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EDITORIAL

Higher milk intake increases fracture risk: confounding or true association?

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Global shifts in aging and increased life expectancy puts demands on health systems. [1] As age-related chronic diseases, osteoporosis and low bone mass are major public health threats [2, 3]. Milk is a good source of bone-specific nutrients [calcium, vitamin D (when fortified), protein, magnesium, potassium, phosphorus]. Studies have reported beneficial associations between milk and bone mineral density [4–10]. However, data on mortality [11–15] and fracture risk are conflicting [14, 16–19], with studies reporting beneficial [13, 16], neutral [8, 11, 12, 15, 17–19], and adverse associations [14].

The largest study [14] on milk intake, fractures and mortality has contributed to controversies surrounding potential benefits of these foods for bone health and longevity. Michaelsson et al. [14] examined milk intake in two large Swedish cohorts. Primary outcomes included mortality, incident fracture, hip fracture over follow-up (women, 20.1 years; men, 11.2 years). In women, ≥3 glasses of milk/day was associated with 93% increased risk of mortality compared with <1glass (200 ml). For every glass of milk, fracture and hip fracture risk was 2–9% higher in women. Cheese and fermented milk showed a 10–15% lower fracture and mortality risk in women. Overall, ≥3 glasses of milk/day was associated with higher mortality in adults and with higher fracture incidence in women. The biological rational included high levels of D-galactose in milk (also found in cheese and fermented milk), which increases oxidative stress and chronic low grade inflammation in animal models. This mechanism is unsubstantiated by other studies.

This study has raised several issues. The highest relative risks were in women with high milk intake (9% of the population). These women, aged >50 when the study started were followed for 20 years. At age 70, people are likely to die from multiple causes and not due to milk intake perse. These women were at increased risk of comorbidities, prone to dietary changes pursuant to age, loss of spouse, and changes in living arrangement. Furthermore, baseline vitamin D status was missing, and Charlson's comorbidity index does not account for diabetes, hypertension, or hypercholesterolemia separately. The high risk associations became weaker if only baseline (compared to two repeated measures) milk intake was associated with mortality risk. The FFQ had limited food items and was not validated for milk. The conclusion disagrees with a recent meta-analysis of 29 prospective cohort studies on milk and mortality that found no association [15].

Large cohort studies provide valuable information on diet-disease relationships. However, the question about true associations or confounded results cannot yet be answered. Validated measurements should be utilized, and a detailed assessment of confounders including vitamin D status are necessary to answer important questions related to milk intake and its effect on fracture and mortality. Large intervention studies of other under-studied dairy foods (yogurt and cheese) would clarify nutritional equivalency of dairy foods in order to optimize bone health. An emerging area of fermented dairy foods, microbiome and aging, could provide valuable insights

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into the unexplored mechanisms via which dairy foods may affect aging in general and skeletal aging in particular.

Compliance with ethical standards

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