INTERNASIONAL CONFERENCE ON
MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE
VOLUME 1 TAHUN 2023, ISSN 3032-4408 (Online)
https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs

Increasing the Risk of Pollution Decreasing the Bacteriological Quality of the Well Water of the Population of Denpasar City

I Ketut Aryana[1], I Wayan Sudiadnyana[1*]

[1] Poltekkes Kemenkes Denpasar, Indonesia
[*]Corresponding author: sudiadnyana67@gmail.com

Article history
Posted : 2023-11-09
Reviewed : 2023-11-09
Received : 2023-10-09

ABSTRACT

Background: The need for drinking water is increasing along with the increase in the population of Denpasar City. Population pressure on land causes wells to become increasingly polluted, which has an impact on reducing the quality of raw water sources. The aim of the research is to analyze the level of pollution risk in reducing the bacteriological quality of well water. **Method:** Analytical research, with a cross-sectional design. The research sample was determined using a sampling quota of 60 wells. A survey was carried out to determine the level of risk of well pollution using an inspection form and water samples were taken for laboratory testing of key MP Coliform/E.coli parameters. **Result:** The results of the study showed wells with a low pollution risk level: 18 (30.0%), medium: 18 (30.0%) and high: 24 (40.0%). Bacteriological quality of well water that meets the requirements: 16 (26.7%) and not eligible: 44 (73.3%). There were 11 types of well pollution risks identified, the dominant of which was not meeting construction requirements. **Conclusion:** There is a significant relationship between the level of pollution risk and the bacteriological quality of well water, the higher the level of pollution, the lower the bacteriological quality of well water. Residents of Denpasar City are expected to continue making efforts to control risk factors for well pollution, so that the bacteriological quality of well water can be improved.

Keywords: Pollutant Risk, Water Quality, Wells.

INTRODUCTION

The main problem in utilizing water resources is that the quantity of demand continues to increase and in terms of quality conditions tend to decline. Decreased water quality can cause disruption, damage and danger to all living things that depend on water resources. Therefore, careful management and protection of water resources is needed (Effendi, 2003).

Humans use water for various purposes, such as household needs, agriculture, fisheries, industry, energy sources, transportation facilities and recreation areas. Each person's water needs are determined by the level of progress of human civilization (Jay, HL. GE.Tylor, AW.Pettyjohn, 1980). Primitive tribes require less water than developing and developed countries. In Indonesia, the household needs of residents in rural areas require 40-50 lt/day/person of water, while those in urban areas require more water, namely 80-100 lt/day/person. In the future, various development and progress activities in the world will require more and more water. Population growth, industrial development, food needs, freshwater fisheries and aquaculture businesses, as well as technological progress and development, all require water resources (Sutrisno, 2002).

Water pollution occurs due to the entry of pollutants which can be in the form of gas, dissolved materials and particulates. Pollution enters water bodies in various ways, for example through the atmosphere, soil, agricultural runoff, domestic and urban waste, industrial waste disposal and others (Sastrawijaya, 2002).

Drilled wells and dug wells are one of the ways people take to meet their clean water needs. The high level of pollutant sources such as domestic and industrial waste causes the quality of drilled well and dug well water to decrease so that it does not comply with drinking water quality requirements (Pitoyo, S., n.d.). Analysis of the water quality of dug wells in the Sanur Denpasar area is classified as moderately polluted (Trisnawulan, 2007) and physical environmental conditions affect the quality of well water (Marwati, 2008). Further studies are needed to determine the relationship between pollution risk and the quality of well water

With the rapid population growth of Denpasar City, many residents still use wells as a source of drinking water. From the results of the preliminary study, it turns out that several residents who use dug or drilled well water still doubt the quality of well water as a source of drinking water, and some are looking for other alternatives using refillable water or mineral water. This condition is also driven by the difficulty of finding a well location that meets the requirements in a narrow house yard and close to the neighbors next door. The aim of this research is to determine the relationship between the level of pollution risk and the bacteriological quality of well water for residents of Denpasar City.

METHOD

Analytical research with cross sectional design. The sample was determined as a quota of 60 wells (Riyanto A, 2011). Measurement of the risk of water source pollution is carried out by observation using a well sanitation inspection form, then the results are grouped according to the level of pollution, namely: low, medium and

high. Water samples are taken for laboratory tests to test the bacteriological quality of water on key parameters, namely MPN coliform and E. Coli .

Determining the relationship between the level of pollution risk and the quality of well water was analyzed using the chi square statistical test with α = 0.053 (Sutrisna, 2002).

