

The Influence of The Environment and Mother's Behaviour Towards Toddlers' Diarrhea in Banjarbaru, South Kalimantan

Nopy Faisal^{1*}, Endang Sriwahyuni², Aminudin Afandhi³

¹Postgraduate Program, Brawijaya University

²Department of Nutrition, Medical Faculty, Brawijaya University

³Department of Plant Disease And Pest, Faculty of Agriculture, Brawijaya University

Abstract

Diarrhea is a disease that causes high fatality in toddlers all over the world. 1.5 million children die each year due to suffering from diarrhea. Diarrhea is still a major health problem in Banjarbaru, it is included in the top 10 diseases in every year. Bad water quality, bad sanitation facility and mother's unhygienic behaviour are the major cause of diarrhea in toddlers. This research aims to analyze the influence of the environment quality and mother's behaviour towards toddlers' diarrhea in Banjarbaru. The research variable consists of the well quality, family latrines, wastewater disposal facility, bacteriological quality of the well water, mother's clean and healthy living behaviours (PHBS or *Perilaku Hidup Bersih dan Sehat*) as well as the incidence of diarrhea in toddlers. It is conducted in Landasan Ulin Public Health Center and North Banjarbaru Public Health Center with total sample of 50 toddlers. The data analysis used is univariate, bivariate and multivariate. The results showed that the mother's PHBS ($p = 0.005$; OR = 13,077) and the bacteriological quality of the well water ($p = 0,041$; OR = 6,966) became the most influential variables of this toddlers' diarrhea. The activities that are required in order to control the diarrheal diseases in Banjarbaru are change the mothers' behaviour in the prevention of toddlers' diarrhea, improve the environment quality with Community Lead Total Sanitation Program (STBM or *Sanitasi Total Berbasis Masyarakat*), making a Local Regulation for wastewater management, an enhancement of officers for prevention and control of diarrhea and awarding donations for low-income citizens.

Key words : diarrhea, mother's behaviour, sanitation, water

INTRODUCTION

Diarrhea is a disease that causes high fatality in toddlers all over the world. One child died in every 30 seconds and it is estimated that 1.5 million children died each year due to suffering from diarrhea [1]. Diarrhea is also stated as the major cause of the toddlers' death in Indonesia. Incidence of diarrhea continued to increase since 2000 as many as 301/1000 population, 375/1000 population in 2003 and reached 420/1000 population in 2006 [2].

Diarrhea is also still a major health problem in Banjarbaru. Diarrhea is always included in the top 10 diseases, even occupying the third cause of the patient's medical treatment in public health care facility as many as 3,025 cases in 2014. From all eight Public Health Center in Banjarbaru, the Landasan Ulin Public Health Center is the highest number of events with diarrhea and the North Banjarbaru Public Health Center is the lowest during the last 3 years [3].

The diarrhea in toddlers is occurred because of the bad sanitation conditions, bad quality of

the water and the unhygienic behaviour of the mother. All of those caused 88% of the children's death due to diarrhea all over the world [4-6]. By 2014, the population who have access to a decent sanitation in Landasan Ulin Public Health Center site area is only 72.8% (19,508 people), it is still below the Strategic Plan target of the Ministry of Health that is 75%.

A good sanitation facility is the absolute requirement that must be met by each family, which consists of a clean water supply, family latrines, wastewater disposal and landfills facility. Poor sanitation system will facilitate the transmission of diarrhea in toddlers [7, 8].

Clean water must fulfil the physical and chemical requirements as well as the radioactive and bacteriological contents [9]. Clean water can be contaminated if the polluters source is too close and the construction facility that it is unworthy [10-11]. Most of the people use wells water for the purpose of consumption which is as much as 66.87% (131,259 people). But the results of the sample examination showed just as much as 61% of the well that is fulfilled the requirements. The use of the contaminated water could be a medium of the diarrhea transmission in toddlers [12-13].

Mother's behaviour is a very important factor considering to the spread of diarrhea in toddlers.

