

## CORRELATION BETWEEN WASH AND STUNTING IN TODDLERS IN JEMBER REGENCY

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### ABSTRACT

Stunting in the working area of the Jelbuk Public Health Center Jember Regency is high. In addition, the working area of the Jelbuk Public Health Center is also in the second worst position in terms of access to sanitation facilities. This study aims to determine the relationship between water, sanitation, and hygiene (WASH) with stunting in toddlers aged 24-59 months in the working area of Jelbuk Public Health Center. The research was conducted from October 2021 to August 2022 using an observational analytic method with a case-control. The sample is 98 respondents consisting of 49 case samples and 49 control samples. The sampling technique used is simple random sampling. They collected data using interviews, documentation studies, and observation. Data analysis used univariate and bivariate analysis. The results showed that the variables that were related were sources of drinking water ( $p$ -value= 0,012 OR = 3,212 95% CI = 1,361-7,581), latrine access ( $p$ -value= 0,039 OR = 2,604 95% CI = 1,129-6,004), garbage disposal ( $p$ -value= 0,009 OR=7,622 95% CI=1,605-36,186), sewerage ( $p$ -value=0,002 OR=4,111 95% CI=1,735-9,740), and mother's hand washing habits ( $p$ -value= 0,000 OR = 6,923 95% CI = 2,852-16,804), while drinking water treatment is not related ( $p$ -value= 0,068). Garbage disposal is the most risky factor for stunting in toddlers aged 24-59 months in the working area of Jelbuk Public Health Center. The community is expected to be able to further improve the behavior of consuming protected drinking water sources by always cooking from the water they consume so that the potential for contamination can be minimized, carrying out proper waste disposal, and improving the habit of washing mother's hands using soap and running water at the recommended time.

**Keywords:** stunting, water, sanitation, hygiene

### ABSTRAK

Stunting di wilayah kerja Puskesmas Jelbuk Kabupaten Jember tergolong tinggi. Selain itu wilayah kerja Puskesmas Jelbuk juga berada pada posisi kedua terburuk dengan akses terhadap fasilitas sanitasi. Penelitian ini bertujuan untuk mengetahui hubungan *water, sanitation, hygiene* (WASH) dengan stunting pada balita usia 24 – 59 bulan di wilayah kerja Puskesmas Jelbuk. Penelitian ini dilakukan sejak Oktober 2021 hingga Agustus 2022 menggunakan metode analitik observasional dengan desain *case control*. Sampel berjumlah 98 responden yang terdiri dari 49 sampel kasus dan 49 sampel kontrol. Teknik pengambilan sampel menggunakan simple random sampling. Pengumpulan data menggunakan wawancara, studi dokumentasi, dan observasi. Analisis data menggunakan analisis univariat dan bivariat. Hasil penelitian menunjukkan bahwa variabel yang berhubungan antara lain sumber air minum ( $p$ -value=0,012 OR=3,212 95% CI=1,361-7,581), akses jamban ( $p$ -value=0,039 OR=2,604 95% CI=1,129-6,004), pembuangan sampah ( $p$ -value=0,009 OR=7,622 95% CI=1,605-36,186), saluran pembuangan air limbah ( $p$ -value=0,002 OR=4,111 95% CI=1,735-9,740), dan kebiasaan cuci tangan ibu ( $p$ -value=0,000 OR=6,923 95% CI=2,852-16,804), sedangkan pengolahan air minum tidak berhubungan ( $p$ -value=0,068). Pembuangan sampah merupakan faktor yang paling berisiko terjadinya stunting pada balita usia 24-59 bulan di wilayah kerja Puskesmas Jelbuk. Masyarakat diharapkan dapat lebih meningkatkan perilaku mengkonsumsi sumber air minum yang terlindungi dengan cara selalu memasak dari air yang di konsumsi sehingga potensi tercemar bisa diminimalisir, melakukan pembuangan sampah yang tepat serta meningkatkan kebiasaan cuci tangan ibu menggunakan sabun dan air mengalir diwaktu yang dianjurkan.