RESULTS

A. Pollution Risk Level

Table 1
Denpasar City Population Well Pollution Risk Level

Pollution Risk Level	Total	Percentage (%)
Rendah	18	30,0
Sedang	18	30,0
Tinggi	24	40,0

From table 1, it can be seen that the level of risk of well pollution for residents of Denpasar City varies quite a bit from low level to high level. The risk of high level pollution had the largest proportion in 24 of the 60 wells examined, namely around 40%. In more detail, there are several risk factors for well pollution caused by 11 conditions as shown in table 2.

Table 2
Risk Factors for Well Pollution for Residents of Denpasar City

Faktor Risiko	Total	Presentage (%)
Toilet distance ≤ 10 m	8	13,3
The position of the latrine is higher than the well	19	31,7
There are other sources of pollution distance ≤ 10	24	40,0
Poor well water drainage, distance ≤ 2 m	28	46,7
Damage to the drainage channel creates puddles of water	22	36,7
The wall around the well cracked	24	40,0
Width of concrete floor around the well ≤ 1 m	34	56,7
Well walls 3 m below ground not covered	16	26,7
Cracks in concrete floor around well	23	38,3
The rope and bucket are placed in a position where there is a possibility of being dirty	16	26,7
There is a well protection fence	24	40,0

B. Water quality

Tabel 3
Quality of Residential Wells in Denpasar City

Well Water Quality	Total	Percentage (%)
Meets Requirements	16	26,7
Not Eligible	44	73,3

From table 3, it can be seen that the majority of Denpasar City residents' wells still do not meet health requirements, namely 44 out of 60 samples, around 73.3%

C. Relationship between the level of pollution risk and the bacteriological quality of well water.

Tabel 4
Tabulasi Silang dan Hasil Uji Statistik Chi Kwadrat

Risk/Quality Level	MR	%	NE	%	TOTAL	%	V	ρ
Low	10	55,6	8	44,4	18	100,0		
Medium	3	16,7	15	83,3	18	100,0	11,065	0,004
Heigh	3	12,5	21	87,5	24	100,0		

Notes :
MR : Meets Requirements
NE : Not Eligible

DISCUSSION

The risk of high level well pollution in Denpasar City reaches 40%, predominantly caused by well construction that does not meet the requirements, including the presence of stagnant waste water around the well. There is stagnant waste water around the well if the waste water channel does not meet the requirements, including the slope is too flat, the waste channel is not watertight or not plastered, allowing waste water to re-enter the ground close to the well. Waste water that seeps into the well will become a pollutant. Around the well, it is best to make a waste water channel, it must be watertight, you can use a PVC pipe, or plaster it so that it doesn't allow waste to come back in. If the walls around the well are cracked, waste water can flow back into the well. This can also cause well water pollution due to all activities around the well, such as washing so that washing waste water enters the well. Although it is realized that well construction, especially from the floor aspect, does not have a direct influence on the total content of coli bacteria in well water (Hasnawi, 2012).

Most of the wells of Denpasar City residents still do not meet health requirements, namely 44 out of 60 samples, around 73.33%. The two parameters, namely MPN Coliform and E. Coli, are used as a reference in determining water quality according to health requirements, using the guidelines of the Republic of Indonesia Minister of Health Regulation No. 32 of 2017, concerning Environmental Health Quality Standards and Water Health Requirements for Sanitation Hygiene Purposes requiring E. coli content = 0 and Total coliform = 50 per 100 ml sample (Kemenkes, 2017).

From the results of the chi square analysis test in table 4 where the p value obtained is 0.004 < α (0.05), it can be concluded that there is a significant relationship between the level of pollution risk and the bacteriological quality of well water for residents of Denpasar City. The results of a similar study conducted in Mandailing Natal Regency, North Sumatra showed almost the same results, namely that 34 of the 55 well water samples examined bacteriologically did not meet health requirements, namely around 61.8% (Hayati, NA, Naria, E., Dharma, 2014). This is also in line with research on the quality of dug wells in the South Denpasar Community Health Center I area, the results of which still exceeded the threshold set for the total coliform parameter, not in accordance with class I water quality standards, Bali Governor Regulation No. 8 of 2007 (Marwati, 2008). If well water that does not meet the requirements is used as a source of drinking water, it will have a negative impact on human digestion and can cause several stomach diseases such as: typhus, cholera, dysentery and others, depending on the bacteria found in the feces (Muchlis, M., Thamrin T., 2017). This is in

accordance with the results of research in Semarang City which also concluded that there was a significant relationship between risk factors for pollution of dug wells and bacteriological quality (Rahayu P, Joko T, 2019).