Nopy Faisal

Email : faisalnopy@gmail.com

Alamat : Postgraduate Program, Brawijaya University
Jl.MT Haryono no.169, Malang

Mother is the person who spend most of the time with toddlers, so that any act will largely determine the condition of them. From ten indicators of PHBS, four of them are the behaviours that the mother should do in order to prevent diarrhea in toddlers such as giving breast milk exclusively, using clean water, using clean toilets as well as hand washing by use clean water and soap [14].

There must be a control towards the increasing incidence of diarrhea so that it would not cause an Epidemic and Extraordinary Events (*Wabah dan Kejadian Luar Biasa*) which will be resulted in the death of the toddlers in Banjarbaru. When bad environment quality is supported with unhealthy mother's behaviour will lead to the diarrhea transmission in toddlers. This research aims to analyze the influence of the environment quality and mother's behaviour towards toddlers' diarrhea in Banjarbaru.

METHODS

This research is a quantitative study with surveys. It is conducted in the area of Landasan Ulin Public Health Center and North Banjarbaru Public Health Center which is chosen based on the highest and lowest rate of diarrhea for the last 3 years. The population of the research were all the toddlers who resides in both Public Health Center areas as many as 1,041 people. The sample of the research is amounted to 50 people and chosen by the method of stratified proportional random sampling.

Free-variables consist of family latrines quality, wells, wastewater disposal facility, bacteriological quality of well water, and mothers' PHBS, where as the dependent variables are the incidence of diarrhea in toddlers. The data of family latrines quality, wells and wastewater disposal facility is obtained from the observation activities while the bacteriological quality of well water is obtained from the sample data, and then the mothers'

PHBS and the diarrhea incidence is obtained from the respondents' research interviews.

The data analysis by using univariate, bivariate and multivariate. Univariate analysis is used to describe each variable, bivariate analysis with *Chi Square* test is used to analyze the relationships between variables, and the multivariate analysis with multiple logistic regression test is used to analyze the most influential variables of the diarrhea incidence in toddlers in Banjarbaru. The software used in this data analysis is *SPSS software* with a confidence level of 95%. The variables entered into the multiple logistic regression model are the variables with a value of $p \leq 0.20$ on *Chi Square* test results.

RESULTS AND DISCUSSION

The results of Chi Square test and Multiple Logistic Regression test on each variable research can be seen in Table 1.

1. The Quality of the Well (*Kualitas Sumur Gali*)

The results of *Chi Square* test show that there is a relationship between the well quality and the diarrhea incidence in toddlers. But from the multiple logistic regression test results, the quality of the well showed an insignificant influence towards the diarrhea in toddlers in Banjarbaru. This means that the quality of the well does not affect the incidence of diarrhea directly, it will only determine the bacteriological quality of the water. If the well does not fulfil either the construction or the site aspect requirements, then it can lead to the decrease of the well water quality in Banjarbaru.

This finding is in agreement with another study conducted in Ethiopia which explained that the wells have no direct effect towards the incidence of diarrhea in toddlers [15]. The wells which do not fulfil the quality requirements can degrade the bacteriological quality of the well water[10-11].

Tabel 1. Chi Square Test Results and Multiple Logistic Regression

Variables	Chi Square Test Results	Multiple Logistic Regression Test Results		
		B	Sig	Exp (B)
The quality of the well	0,016	1,447	0,105	4,249
The quality of family latrines	0,021	0,337	0,756	1,359
The quality of wastewater disposal fac.	0,039	-0,645	0,507	0,524
The bacteriological quality of well water	0,004	1,941	0,041	6,966
Mothers' PHBS	0,001	2,571	0,005	13,077
		Hosmer and Lameshow Test		= 0,478
		Nagelkelke R Square		= 52,9%

The most widely used is the well with the high pollution risk levels which are as many as 26 wells (52%), while the well with low pollution risk levels are only 8 wells (16%). The wells with high pollution risk levels are more likely to found in Landasan Ulin Public Health Center site area with a total of 18 wells (60%) whereas the other 9 wells (45%) are found in North Banjarbaru Public Center site area. The results of the well quality observation in Banjarbaru can be seen in Figure 1 and 2 below