**Kata Kunci:** stunting, water, sanitasi, hygiene

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## Introduction

Globally in 2020, according to UNICEF / WHO / World Bank Group Globally in 2020 who are members of the Joint Child Malnutrition Estimates (JME) shows that there are 149,2 million children under the age of 5 years experiencing stunting, with more than half of children under 5 years affected. Stunting live in Asia (53%), and two out of five live in Africa (41%).<sup>1</sup> Indonesia is ranked third in the Southeast Asian region as the country with the highest prevalence of stunting 36,4%.<sup>2</sup> Stunting is a condition of failure to grow based on indicators of body length for age (PB/U) or height for age (TB/U) categorized as *stunted* (short) if the *z-score* 3 SD to SD < -2 SD and classified as *severely stunted* (very short) if the *z-score* is < -3 SD.<sup>3</sup>

One of the Sustainable Development Goals (SDGs) targets included in the 2nd sustainable development, namely eliminating the goal and all forms of malnutrition by 2030 and achieving food security.<sup>2</sup> One of the public health program activities in the 2020-2024 National Medium Term Development Plan focus on reducing the prevalence of stunting in toddlers.<sup>4</sup> Based on Riskesdas data, Jember Regency is in the top 10 provinces in East Java with a stunting prevalence in 2018 of 38,3%.<sup>5</sup> In 2021, the majority of stunting under five in Indonesia based on the Indonesian Nutritional Status Survey at the national, provincial, and district/city levels is 24,4%, in East Java Province it is 23,5%, while in Jember Regency it is 23,59%.<sup>6</sup> In addition, Jember Regency is one of the districts that will be the focus of integrated stunting reduction interventions in 2022.<sup>7</sup> Based on data from the Jember District Health Office, the prevalence of stunting in the working area of the Jelbuk Public Health Center in 2019 was 20%, in 2020 it was 29,71%, in 2021 the weighing month in February 2021 was 27,55%.<sup>8</sup> This shows that the prevalence of stunting in the working area of the Jelbuk Public Health Center in 2019, 2020, and 2021 the weighing month of February 2021 is high because it exceeds *cut off* WHO which is  $\geq 20\%$ .<sup>9</sup>

*Water, Sanitation, and Hygiene* (WASH) is one of the factors causing stunting. Globally, 2 billion people do not have basic sanitation facilities such as toilets or latrines. In addition, there are 673 million people who still defecate (BAB) carelessly.<sup>10</sup> Based on TN2K 2017, data in the field shows that 1 in 5 households in Indonesia still defecates in the open, and 1 in 3 homes do not have access to clean drinking water.<sup>11</sup> Jember Regency based on the Health Profile of East Java Province in 2020 is at the bottom 5 out of 38 regencies/cities in East Java Province with family access to proper sanitation facilities (healthy latrines) of 76,18%, other than that only 14,51 % of villages that have implemented Stop Open defecation.<sup>12</sup> Jelbuk Public Health Center based on environmental health profile data 2020 Jember Regency Health Office is in the second worst position with access to proper sanitation facilities, namely healthy latrines by 52,7% and not yet free from *Open Defecation Free* (ODF).<sup>13</sup> The purpose of this study was to determine the

relationship between *water, sanitation, hygiene* (WASH) with stunting in toddlers aged 24-59 months in the working area of the Jelbuk Public Health Center.

## Methods

This research is quantitative, researching terms of an observational analytic method. The design is case-control. This research was conducted from October 2021 to August 2022 in 6 villages in the Jelbuk Public Health Center Jember Regency working area. The sample size of this study in the stunting case group was 49, while the control group was 49 using a simple random sampling technique. Stunting case data and typical toddlers are secondary data obtained from the data from the nutrition division of the Jelbuk Public Health Center. At the same time, for risk factor WASH, we conducted interviews using a questionnaire instrument to ask about factor WASH (drinking water sources, drinking water treatment, access to latrines, garbage disposal, sewerage, and mother's hand washing habits) in the last 1 week. Then, we confirmed WASH activity by making observations. The questionnaire has also been tested for validity and reliability. Respondent characteristics (mother's education, mother's occupation, number of family members, family income) and attributes of toddlers (age, gender, history of exclusive breastfeeding, history of complementary breastfeeding, low birth weight, history of infectious diseases) we describe the frequency. At the same time, we analyze the WASH factor using the chi-square.