The high risk of pollution in wells will have a negative impact on reducing the quality of well water. A well that is cracked or broken will provide a greater opportunity for contamination to occur. Moreover, if the well location requirements do not meet the requirements of a distance of less than 10 m from a waste well or waste water disposal pit. This condition allows water seepage from fecal wells to flow into wells as a source of drinking water (Trisnawulan, 2007).

CONCLUSION(S)

The level of risk of well pollution is related to the bacteriological quality of well water for residents of Denpasar City. The higher the level of well pollution risk, the bacteriological quality of well water decreases. It was identified that the risk of contamination of Denpasar City residents' wells was predominantly caused by well construction factors that did not meet health requirements.

Conflict of Interest

During the research process up to the preparation of the report, there were no conflicts of interest with any institutions.

Acknowledgment

We would like to express our thanks to the Honorable Director of the Health Polytechnic, Ministry of Health, Denpasar and the Chair of the Environmental Health Department.

References :

Effendi, H. (2003). *Telaah Kualitas Air Bagi Pengelolaan Sumber Daya Air dan Lingkungan*. Kanisius.

Hasnawi, H. (2012). Pengaruh Konstruksi Sumur Terhadap Kandungan Bakteri Eschercia Coli Pada Air Sumur Gali di Desa Dopalak Kecamatan Paleleh Kabupaten Buol'. *Public Health Journal*, *1*(1), 37244.

Hayati, NA, Naria, E., Dharma, S. (2014). *Hubungan Faktor Risiko Pencemaran dan Kualitas Air Sumur Gali secara Mikrobiologis dengan Kejadian Diare di Desa Hutabaringin Kecamatan Kotanopan Kabupaten Mandailing Natal*. http://download.garuda.kemdikbud.go. id/article.php? article =1425586&val=4110&title=HUBUNGAN FAKTOR RISIKO PENCEMARAN DAN KUALITAS AIR SUMUR GALI SECARA MIKROBIOLOGIS DENGAN KEJADIAN DIARE DI DESA HUTABARINGIN KECAMATAN KOTANOPAN KABUPATEN MANDAILING NATAL

Jay, HL. GE.Tylor, AW.Pettyjohn, D. J. (1980). *Domestic Water Treatment*. Book Press.

Kemenkes, R. (2017). *Peraturan Menteri Kesehatan Nomor 32 Tahun 2017 tentang Standar Baku Mutu Kesehatan Lingkungan dan Persyaratan Kesehatan Air Untuk Keperluan Higiene Sanitasi, Kolam Renang, Solus Per Aqua, dan Pemandian Umum*. https://peraturan.bpk.go.id/ Details/ 112092/permenkes-no-32-tahun-2017

Marwati, N. (2008). *Kualitas Air Sumur Gali Ditinjau dari Kondisi Lingkungan Fisik Dan Perilaku Masyarakat Di Wilayah Puskesmas I Denpasar Selatan* (Tesis). Universitas Udayana.

Muchlis, M., Thamrin T., S. S. (2017). Analisis Faktor yang Mempengaruhi Jumlah Bakteri Escherichia coli pada Sumur Gali Penderita Diare di Kelurahan Sidomulyo Barat Kota Pekanbaru. *Dinamika Lingkungan Indonesia*, *4*(1), 18.28. https://doi.org/10.31258/dli.4.1

Pitoyo, S., P. P. (n.d.). *Deteksi Pencemaran Air*

Minum. Aneka Ilmu.

Rahayu P, Joko T, D. H. (2019). Hubungan Faktor Risiko Pencemaran Sumur Gali dengan Kualitas Bakteriologis di Lingkungan Pemukiman RWIV Kelurahan Jabungan Kota Semarang. *JURNAL KESEHATAN MASYARAKAT*, *7*(3), 156–163. http://download.garuda.kemdikbud.go.id/article.php?article=1569640&val=4700&title=HUBUNGAN FAKTOR RISIKO PENCEMARAN SUMUR GALI DENGAN KUALITAS BAKTERIOLOGIS DI LINGKUNGAN PEMUKIMAN RW IV KELURAHAN JABUNGAN KOTA SEMARANG

Sastrawijaya, A. (2002). *Pencemaran Lingkungan*. Rineka Cipta.

Sutrisna, H. (2002). *Statistik* (2nd ed.). Andi.

Sutrisno, T. dan E. S. (2002). *Teknologi Penyedian Air Bersih*. Rineka Cipta.

Trisnawulan, I. (2007). Analisis Kualitas Air Sumur Gali Di Kawasan Pariwisata Sanur. *Jurnal Ilmu Lingkungan*, *1*(2), 57–61.

.