

Health risk associated with nitrate exposure from groundwater intake among respondents of Keting Village, Bachok District, Kelantan State, Malaysia

ABSTRACT

Nitrate is one of the compounds of nitrogen found in the nitrogen cycle that is which originates from both natural and anthropogenic sources. Most rural areas in Kelantan state still depend on well water as their primary water source. Their main economic activity is agriculture which uses high amounts of nitrate fertilizer to nurture their crops. The increased use of nitrate fertilizers has a possible risk factor associated to health problems such as methemoglobinemia and cancers. Health risk assessment can be conducted to quantify the probability of harmful effects of nitrate to individuals or populations from certain human activities. To determine levels of nitrate in groundwater and to perform health risk assessment among respondents in Keting village, Bachok district, Kelantan state. A total of 47 respondents were chosen for this study and groundwater samples in duplicates were collected from the respondents' houses. The samples were then analyzed by using a portable Hanna Instrument multimeter model HI98191 and probe model HI4113. while a set of questionnaires were used to collect information for health risk assessment of the exposure. Nitrate levels in groundwater did not exceed the maximum concentration value of Drinking Water Quality Standard (44.3 ppm nitrate – NO₃) with a mean \pm sd of 5.34 ± 4.94 (ppm). Spearman's rho correlation analysis shows that only depth of well (meter) is correlated ($r = -0.348$) to nitrate levels ($p < 0.05$). The Hazard Quotient (HQ) for the study population was less than 1. In terms of nitrate, the groundwater analyzed in the study area was considered safe for drinking and cooking purposes. The result for HQ indicated that the non-carcinogenic risk related to nitrate was not significant to the study population. However, nitrate levels in drinking water should be concerned by the consumers as it will give bad health impact to them in long-term exposures.

Keyword: Nitrate; Groundwater; Maximum concentration value; Hazard quotient