Based on the operational definition, a mother's education is categorized as basic education (SD-SMP equal), middle education (SMA-equal), and higher education (Diploma, Bachelor, Master, Specialist, and Doctoral). Mother's occupation is categorized as working and not working. The number of family members is categorized as  $\geq 4$  people (large) and  $< 4$  people (small). Family income is categorized below the UMR Jember Rp. 2,355,662.91 and above the UMR Jember Rp. 2,355,662.91. Toddler ages are categorized as 24-36 months, 37-48 months, and 49-59 months. Gender is categorized as male and female. History of exclusive breastfeeding is categorized as no and yes (breastfeeding is given from 0-6 months of age without any other food or drink). The history of MP-ASI was categorized as inappropriate (given when the baby was  $< 6$  months old or  $> 6$  months old) and right (given when the baby was exactly 6 months old). History of infectious diseases was categorized as non-existent (having no infectious diseases in the last 6 months) and present (having had an infectious disease in the last 6 months). LBW (Low Birth Weight) is categorized as no (birth weight  $\geq 2,500$  grams) and yes (history of birth weight  $< 2,500$  grams).

Drinking water sources is categorized as unprotected (bore wells/pumps with a distance to the nearest dirt/feces/waste collection  $< 10$  meters, dug wells are not protected if there is no cement floor at least 1 meter around the well and the distance to the nearest dirt/feces/waste collection  $< 10$  meters, springs are not protected if they are not protected from used water, used for bathing, washing, or others (there is no spring protection) and the distance to the nearest dirt/feces/waste

collection <10 meters). Sources of drinking water are categorized as protected (bottled drinking water, refilled water, PDAM, drilled wells/pumps (with a distance to the nearest dirt/feces/waste collection  $\geq 10$  meters), dug wells are protected if there is a cement floor of at least 1 meter around the well and the distance to the nearest dirt/feces/waste collection place is  $\geq 10$  meters, the spring is protected if it is protected from used water, used for bathing, washing, or others (there is spring protection) and the distance to the nearest dirt/feces/waste collection is  $\geq 10$  meters). Drinking water treatment is categorized as unprocessed (uncooked, not bleached, not filtered, not disinfected by sunlight, not clumped (coagulant powder) and categorized as processed (cooked, bleached, filtered, disinfected by sunlight, clotting (coagulant powder) and if using bottled water or refilled water, it is included in the treated category. Access to latrines is categorized as not eligible (households do not use defecation facilities that are used alone, do not share/communal with the type of gooseneck, and have a *septic tank*) and is categorized as eligible (households use these facilities defecation used alone, shared/communal with gooseneck type, and there is a *septic tank*.) Garbage disposal is categorized as bad (garbage is not collected where it does not have a closed and watertight trash can, garbage is not routinely disposed of every day, waste is burned/thrown into rivers/roads), categorized as good (garbage is collected where it has a safe place) closed and watertight waste, garbage should not be in the house and must be disposed of every day, made into compost / buried in the ground / transported by officers / disposed to TPS). Sewerage is categorized as bad (open, drained into a hole in the ground/directed to a ditch/river, inundated, becomes a vector nest) and is categorized as good (closed, does not pool, does not become a vector nest). Mother's hand washing habits are categorized as not good (not using running water and not using soap at the recommended times, namely before eating, before processing and serving food, before breastfeeding, before feeding babies/toddlers, after defecating/urinating, after contact with animals) and categorized as good (using running water and using soap at the recommended times before eating, before processing and serving food, before breastfeeding, before feeding infants/toddlers, after defecating/urinating, after contact with animals). This research has passed ethics by the Health Research Ethics Committee Faculty of Public Health University of Jember No. 205/KEPK/FKM-UNEJ/VI/2022.