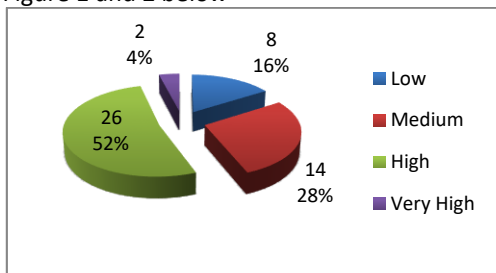


Figure 1. The Quality of the Well in Banjarbaru

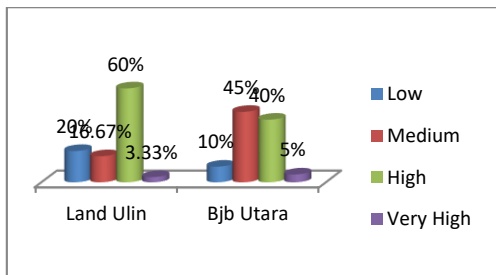


Figure 2. The Difference of the Well Quality based on the Public Health Center

The high number of the well with high pollution risk levels is due to the construction and site aspect requirements that are not fulfilled. The wells of the respondent are not equipped with wall, floor, edges, and the location of the wells are pretty close to the source of the contaminant.

A well must be equipped with a wall as deep as 3 meters, with a floor of 1 meter square and with the edges as high as 80 cm from the surface of the ground. A complete construction is needed to prevent materials contamination that can degrade the bacteriological quality of the well water. The location should be located more than 10 meters away from the source of the contaminant. This is necessary because the bacteria which could contaminate the water is able to traverse a distance as far as 10 meters below ground level [16].

Well is a clean water facility that is most widely used for the drinking water needs in Indonesia [17], the quality of the well water should always be guarded so it will not cause an adverse impact of its users. The people which is use the well water for the purposes of consumption in Banjarbaru is as much as 66.87% (140,123 people), while the rest use refill drinking water and Water Supply Company (*Perusahaan Daerah Air Minum*).

The activities that are necessary in order to improve the quality of the well in Banjarbaru are by increasing the public knowledge about the importance of a proper well, conducting a mapping activities to determine the priority areas so that the intervention can be done directly and perfectly on target, as well as providing a development assistance of a proper well for the low income communities.

2. The Quality of Family Latrines (*Kualitas Jamban Keluarga*)

The results of *Chi Square* test show that there is a relationship between the quality of family latrines with the incidence of diarrhea in toddlers. However, the result of the multiple logistic regression test indicates that the quality of family latrines does not have a significant influence towards the diarrhea in toddlers. This means that the quality of family latrines is not able to influence the incidence of diarrhea directly, there are still other more dominant variables which affected this disease in Banjarbaru.

Other researches also explained that the quality of the family latrines has no direct influence towards the incidence of diarrhea in toddlers [18-19], but bad family latrines can cause a declining in water quality. It will be happened if the distance of the septic tank with the well is less than 10 meters.

Family latrines is one of the component that must be available at each home. The people who is defecating at any place can be infected by diarrhea 66% higher than those who do on the home toilets [6]. A healthy latrine is the latrine which does not contaminate the quality of water and soil, insects free, no odor and easy to clean, equipped with a proper wall and door, and poses no risk of accident for its users.

The observations showed that there are 23 (46%) family latrines with high pollution risk levels while the low pollution risk levels

just as much as 17 latrines (34%). Family latrines with high pollution risk levels are more likely to found in Landasan Ulin Public Health Center area with a total of 16 latrines (53.33%) while the family latrines with low pollution risk levels are found in North Banjarbaru Public Health Center site area as many as 8 latrines (40%) (See Figure 3 and 4).

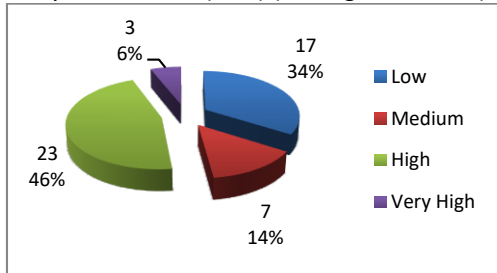


Figure 3. The Quality of Family Latrines in Banjarbaru

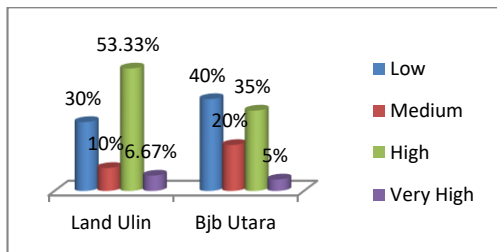


Figure 4. The Difference of the Family Latrines Quality based on the Public Health Center

There are still many family latrines which do not fulfil the requirements because of the dirty looks, no availability of hand soap, no sufficient amounts of water, no permanent construction of septic tanks and the location that is close with the clean water source.

