmasin, Indonesia

³Department of Pulmonology, Faculty of Medicine, Universitas Lambung Mangkurat, Banjarmasin, Indonesia

⁴Nursing Study Program, Faculty Of Medicine, Universitas Lambung Mangkurat, Banjarmasin, Indonesia

⁵Division of Histology, Department of Biomedic Faculty of Medicine, Universitas Lambung Mangkurat, Banjarmasin, Indonesia

Coresspondence Author: irfanners@gmail.com

Abstract:

Martapura river had been discovered of indicators of microbial contamination of drinking water, namely total coliform and E coli which are harmful to health. CTPS program for elementary schools in West Martapura sub-district has been going for long time to prevent disease. Tihis study aimed to know the difference in the effectiveness of using Martapura river water for CTPS in elementary school children in Martapura Barat District to preventing E. Coli contamination. The research method used the true experiment method with a posttest only control group design research design. The research group named group (P1) CTPS using processed Martapura river water, group with hand washing soap (P2) CTPS using Martapura river water without being processed and group (K) CTPS with PDAM water . The research subjects were 18 elementary student selected by simple random sampling technique. The object study was the observation of the presence of Escherichia coli bacteria which were found from the hand swabs of elementary school children in West Martapura sub-district whose schools had treated water facilities and did not have treated water facilities. Also taking palm swabs for the research subjects, a quality test for PDAM water, Martapura river water and processed river water at the three elementary schools was carried out and examined at the Banjarbaru BBTKL-PPB Laboratory. The results showed that for CTPS water samples from PDAM water sources only counted 1 CFU E coli/100 ml, while CTPS water from the Martapura River and PAMSIMAS the number of E. coli colonies was > 200 CFU/100 ml. For all samples of palm swabs from the elementary school students, all results were negative for E. Coli CFU / cm². The conclusion is that there is no difference in the effectiveness of using Martapura River water, both treated and untreated, in the CTPS program in reducing E.Coli numbers.

Keywords: Handwashing Program With Soap; E. Coli; Elementary Student

Introduction

Escherichia is an indicator of the quality of drinking water because its presence in the water indicates that the water is contaminated with faeces, which may also contain other pathogenic enteric microorganisms. *E. coli* bacteria are also known as sanitation and hygiene indicator bacteria, namely bacteria whose presence in a food product indicates a low level of sanitation applied.^{1,2}

Data from the South Kalimantan Regional Environmental Agency (BLHD) for July 2017, samples of the Martapura River water in the upstream area touched 11,300 E-Coli, while the downstream Martapura River touched 2,900 E-Coli. Other data states that the status of river water quality in South Kalimantan according to the Ministry of Environment is classified as heavily polluted, especially for the Martapura River and Barito River.³

The behavior of washing hands with soap if practiced properly and correctly is the easiest and most effective way to prevent the spread of diseases that are transmitted via faecal-oral such as diarrhea, cholera, ARI, intestinal worms, flu, hepatitis A, and even Covid 19, bird flu and others.⁴ Washing hands with water and soap can more effectively remove dirt and dust mechanically from the skin surface and significantly reduce the number of microorganisms that cause disease. Therefore, washing hands with water and soap can more effectively clean dirt and worm eggs attached to the surface of the skin, nails and fingers on both hands. Soap can remove a lot of bacteria because in soap there are special ingredients that can control bacteria that are on the hands, in this case there are several active ingredients contained in hand washing soap, namely alcohol, emollient, triclocarban, triclosan, triclocarban, and others.^{4,5} Proper hand

washing according to the Regulation of the Minister of Health of the Republic of Indonesia No. 3 of 2014 is Washing Hands with Soap (CTPS) where CTPS is one of the elements of several pillars of health development in Indonesia, namely clean and healthy living behavior.⁶

However, this is a separate problem for the implementation of the CTPS program whose goal is to reduce disease rates, the CTPS program objectives have not been achieved and are not effective due to indications of *E. Coli* contamination in the Martapura river. This requires special attention and needs to be investigated further whether CTPS using treated and untreated Martapura river water will differ in its effectiveness in killing bacteria, especially *E. Coli*. Because of that, it is necessary to conduct a study to see the difference in the effectiveness of using treated and untreated Martapura river water for CTPS in reducing disease rates in children on the banks of the Martapura river.

Method

The research used the true experiment method with a posttest only control group design research design. The research group uses 3 groups, namely: Treatment group (P1): CTPS using PAMSIMAS processed river water; Treatment group (P2): CTPS using Martapura river water; Control group (K): CTPS using PDAM water.