## Results

**Table 1. Description of the Characteristics of Research Respondents in the working Area of Jelbuk Public Health Center**

Variables	Case		Control	
	n	%	n	%
<b>Mother's Education</b>				
Basic Education	36	73,5	34	69,4
Middle Education	13	26,5	15	30,6
<b>Mother's Occupation</b>				
Working	12	24,5	11	22,4
Not Working	37	75,5	38	77,6
<b>Number of Family Members</b>				
≥ 4 people (Large)	31	63,3	31	63,3
< 4 people (Small)	18	36,7	18	36,7
<b>Family Income</b>				
Below the Jember UMR(Rp 2.355.662,91)	40	81,6	36	73,5
Above the JemberUMR (Rp 2.355.662,91)	9	18,4	13	26,5

Based on table 1. most of the mothers with basic education (73,5%), not working (75,5%), a number of family members  $\geq 4$  people (63,3%), and family income below UMR Jember Regency (81,6%).

**Table 2. Description of the Characteristics of Research Toddlers in the working Area of Jelbuk Public Health Center**

Variables	Case		Control	
	n	%	n	%
<b>Age</b>				
24 – 36 months	16	32,7	21	42,9
37 – 48 months	18	36,7	18	36,7
49 – 59 months	15	30,6	10	20,4
<b>Gender</b>				
Male	25	51,0	27	55,1
Female	24	49,0	22	44,9
<b>History of Exclusive Breastfeeding</b>				
No	12	24,5	8	16,3
Yes	37	75,5	41	83,7
<b>MP-ASI History</b>				
Incorrect	27	55,1	15	30,6
Exactly	22	44,9	34	69,4
<b>Low Birth Weight (LBW)</b>				
Yes	10	20,4	7	14,3
No	39	79,6	42	85,7
<b>History of Infectious Disease</b>				
Yes	45	91,8	42	85,7
No	4	8,2	7	14,3

Based on table 2, more were at the age of toddlers 37 – 48 months (36,7%) and male gender (51,0%). Most with a history of exclusive breastfeeding (75,5%), and a history of MP-ASI

(55,1%). For LBW the majority did not experience LBW (79,6%), and the majority had a history of infectious diseases (91,8%).

**Table 3. Relationship of Factors Water, Sanitation, Hygiene (WASH) with Stunting in Toddlers Aged 24–59 Months in the working Area of Jelbuk Public Health Center**

Variables	Case		Control		p-value	OR
	n	%	n	%		
<b>Water</b>						
<b>Drinking Water Source</b>						
Unprotected	25	51,0	12	24,5	0,012	3,212 (1,361-7,581)
Protected	24	49,0	37	75,5		
<b>Drinking Water Treatment</b>						
Unprocessed	13	26,5	5	10,2	0,068	3,178 (1,035-9,754)
Processed	36	73,5	44	89,8		
<b>Sanitation</b>						
<b>Access to Latrines</b>						
Not Eligible	35	71,4	24	49,0	0,039	2,604 (1,129-6,004)
Eligible	14	28,6	25	51,0		
<b>Garbage Disposal</b>						
Bad	47	95,9	37	75,5	0,009	7,622 (1,605-36,186)
Good	2	4,1	12	24,5		
<b>Sewerage</b>						
Bad	37	75,5	21	42,9	0,002	4,111 (1,735-9,740)
Good	12	24,5	28	57,1		
<b>Hygiene</b>						
<b>Mother's Hand-washing Habit</b>						
Not Good	36	73,5	14	28,6	0,000	6,923 (2,852-16,804)
Good	13	26,5	35	71,4		

Based on table 3. the source of drinking water is associated with stunting ( $p\text{-value}<0,05$ ), while drinking water treatment is not associated with stunting. Access to latrines, garbage disposal, and sewerage is associated with stunting ( $p\text{-value}<0,05$ ). The habit of washing mother's ser's hands is associated with stunting ( $p\text{-value}<0,05$ ).