The existence of ineligible latrines is because of the community low income level, there are 22 respondents (44%) with the earnings less than one million rupiahs every month. The problem also occurs because of the public lack of knowledge. The fact is that the land is broad enough to build a septic tank that is more than 10 meters with the clean water source but the community builds the septic tank near that source due to the public lack of knowledge.

Some of the things that need to be implemented are by increasing the knowledge about the importance of proper and qualified latrines, optimizing the Community Lead Total Sanitation (*Sanitasi Total Berbasis Masyarakat* (STBM)) program to change the public consciousness and

behaviour on using the toilet as well as involving private parties to provide such proper latrines in Banjarbaru. This can be done by channeling the funds of Corporate Social Responsibility (CSR) or granting credit loans to the people in need.

3. The Quality of Wastewater Disposal Facility (*Kualitas Sarana Pembuangan Air Limbah* (SPAL))

The most used SPAL is the SPAL with high pollution risk levels, i.e. as many as 22 SPAL (44%) where as the SPAL with low pollution risk levels are just 10 SPAL (20%). 15 SPAL (50%) with high pollution risk levels are found in Landasan Ulin Public Health Center site area while 8 SPAL (40%) with medium pollution risk levels are found in the area of North Banjarbaru Public Health Center. Here are the results of the SPAL quality observation in Banjarbaru.

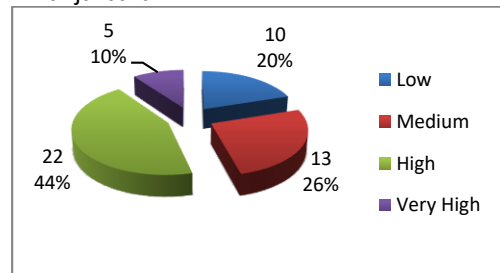


Figure 5. The Quality of SPAL in Banjarbaru

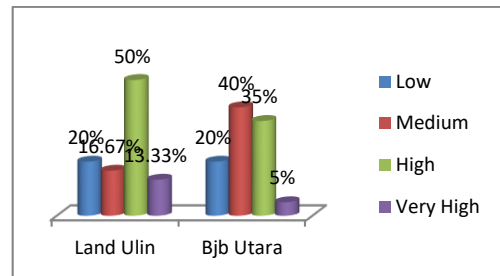


Figure 6. The Difference of the SPAL Quality Based on the Public Health Center

The high number of SPAL with high pollution risk levels is due to the open discharge channels which are not water proof, no water infiltration, no smooth water flow which will cause a puddle around the house, odor smells, and well water contamination because of the distance is less than 10 meters.

The results of Chi Square test show that there is a quality relationship between the occurrence of diarrhea in toddlers and SPAL. However, multiple logistic regression test

indicates that the SPAL quality has no significant effects towards the incidence of diarrhea in toddlers in Banjarbaru.

This means that there are other factors which are more dominant on affecting the incidence of diarrhea in toddlers in Banjarbaru. SPAL quality has no direct effect towards the incidence of diarrhea, but the ineligible SPAL will cause the decline of the well water bacteriological quality in Banjarbaru. The other research results also pointed that an unqualified SPAL and the location that is close to the well are the cause of well water quality declining in Tuban.

Wastewater could be harmful if the disposal facility is not being managed properly. The wastewater in urban area is derived from the activities of households, industries, offices, trading activities and other public places. The increasing number of the construction development and population is proportional to the increasing number of wastewater pollution in urban area [20].

