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Does Exposure to Nitrate in Drinking Water Contribute Anything the Effect of Water Chlorination on Children Methemoglobin Levels?

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ABSTRACT

Previous studies showed contradictory findings regarding the relationship between nitrate in drinking well-water and abnormal methemoglobin (MetHb) level (>2%) among children. We studied the effect of water chlorination in this relationship in children aged up to 7. 240 subclinical children participated in this cross-sectional study. Water nitrate was analyzed for each participant, and so was blood MetHb. Analysis of two water nitrate exposure levels (<50 and >50 mg/L as)-other extraneous factors (Breslow-Day-Test for interaction), bivariate and multivariate analyses were performed. Abnormal MetHb levels (up to 7.9%) were associated (p-value = 0.020) with exposure to drinking water nitrate. Only water chlorination was an effect modifier. Among those who do not disinfect water, the prevalence of abnormal MetHb for those with nitrate level >50 mg/L was 4.95 (p-value = 0.001, 95% CI = [1.92 - 12.79]) times the prevalence for those with nitrate level <50 mg/L. Whereas, among those who do disinfect water, the prevalence for those with high nitrate levels was only 1.38 (p-value = 0.435, 95% CI = [0.62 - 3.07]) times the prevalence of those with low nitrate levels. The biological plausibility of a relationship between waterborne microorganisms, drinking water nitrate, drinking water chlorination, and development of an abnormal MetHb level needs to be further explored.

KEYWORDS

Methemoglobin; Drinking Water; Nitrate; Chlorine; Children

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