## Discussion

Based on the results of the study showed stunting in toddlers aged 24-59 months in the working area of Jelbuk Public Health Center. Most of the respondents were mothers with primary education, did not work, the number of family members was in a large category, namely 4 people, and the majority of family incomes were below the minimum wage Jember Regency. A mother's education level can affect her health status. This is related to the role of mothers, who mostly play a role in the formation of children's eating habits because mothers prepare food by starting to arrange menus, shopping, cooking, preparing food, and distributing food.<sup>14</sup> The level of a mother's education in addition to being able to influence the behavior of mothers in managing the household, especially diet, also understands and receives nutrition information.<sup>15</sup> In addition, mothers who do not work have more time to care for their children, but if the parenting pattern provided is not good, such as a lack of attention to diet, there will be nutritional problems.<sup>16</sup> Likewise, a large number of

families members will be followed by the many needs that must be met in the family. Family income greatly determines the family's ability to meet nutritional needs, which is one of the crucial factors in determining the quality and quantity of family food.<sup>15</sup>

Based on the results of the study showed, stunting in toddlers aged 24-59 months in the working area of the Jelbuk Public Health Center was found to be mainly in the 37-48 month age group and more in the male gender. In addition, the majority of stunting toddlers have a history of exclusive breastfeeding. However, although the majority of stunting toddlers have a history of exclusive breastfeeding, there are 12 (24,5%) children under five in the case group with no history of exclusive breastfeeding. One way to prevent stunting is to provide exclusive breastfeeding. Exclusive breastfeeding is the easiest way to meet the nutritional needs of babies. Where exclusive breastfeeding is proven to offer benefits in helping children get adequate nutritional intake so that the risk of stunting in children can be minimized.<sup>17</sup> In this study, 15 stunting toddlers, were given exclusive breastfeeding beyond the time soMP-ASI was not appropriate (late). Giving MP-ASI too early and too late becomes inappropriate. Giving MP-ASI too early, when the baby's age is less than 6 months can cause diarrhoea or difficulty defecating (BAB) because the digestive tract is disturbed. At the age before 6 months, the baby's digestive tract function is not ready or not able to process food.<sup>18</sup> For this reason, it is better to start giving MP-ASI at 6 months to wait for the readiness of the digestive system and other organs, such as the liver and kidneys, and the willingness of the baby's nervous and motor systems. Giving MP-ASI too slowly will increase the risk of lack of energy, impaired growth and development, and slow adaptation to food.<sup>18</sup> In this study. However, most of the stunting toddlers did not experience LBW. In the case group, there were 10 (20,4%) toddlers who participated in LBW. Babies with low birth weight find it difficult to pursue optimal growth during the first two years of life.<sup>19</sup> Infectious diseases are things that are prone to occur and are often experienced in toddlers. Toddlers are an age group that is vulnerable to nutrition and disease prone.<sup>20</sup> Infectious diseases and stunting have a relationship where infectious diseases can affect the nutritional intake of toddlers; if the nutritional information of toddlers decreases, it can cause stunting events.<sup>21</sup>

The results showed a significant relationship between drinking water sources and stunting in toddlers aged 24 – 59 months in the working area of Jelbuk Public Health Center, where families with unprotected drinking water sources had 3,2 times risk of stunting compared to families with drinking water sources protected. The results of this study are in line with the results of previous studies, which showed that there was a significant relationship between drinking water sources and stunting in toddlers.<sup>22,23,24,25</sup>

Water is one of the essential factors in meeting the vital needs of living things, including as a source of drinking water or other household needs.<sup>22</sup> In the 6th goal of the Sustainable Development Goals (SDGs), namely clean water and proper sanitation, one of the targets in 2030 is

to achieve universal and equitable access to safe and affordable drinking water for all. The water used is non-toxic and must be germ-free. Improper or polluted water can be at risk of causing various diseases, so every family needs to have a source of clean water so that family health is maintained and toddlers can grow and develop optimally.<sup>24</sup>

