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Contamination Status of Well Water around Nawinna Dumping Site, Maharagama

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Abstract

Waste generation by man started since the beginning of civilization as a consequence of human activities, involving the production of goods and services and the consumption of natural sources. Garbage dumping is a global environment issue. Ground water is one of the main victims of garbage dumping. The major danger associated with drinking water sources is the possibility of its recent contamination by sewage or human and animal excreta. Another problem is siting of a drinking water system (wells and boreholes) near a refuse dumpsite or landfill. When aquifer from which the well draws water is contaminated or contaminated surface water enters the well, well water can be contaminated.

Nawinna area which is located in Maharagama contained a major solid waste dumping site. Eighty wells were sampled monthly from January 2012 to October 2012. Water samples were collected in sterilized glass bottles using standard methods both for microbial and physico-chemical tests. Microbiological and physico-chemical parameters were measured using the standard methods and Principal Component Analysis (PCA) was carried out to evaluate the relative water quality among GN divisions around dumping site.

Results showed that both total and fecal coliform counts ranged between 0 to >1,100 counts per 100 ml and almost all tested wells were significantly contaminated with total and fecal coliform ($p<0.001$), sometimes exceeding 1,100/100 ml. The total nitrate concentration was significantly high ($p<0.001$) exceeding more than 60 mg/l. The first study, reported in 2007 in the same study area found that Nitrate concentration was exceeding 40mg/l and the second repeated study in the same area in 2011 was detected 50 mg/lof nitrate. Therefore, there might be a significant tendency of increasing the nitrate concentration in well water in the area. Mean ranges of physico-chemical parameters of pH (4.11-7.14), Nitrate (0.64-77.31 mg/l), Conductivity (114-70,000 µS cm-1), Biological Oxygen Demand (BOD) (0.03-19.40 mg/l), Phosphate (0.07-2.68 mg/l) and Chemical Oxygen demand (COD) (0.14-64.13 mg/l) detected respectively. Nitrate concentration has a significant correlation with Chemical Oxygen Demand (COD). Principal component analysis revealed that the Wattegedara GN division contained the highest polluted wells. According to the questionnaire survey, people of the area are complaining about the deterioration status of water quality with odour, taste and colour. It was found that some wells within the study area were acidic (pH 4.11).

As a conclusion, total coliform, fecal coliform, nitrate, phosphate, COD, BOD and conductivity values were exceeded than the drinking water quality standards given by SLS. This may due to excessive application of organic and inorganic fertilizers in homegardens, unregulated garbage dumping, too much closer toilet pits, limited space for constructing houses, and lack of restrictions. The presence of coliform bacteria can indicate the possible

presence of pathogens and other pollutants. It is important to highlight that the study area has a very shallow water table and susceptible to spread of pollutant and microbes which effect on human health within very short period and this situation becomes worse in near future.