Subjects in the study were 3rd grade elementary school children from SD that had CTPS facilities using Martapura river water treated with PAMSIMAS, SD using Martapura river water and SD using PDAM water selected by simple random sampling technique, sample size was 18 children divided by 6 in each research group. The object of this study was the observation of the presence of

Escherichia coli bacteria found from the hand swabs of 4th grade elementary school children. The research subjects took palm swabs and tested the quality of Martapura river water and processed river water at the Banjarbaru BBTKL-PPB Laboratory. The data collection technique for Escherichia coli comes from pure isolates obtained from the identification of SD palm swabs and water samples that carry out the CTPS program using the method used by the Banjarbaru BBTKL-PPB Laboratory

Results

Research has been carried out on 3 elementary schools in West Martapura sub-district which are fed by tributaries of the Martapura River. Each SD has differences in the provision of water sources for school needs, including the fulfillment of the CTPS

program. SDN Keliling Benteng Tengah has a water source for CTPS from the Martapura River which is channeled through a water pipe to the school, while SDN Keliling Benteng Ulu 2 has a CTPS water source from Martapura River water which is processed in the PAMSIMAS program, and SDN Sungai Rangas Hambuku has a CTPS water source from PDAM Intan Bandarmasih water. The results of microbiological examination of water samples for CTPS for counting E.Coli (Table 1)

From the results of palm swab examination on 18 research subjects which were divided into 3 research groups divided into 6 subjects/groups, namely the group of children who had CTPS with Martapura River water, CTPS with PAMSIMAS water and CTPS with PDAM water, the following data were obtained in table 2.

Table 1 Results of Microbiological Examination on Water Samples at Elementary Schools in Martapura Barat District

Elementary School as Subject Research	Microbiology Examination Parameter E.Coli(CFU /100 ml)
SDN Keliling Benteng Tengah	>200
SDN Keliling Benteng Ulu 2	>200
SDN Sungai Rangas Hambuku	1

Table 2. Palm Swab Results For Study Subjects With Different Water Sources

Elementary School as Subject Research	Microbiology Examination Parameter (CFU/cm ²)
SDN Keliling Benteng Tengah	All negatif
SDN Keliling Benteng Ulu 2	All negatif
SDN Sungai Rangas Hambuku	All negatif

Discussion

Data table 1 shows that the South Kalimantan Regional Environment Agency (BLHD) data in July 2017 are still relevant to the current condition of the Martapura River water, namely the Martapura River water samples in the upstream area touched 11,300

E-Coli, while the downstream Martapura River touched 2,900 E. -Coli. Likewise other data which states the status of river water quality in South Kalimantan according to the Ministry of Environment is classified as heavily polluted, especially for the Martapura River and Barito River in 2018. In addition, the

highest total coliform for the Martapura river is 2400 mg/l and the concentration of E.coli reaches 1600 MPN/ml.⁷ The water quality of the Martapura River is above the quality standard for drinking water, so it is not suitable for drinking water sources and MCK needs. The high rate of E.coli contamination is due to the domestic waste of people who still use floating toilets or latrines in the river.^{8,9} Escherichia is an indicator of the quality of drinking water because its presence in the water indicates that the water is contaminated with faeces, which may also contain other pathogenic enteric microorganisms. E. coli bacteria are also known as sanitation and hygiene indicator bacteria, namely bacteria whose presence in a food product indicates a low level of sanitation applied. Total coliform in food or drink indicates the possibility of the presence of enteropathogenic and/or toxigenic microbes that are harmful to health. Total coliform is a group of bacteria used as an indicator of sewage pollution.¹ E. coli is a bacterium that causes a number of cases of enteric illness in children in several developing countries. Escherichia coli is the main etiologic cause of diarrhea. One study in Kalimantan Selatan showed that E. coli is one of the bacterial isolates also found in hands of housewives who mostly provides food to their children.¹⁰ In some cases it can cause symptoms of haemolytic uraemic syndrome (HUS) which can result in kidney failure. The infection can even cause death.^{11,12}

Based on table 2 it can be assumed that the right handwashing behavior is very effective in preventing E. Coli bacteria from sticking to the hands of research subjects even though the water source used is contaminated with these bacteria. Washing hands with water and soap can more

effectively remove dirt and dust mechanically from the skin surface and significantly reduce the number of microorganisms that cause disease. Therefore, washing hands with water and soap can more effectively clean dirt and worm eggs attached to the surface of the skin, nails and fingers on both hands. Soap can remove a lot of bacteria because in soap there are special ingredients that can control bacteria that are on the hands, in this case there are several active ingredients contained in hand washing soap, namely alcohol, emollient, triclocarban, triclosan, triclocarban, and others.^{13,14,15}

Soap removes dirt or organic matter. The secret to soap's impressive strength is its hybrid structure. Soap is composed of molecules that are modeled like pins, in which each molecule has a hydrophilic head that can combine with water, while the hydrophobic tail cannot combine with water, but can only combine with oils and fats. When these molecules are suspended in water, they will alternately float into solitary units. This molecule can connect with other molecules in the solution and form small bubbles called micelles, the position of the head facing out and the tail tucked inside. The mechanism of soap damage to the bacterial membrane is through the possession of a double-layered micelle-like lipid membrane which has two hydrophobic tail bands sandwiched between two hydrophilic head rings. These membranes are full of important proteins that give bacteria a chance to infect cells and perform vital tasks that keep bacteria alive.^{16,17}

Conclusions

There is no difference in the effectiveness of using Martapura River water, both treated and untreated, in the CTPS program in reducing E.Coli numbers it means CTPS

program very effective to prevent children's hands hygiene from E Coli contaminant

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