

UNIVERSITI TEKNOLOGI MARA

**NITRATE CONCENTRATION IN GROUNDWATER AND
POTENTIAL RISK TO HUMAN HEALTH**

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degree of Bachelor in Environmental Health and Safety (Hons.)**

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Declaration by Student

Project entitled "*Nitrate Concentration in Groundwater and Potential Risk to Human Health*" is a presentation of my original research work. Wherever contributions of others are involved, every effort is made to indicate this clearly, with due reference to the literature, and acknowledgement of collaborative research and discussions. The project was done under the guidance of Associate Prof. Hazillia Hussain as Project Supervisor and Madam Nadiatul Syima Mohd Shahid as Co-Supervisor. It has been submitted to the Faculty of Health Sciences in partial fulfillment of the requirement for the Degree of Bachelor in Environmental Health and Safety (Hons).

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Abstract

Nitrate Concentration in Groundwater and Potential Risk to Human Health

Wan Noor Azah bt Wan Abdul Aziz

Introduction: Nitrate (NO₃⁻) is a naturally occurring form of nitrogen found in soil. Nitrogen is essential to all life. In moderate amounts, nitrate is a harmless constituent of food and water. The level of nitrate in drinking water should not exceed 10 milligrams per liter (10 ppm). Nitrate is a health hazard because of its conversion to nitrite. Once ingested, conversion of nitrate to nitrite takes place in the saliva of people of all age groups, and in the gastrointestinal tract of infants. Infants who are six months old or younger have the greatest risk of developing methemoglobinemia, because they consume a large amount of fluids in relationship to their body weight. Their stomachs also have a low acidity which creates an ideal environment for bacteria to convert nitrate to nitrite.

Methodology: The study was conducted at Pasir Puteh, Kelantan. Focused at Kg Besar (n=10), Kg Tok Din (n=10), Kg Sepulau (n=10), and Kg Sungai Petai (n=10) at Mukim Semerak. The number of respondents is sixty respondents. The study design is cross sectional study. Sampling data collection using questionnaire, oral interview, measuring tape, camera, pH and temperature meter, and turbidity meter for in-situ. Ex-situ by using HACH DR2800 Spectrophotometer. The High Density Poly Ethylene (HDPE) bottles were used for collect the samples. A statistical analysis that is statistical package for the social science (SPSS) version 17.0 was used in this study.

Results: The mean of nitrate concentration between four different villages were low and below the standard at Kg Besar, Kg Tok Din and Kg Sg Petai was 4.37 mg/L, 3.57 mg/L and 3.15 mg/L respectively. Kg Sepulau had a high level of nitrate concentration with the mean concentration of 9.4 mg/L. There was a significant difference of nitrate concentration in well water with the location from the livestock activities ($p=0.002$). Mean nitrate exposure calculated was 0.1692 mg/kg/day. The min-max range is between 0.03 – 0.92 mg/kg/day. The age of respondents and Chronic Daily Intake (CDI) was statistically significant. There was significant association between amount of water intake and hazard index. Respondents who consumed more than 2.5 L water, will exposed to harmful potentially health risk. There was significant association between chronic daily intake and Hazard Index (HI) with p -value < 0.05 ($p= 0.001$).

Conclusion: In conclusion, all respondents have low risk in their daily intake of nitrate. All respondent have Hazard Index below 1. It can be concluded that location of the wells with the location of the livestock activities, could be one of the factor that affect the nitrate level in the groundwater.

Keywords: Nitrate, Chronic Daily Intake, Index Hazard, Methemoglobinemia