Wastewater management can be done *on site* or *off site*. The families who have a sufficient wide land can manage their waste on site, i.e. by funneling the waste through a closed funnel into the water infiltration. While the offsite management can be used as solutions for the wastewater management in a dirty and densely populated location, by build a wastewater management installation (*Instalasi Pengolahan Air Limbah (IPAL)*) in Banjarbaru.

Wastewater management in private sector also yet to be implemented properly. This is because there is no Regional Regulations which set the terms of wastewater management addressed for private parties in Banjarbaru. Whereas the development activity in Banjarbaru nowadays is keep on growing, both from the real estate and industry development, and trading activities. This is in line with the plan that the Capital of South Kalimantan Province will be transferred to Banjarbaru. It is expected with the presence of Local Regulations, the wastewater management activities from private sector can be handled properly.

4. The Bacteriological Quality of Well Water

Most of the well water quality in Banjarbaru do not meet the requirements of a qualified well water. There are 50 samples which are examined, but only 19 of the

samples (38%) are eligible. In Landasan Ulin Public Health Center site area, there are 21 samples that showed the ineligible water (70%) while in the area of North Banjarbaru Public Health Center there are only 10 samples (50%) (See Figure 7 and 8)

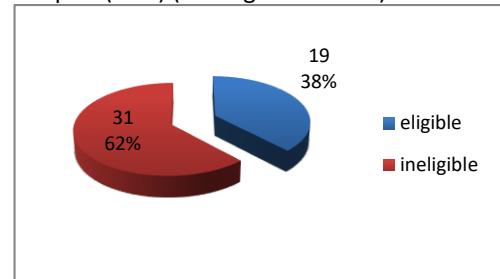


Figure 7. The Bacteriological Quality of Well Water in Banjarbaru

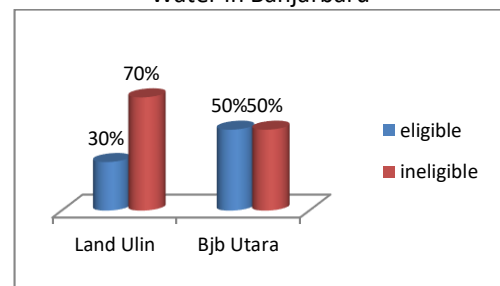


Figure 8. The Difference of the Bacteriological Quality of Well Water based on the Public Health Center

The large number of well water that did not qualified indicates that there has been a contamination in Banjarbaru. The highest total coliform number found is 1600/100 ml. That number is far exceeded the standard according to the Decree of Ministry of Health No. 416 of 1990 about the term and control of water quality, the total coliform number that is still allowed is only 50/100 ml.

The water quality in the area of Landasan Ulin Public Health Center looks yellowish, odor and a little greasy. It can be occurred due to the geographical conditions of the territory that is lowland and swamp, thus will cause any puddles at the time of rainy season. While the geographical condition in the area of North Banjarbaru Public Health Center is highlands and rare to be flooded, so the water quality is physically could meet the requirements.

The results of Chi Square test show that there is a relationship between the bacteriological quality of well water with diarrhea in toddlers. Furthermore, the results of multiple logistic regression test showed

that the bacteriological quality of well water has a significant direct effect in the toddlers' diarrhea in Banjarbaru. This means that the ineligible well water is the cause of the diarrhea in toddlers in Banjarbaru. Toddlers who use the well water that is not qualified may be affected by diarrhea 6.96 times higher compared with those who use a qualified well water.

This finding is in agreement with another study that explains the family using ineligible well water can suffered diarrhea more often compared to the use of water wells qualify [21,22]. Process of transmission of diarrhea occur when is ineligible well water use for washing bottles that will be given to infants [23,24]

Water pollution occurs due to the bad condition of the wells, i.e. as many as 26 wells (52%). The wells which is not equipped with walls, floors and edges will cause a higher well water contamination. The contamination is also occurred because of the large number of the unworthy sanitation. The qualified family latrines are only amounted to 24 latrines (48%) while the qualified SPAL are only 22 (44%). The no watertight septic tank and SPAL as well as the location that is near with the well will cause the water contamination.