Poor WASH conditions can lead to the potential for infectious diseases that can interfere with the absorption of nutrients in the digestive process, such as diarrhoea, worms, or environmental enteropathy. These infections and conditions can directly affect nutritional status in a variety of ways, including loss of appetite, impaired nutrition or malabsorption, chronic immune activation, and other responses to infection that can impair the absorption of nutrients and energy.<sup>21</sup> Source of drinking water is one of the important and associated with infectious diseases such as diarrhoea. Some of the infectious germs that cause diarrhoea are transmitted through the faecal-oral route so that germs can enter the mouth, fluids, or contaminated objects.<sup>26</sup> In this study, it was shown that in the case group, more than half of them had unprotected drinking water sources. Sources of clean and protected drinking water are important factors for body health and reduce the risk of various diseases because toddlers are subjects who are susceptible to natural infectious diseases because toddlers immunity is low.<sup>25</sup>

Treatment of drinking water in households is carried out to obtain water with drinking water quality. Based on the study results, there is no significant relationship between drinking water treatment and stunting in toddlers aged 24-59 in the working area of Jelbuk Public Health Center. The results of this study are in line with the previous research, which is that there is no relationship between drinking water treatment and stunting. This study shows that the majority of the case group and the control group treated their drinking water, namely by cooking and using bottled water/refill water.<sup>23</sup> Based on the results of this study, there is no relationship between drinking water treatment and stunting in toddlers aged 24-59 months in the Jelbuk Public Health Center Working Area this can be caused by other factors that are more dominant considering stunting in toddlers is multifactorial, besides that the majority of respondents treat their water well so that it is categorized as processed according to the 2014 Indonesian Ministry of Health standards.

According to Depkes RI (2008), domestic drinking water treatment, one of that is boiling, boiling has been efficient in killing microorganisms so that it does not cause infectious diseases, namely diarrhea. Water that is not managed with household drinking water management standards can cause illness.<sup>27</sup> The results of this study are not in line with other research. It shows that there is a relationship between drinking water treatment and stunting in toddlers, where as many as 18 (45%) toddlers are stunting with poor drinking water treatment.<sup>28</sup>

Healthy latrines are effective in breaking the chain of disease transmission.<sup>29</sup> The results showed that there was a significant relationship between access to latrines and stunting in toddlers aged 24-59 in the working area of Jelbuk Public Health Center where families with inadequate



latrine access had 2,6 times risk of stunting compared to families with the access to latrines not feasible. The results of this study are in line with the results of previous studies, which showed that there was a significant relationship between access to restrooms and stunting in toddlers.<sup>30,31</sup>

However, conditions in the field found that most cases had inadequate latrine access (71,4%) where the majority still defecated in the river (*Open Defecation Free*). Open defecation behavior can lead to the emergence of environmental enteropathy, which is the leading cause of child malnutrition in the form of subclinical conditions of the small intestine. Environmental enteropathy causes damage to the protuberances or villi of the large intestine so that it is difficult to absorb nutrients which is then prone to chronic diarrhea so that it can cause a lack of nutritional intake. This is what causes malnutrition for a long time, namely stunting.<sup>32</sup> Stop open defecation by defecating in healthy latrines where the condition of sanitation facilities that meet health standards and requirements does not result in the direct spread of hazardous materials for humans as a result of the disposal of human waste and waste. Can prevent carrier vectors from spreading disease to users and the surrounding environment.<sup>29</sup>

The results showed a significant relationship between garbage disposal and stunting in toddlers aged 24-59 in the working area of Jelbuk Public Health Center, where families with poor garbage disposal had 7,6 times risk of stunting compared to families with suitable garbage disposal. The results of this study are in line with the results of previous studies, which showed that there was a significant relationship between garbage disposal and stunting in toddlers.<sup>25,33,34</sup> Research Mayasari *et al.* (2022) stated that sewers that do not meet the requirements have a 5,207-fold risk of experiencing stunting.<sup>25</sup>

Garbage collection facilities that are not covered can attract fly vectors and are used as breeding grounds. In addition, fly vectors that land from the garbage will carry germs so that they can cause increased disease.<sup>36</sup> According to previous research, by taking into account the requirements for waste disposal facilities, insects or other animals can be prevented from entering the trash can resulting in environmental pollution and the risk of spreading disease. The trash can should be easy to clean so that it is easy for the following waste disposal process.<sup>25</sup> Based on the conditions in the field, it was found that in the case group, there were respondents who did not dispose of waste directly every day but piled it up first before being disposed of. The majority had open trash cans and burned waste.

