Analisis Risiko Mikrobiologis pada Air Minum Non Perpipaan (Studi Kasus: Kota Bekasi dan Metro) = Microbiological Risk Analysis of Non-Piped Drinking Water (Case Study: Bekasi and Metro City)

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Abstrak

Pelayanan air perpipaan di Indonesia yang masih kurang mendorong masyarakat untuk menggunakan sumber air nonperpipaan seperti air tanah dan air isi ulang. Namun berdasarkan beberapa penelitian, air nonperpipaan diketahui memiliki risiko akibat kontaminasi bakteri dan patogen. Studi ini dilakukan sebagai upaya peningkatan kualitas air minum dengan mengetahui persebaran kontaminasi E. coli, faktor yang mempengaruhinya, serta membandingkan risiko kesehatan air minum nonperpipaan di Kota Bekasi dan Metro. Penelitian dilakukan dengan metode Most Probable Number (MPN) untuk mengetahui konsentrasi bakteri dan metode Quantitative Microbial Risk Assessment (QMRA) dengan indikator bakteri E. coli dan patogen indeks Salmonella. Pengujian kualitas air minum menunjukkan bahwa terjadi kontaminasi E. coli sekitar 26,7% dari total 202 sampel di Kota Bekasi dengan rata-rata 18,7 MPN/100 mL. Sedangkan di Kota Metro 30,0% dari 190 sampel terkontaminasi E. coli dengan rata-rata 77,3 MPN/100 mL. Berdasarkan uji korelasi Spearman¸ faktor seperti sumber air, pewadahan, dan pengolahan air tidak menunjukkan adanya korelasi terhadap konsentrasi E. coli, kecuali untuk faktor pewadahan di Kota Metro yang berhubungan signifikan dengan E. coli 100 MPN/100 mL. Kemudian hasil penelitian mengenai rasio patogen indeks Salmonella dengan sampel air tanah di kota Bekasi (n=7) diperoleh nilai rasio sebesar 0,03. Hasil perhitungan analisis QMRA dengan simulasi Monte-Carlo di Kota Bekasi menunjukkan bahwa air tanah memiliki nilai median beban penyakit sebesar 0,01 ± 0,03 DALY/orang/tahun dan air isi ulang dengan nilai sebesar 0,003 ± 0,02 DALY/orang/tahun. Sedangkan, untuk Kota Metro diperoleh sebesar 0,04 ± 0,04 DALY/orang/tahun untuk air tanah dan air isi ulang sebesar 0,03 ± 0,04 DALY/orang/tahun. Seluruh nilai yang diperoleh melebihi batas nilai maksimum menurut WHO yaitu sebesar 10-4 DALY/orang/tahun. Oleh karena itu, intervensi yang tepat perlu dilakukan oleh pemerintah untuk mengedukasi masyarakat tentang konsumsi air minum yang aman dan layak

.....Piped water services in Indonesia are still relatively low. This condition encourages people to use non-piped water sources such as groundwater and refilled water. However, based on several studies, non-piped water is known to have risks due to bacterial and pathogen contamination. This study was conducted as an effort to improve drinking water quality by knowing the distribution of E. coli contamination, the factors that influence it, and comparing the health risks of non-piped drinking water in Bekasi City and Metro. The research was conducted using the Most Probable Number (MPN) method to determine the concentration of bacteria and the Quantitative Microbial Risk Assessment (QMRA) method with E. coli as indicators and Salmonella as reference pathogen. The drinking water quality testing showed that there was around 26.73% E. coli contamination from a total of 202 drinking water samples in Bekasi City with an average of 18.74 MPN/100 mL. Whereas in Metro City 30% of 190 samples were contaminated with E. coli with an average of 77.31 MPN/100 mL. Based on the Spearman correlation test¸ risk factors such as water sources, containers, and water treatment did not show a correlation with E. coli concentrations, except for the container factor in Metro City which is significantly related to E. coli 100 MPN/100 mL. Then to find out

the reference pathogen ratio, a Salmonella concentration test was carried out for groundwater in the city of Bekasi (n=7) and a ratio value of 0.03 was obtained. The results of QMRA analysis calculations using Monte-Carlo simulations in Bekasi City show that groundwater has a median disease burden value of 0.01 ± 0.03 DALY/person/year and refill water with a value of 0.003 ± 0.02 DALY/person/year year. Whereas for Metro City, the median disease burden of groundwater was 0.04 ± 0.04 DALY/person/year and for refill water it was 0.03 ± 0.04 DALY/person/year. All values obtained exceeded the maximum value limit according to WHO, namely 10-4 DALY/person/year, therefore proper intervention from the government is needed to educate the public about consumption of safe drinking water.