A supply of a qualified water must be optimized in order to reduce the incidence of diarrhea in toddlers in Banjarbaru. The activities that need to be implemented are by increasing the knowledge of the society about the importance of a proper water supply consumption, conducting a monitoring activities to see the conditions of the water quality in every year, and repairing the sanitation facilities.

The community must understand the good water management. The water that is not eligible should be managed before it is consumed. The activities of rarefactions, filtering, giving substance disinfectant, and water boiling are proved to be effectively reduce the risk of diarrhea in toddlers [25]. The water storage must be keep in a closed place. A research in Botswana shows that diarrhea occur more frequently in children from a family that store the water in an open place [26].

5. Mother's PHBS

Bad PHBS mother are amounted to 29 people (58%) while the good PHBS mother only 21 people (42%). The bad PHBS mother are more likely to found in the area of Landasan Ulin Public Health Center which are 21 people (70%), while in North Banjarbaru Public Health center site are there are the good PHBS mother as many as 12 people (60%).

The results of Chi Square test show that there is a relationship between the mother's PHBS with the diarrhea in toddlers. The results of the multiple logistic regression test indicate that mother's PHBS becomes the most dominant factor that influence the incidence of diarrhea in toddlers in Banjarbaru. Bad PHBS mothers put their toddlers in a risk of diarrhea 13 times greater than the toddlers of a good PHBS mother.

A mother is the person who provides food and drinks and spends most of the time with the children, every action will largely determine the health condition of the toddlers. PHBS indicators which still abandoned by many mother is not giving an exclusive breast milk for their children (42%), using a well water near the source of the polluters (74%), storing the water in an open place (70%) and washing their hands only with water without soap (62%).

Exclusive breast feeding is very important to prevent diarrhea in toddlers. Toddler that is not given an exclusive breast milk during the first 6 months of birth are at a risk of suffering diarrhea 30 times greater. The use of well water near the source polluters will cause diarrhea in toddlers. This happens if the contaminated water is used for the purpose of consumption, utensils washing, cooking, and milk bottles washing for toddlers.

The behaviour of the water storage in an open place can also cause diarrhea. Another research result indicates that the behaviour of mother to pick up the water with unhygienic tools and store it in an open place resulting in the high transmission of diarrhea in toddlers in Mali [27]. The behaviour of hand washing with clean water and soap should also be conditioned, some research shows that washing hands with clean water and soap is effective to prevent diarrhea. Clean hands can stop the spread of germs that cause diarrhea [28-29].

The high number of bad PHBS mother can be caused by the low levels of education. Most respondents are only educated up to Senior High School (*Sekolah Menengah Atas*), as many as 24 people (48%). An educative activity is need to be implemented so that the mothers could understand and realize the proper behaviour that needs to be done in order to prevent diarrhea in toddlers. Also, STBM program must be optimized in order to accomplished the concept of better mother behavior.

The strategy to change the behaviour should be based on the identification of three factors, namely predisposing factors, enabling factors, and reinforcing factors [30].

Predisposing factors are the level of knowledge, attitudes, believe, education and so on. The intervention that is required is by providing the guidance in order to improve the knowledge of the mother.

Enabling factors include the availability of facilities and infrastructure which allow people for behave healthily. For example, the availability of qualified well and clean water which will enabled them to use clean water. The efforts that needs to be deal with problems like this is to provide such facilities and infrastructure, either by community empowerment or by granting the aid funds directly.

Reinforcing factors include the role of the community leaders, religious figures, as well as the health officers which will emulated the mothers' behavior, it can also be derived from the existence of binding rules. To behave healthily, sometimes is just not enough to simply give the knowledge and facilities only, it also needs to give such a rule so that it requires people to have a clean and healthy live.

6. The Incidence of Diarrhea In Toddlers

The toddlers who suffered from diarrhea are amounted to 22 people (44%) whereas those who does not suffer from diarrhea are 28 people (56%). 17 toddlers are suffered from diarrhea in Landasan Ulin Public Health Center site area (56,67%) whereas in North Banjarbaru Public Health Center site area are more likely to found the toddler who doesn't suffer from diarrhea as many as 15 people (75%).