The results showed that there was a significant relationship between sewerage and stunting in toddlers aged 24-59 in the working area of Jelbuk Public Health Center where families with poor sewerage had 4,1 times the risk of stunting compared to families with good sewerage. The results of this study are in line with the results of previous studies, which showed that there was a significant relationship between sewerage and stunting in toddlers.<sup>33,37,35,38</sup> The results of another study stated that the sewerage risk of 5,207 times stunting.<sup>35</sup>

Based on the facts in the field, it shows that in the case group, there are 75,5% with inadequate sewerage, namely the open category. The results of previous studies indicate that wastewater generated from either the kitchen or bathroom is not disposed of in a proper sewerage system. Still, on average, all houses dispose of it just like that, so wastewater stagnates in the yard. This causes the stagnant wastewater to become a breeding medium for disease-causing microorganisms or a suitable habitat for disease vectors.<sup>38</sup> Wastewater that is stagnant in the sewer can drive the environment around the house to become dirty. Besides that, environmental pollution occurs and can become a breeding ground for disease germs.<sup>34</sup>

The results showed a significant relationship between mother's hand-washing habits and stunting in toddlers aged 24-59 in the working area of Jelbuk Public Health Center where families with poor mother hand-washing habits had 6,923 times risk of stunting compared to families with good mother hand-washing habits. The results of this study are in line with research which shows that children under five who live at home with quality CTPS for mothers who do not meet the requirements have a risk of 4,808 times to experience stunting compared to mothers with quality CTPS who meet the requirements.<sup>39</sup>

Other research shows that there is a significant relationship between hand washing with soap in running water and stunting in toddlers at the Wonomulyo Health Center, Polewali Mandar Regency with an OR value of 2,719.<sup>40</sup> CTPS can affect the quality of maternal hygiene when dealing with children, so that children are susceptible to infectious diseases by unclean hands that are used when caring for children directly, in the end, the child can be at risk of being exposed to germs that stick to the mother and can cause infectious diseases such as diarrhea, which also can make them stunted.<sup>46</sup> The critical times for CTPS are before eating, before processing and serving food before breastfeeding, before feeding babies/toddlers, after defecating/urinating, and after handling animals/poultry. Based on the facts in the field, the mother's hand washing habits in the case group, 73,5% with lousy hand washing habits where there are still mothers who wash their hands without using soap and running water and not at the recommended time. Washing hands with soap with running water can prevent diarrhea, and upper respiratory infections by more than 50% and can reduce the incidence of worms by 50%.<sup>41</sup>

## **Conclusion**

There is a significant relationship between drinking water sources, access to latrines, garbage disposal, sewerage, and mother's hand washing habits with stunting in toddlers aged 24-59 months in the working area of the Jelbuk Public Health Center while drinking water treatment is not associated with stunting. For the community, it is expected to be able to improve further the behavior of consuming protected drinking water sources by always cooking and boiling from the water they drink so that the potential for contamination can be minimized. It is hoped that they can

maintain the cleanliness of the living environment by proper waste disposal, and apply good parenting to toddlers by improving the behavior of clean and healthy living in daily life with the habit of washing mother's hands using soap and running water at the recommended time. For Jelbuk Public Health Center to increase socialization to the community regarding stunting risk factors, especially water, sanitation, and hygiene (WASH) as an effort to prevent and control stunting in the working area of Jelbuk Public Health Center through health workers or trained cadres. Socialization activities for the community can be carried out during the integrated services post activities for toddlers. For further researchers, it is necessary to conduct further research related to stunting risk factors, such as the frequency and duration of a history of infectious diseases suffered by children under five, as well as paying attention to low birth weight in the exclusion criteria.

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### **Conflict of Interest**

There is no conflict of interest for this research.

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