

# COHORT OF NORWAY: ACIDIC DRINKING WATER AND THE RISK OF FOREARM-FRACTURE

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**Background and Aims:** The prevalence of forearm fractures in Norway is high, and it increases with increasing degree of urbanization. We have investigated whether the quality of drinking water may explain this urban-rural gradient. In Norway, pH in drinking water should be 7.5-8.5. We know that pH < 7.5 could be unfavorable to bone-health, with less bicarbonate and calcium, and more heavy metals available. The relationship between drinking water and fractures has not previously been studied on a population level.

**Methods:** "Cohort of Norway" comprises ten population-based surveys with 174,430 participants aged 20 years or more answering 50 common questions, one concerning former forearm fractures. Geographic Information Systems were used to link the survey-information to the waterworks-registry, based on the participants' home-addresses. Analyses were limited to 126,923 individuals with valid information on exposure, outcome and relevant covariates (age, BMI, marital status, urbanization). For adjustment, we also included the acidity-level in raw-water as a proxy for non-measured water-quality factors.

**Results:** The pH in tap water was less than 7.5 for 72% of participants, and overall 14% reported having suffered a fracture. Water with pH < 7.5 was associated with an increased risk of forearm fracture in men, compared with pH $\geq$ 7.5 (OR 1.17, 95% CI 1.12-1.21). A similar odds ratio was observed in women. Adjustment for the covariates did not significantly change these estimates. Including pH-level in raw-water weakened the association, and in women it was only borderline significant (p=0.07).

**Conclusions** Our results suggest that the pH in drinking water influences the risk of forearm fractures, independently of degree of urbanization and other background factors. The effect of tap water with pH < 7.5 on fracture-risk may to some extent be confounded by the quality of the raw water.

**References:** Søgaard AJ et al (2007) Urban-rural differences in distal forearm-fractures: Cohort Norway. *Osteoporosis Int* 18: 1063-1072

Flaten TP (1991) A nation-wide survey of the chemical composition of the drinking water in Norway. *Sci Total Environ* 102:35-73

Tomten SE et al (2003) Acid and bone resorption. In: Bjertnes E (ed) *Osteoporosis: From Mechanisms and Risk Factors to Prevention*. The Norwegian Academy of Science and Letters, Oslo, Norway, pp. 35-42