The number of diarrhea cases increases since August 2015 until January 2016 and

decreases in this February 2016. The number of cases of diarrhea in Landasan Ulin Public Health Center area in 2015 is as much as 591 cases whereas in the area of North Banjarbaru Public Health Center there are 459 cases.

The cause of diarrhea in toddlers in Banjarbaru is the bad PHBS mother and the bacteriological quality of well water which is not eligible. Multiple logistic regression test results indicate the influence of both variables together that is 52,9%. It means that there are still 48.1% influence of other variables besides the variables examined.

The amount of the partial influence can be seen from the value Exponent (B). The variable with the value of mother PHBS Exponent (B) is 13.077, means that the risk of diarrhea in toddlers with bad PHBS mothersis 13 times greater than the toddlers with a good PHBS mothers. While the variable of the bacteriological quality of well water is (B) = 6.966, means that toddlers who use an ineligible well water are 7 times greaterat risk of diarrhea than the toddlers who use eligible water. Some of the results from other studies also shown that mother's behavior is a major factor of its influence on the incidence of diarrhea in toddlers [18.23].

Other risk factors that can cause diarrhea in toddlers are the conditions of the body's durability, nutritional status and immunization history. A research in Manado showed that nutritional status and immunization history have an impact on the incidence of diarrhea in toddlers in Manado [31]. While a study in India showed that a low nutrient status will cause a more severe diarrhea in a person [32-33]. The results of other studies have also shown that nutritional status effected the toddlers' diarrhea in Iraq [34].

The age factors, family socio-economic conditions and the existence of a companion disease can also cause a diarrhea in toddlers. It is described in a research which was conducted in Brazil, diarrhea can occur in younger children, low family socioeconomic status, low nutritional status, the presence of other diarrhea children as well as the presence of an acute respiratory infections [35]. Other studies also explain that the diarrhea in toddlers could be occurred because of low nutritional status, low family income which is less than 1.5 million per

month and low breast feeding which is only for 4 months [36].

A health problem is a problem that is multifactorial, a lot of factors play a role in the process of the disease occurrence. Generally, it consists of environmental factors, behavioral factors, genetic factors, and health service factors. Therefore, the handling of the health problem should be done on an integrated and comprehensive way which could cover all the aspects.

In order to control diarrhea in Banjarbaru, several activities need to be done in order to improve the mother's behavior so that it could implement PHBS as well as to improve the quality of the well water. Some research results explain that a strategy that is proven to be effective in controlling diarrhea in toddlers is to apply the concept of maternal behavior, clean water provision, improved sanitation facility, and educative activity to increase mother's knowledge and awareness [27,37].

One attempt that could be done in order to achieve a better behavior of the community is by implementing STBM Program. The healthiness and sickness of a person is because of its habit or behavior; unhealthy behavior will support the occurrence of diarrheal disease. In addition to the efforts of Banjarbaru Government, it is expected that the other parties such as the academia, private sectors, and the community can participate well so that the control of diarrhea in Banjarbaru could be done properly. Mother's behavior that should be done in order to prevent diarrhea in toddlers are providing breast milk exclusively, using clean water, using hygienic toilets, and washing hands with clean water and soap.

CONCLUSION

Diarrhea in Banjarbaru is caused by the bad PHBS mother and the bacteriological quality of well water that does not meet the requirements. The declining quality of well water is caused by the large number of poor sanitation facilities. The number of the well that is ineligible is as much as 56%, and the family latrine that is not qualified is as much as 52% while the wastewater disposal that did not meet the requirement is amounted to 54%.

RECOMMENDATIONS

This research recommends the need of ; socialization for mothers of infants in order to carry out PHBS, improve the environment quality with STBM Program, a development of Wastewater Cultivation's Installation, making a Local Regulation for wastewater management, an enhancement of officers for prevention and control of diarrhea, and awarding donations for low-income citizens through the funds Corporate Social Responsibility (CSR) and credit loans for sanitation constructions.

ACKNOWLEDGMENTS

The authors would say the deepest thank you and gratitude to Dr. dr. Endang Sriwahyuni, MS and Dr. Ir. Aminudin Afandhi, MS who has provided a guidance in writing this article. Another thank you is also said for the parties in Banjarbaru and those who have participated in this research activity.

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