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Quantitative microbial risk assessment combined with hydrodynamic modelling to estimate the public health risk associated with bathing after rainfall events

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This study investigated the public health risk from exposure to infectious microorganisms at Sandvika recreational beaches, Norway and dose-response relationships by combining hydrodynamic modelling with Quantitative Microbial Risk Assessment (QMRA) framework. Meteorological and hydrological data were collected to produce a calibrated hydrodynamic model using *Escherichia coli* as an indicator of faecal contamination. Based on average concentrations of reference pathogens (norovirus, *Campylobacter, Salmonella, Giardia* and *Cryptosporidium*) relative to *E. coli* in Norwegian sewage from previous studies, the hydrodynamic model was used for simulating the concentrations of pathogens at the local beaches during and after a heavy rainfall event, using three different decay rates. The simulated concentrations were used as input for QMRA and the public health risk was estimated as probability of infection from a single exposure of bathers during the three consecutive days after the rainfall event. The level of risk on the first day after the rainfall event was acceptable for the bacterial and parasitic reference pathogens, but high for the viral reference pathogen at all beaches, and severe at Kalvøya-small and Kalvøya-big beaches, supporting the advice of avoiding swimming in the day(s) after heavy rainfall. The study demonstrates the potential of combining discharge-based hydrodynamic modelling with QMRA in the context of bathing water as a tool to evaluate public health risk and support beach management decisions.

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Oxidative stress status in nutritionally stunted children

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Objective: This work aims to assess the oxidative stress status in a sample of Egyptian malnourished stunted children and investigate the relations between oxidative stress markers and anthropometric measurements.

Subjects and methods: This cross sectional descriptive analytical study was carried out on 50 malnourished stunted children (28 males and 22 females), aged from 6–9 years and 50 healthy age and sex-matched controls. Blood oxidative stress biomarkers including catalase (CAT), superoxide dismutase (SOD) malondialdehyde (MDA), plasma glutathione (GSH), total plasma proteins, total anti-oxidant capacity (TAC), copper (Cu), zinc (Zn), and vitamin C were measured in stunted children and controls. Social status was assessed for stunted children. Body weight and height were measured and body mass index (BMI) was calculated. Children were classified according to their height for age Z-scores (HAZ) into moderate and severe stunted. According to nutritional assessment stunted children were classified into two groups ; group 1 with deficient intake <50% and group 2 with accepted intake > 50%.

Results: Nutritionally stunted children showed significantly lower levels of the blood oxidative stress biomarkers including, CAT, SOD, plasma GSH, total plasma proteins, Cu, Zn and vitamin C and significantly higher levels of MDA compared with controls ($p < 0.001$). There was significant difference in plasma levels of Vitamin C and Zn between patients with different social levels. No significant relationships were found between the degree of stunting and oxidative markers.

Conclusions: Nutritionally stunted children had an increased oxidative stress and decreased antioxidant defense system compared with healthy controls. Oxidative stress, malnutrition and low social level might play an important role in the pathogenesis of stunting. Nutrition education and supplementation is very important.

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