MedicalXpress

Vegans, vegetarians and pescetarians may be at higher risk of bone fractures

November 23 2020

Compared with people who ate meat, vegans with lower calcium and protein intakes on average, had a 43% higher risk of fractures anywhere in the body (total fractures), as well as higher risks of site-specific fractures of the hips, legs and vertebrae, according to a study published in the open access journal *BMC Medicine*. Vegetarians and people who ate fish but not meat had a higher risk of hip fractures, compared to people who ate meat. However, the risk of fractures was partly reduced once body mass index (BMI), dietary calcium and dietary protein intake were taken into account.

Dr. Tammy Tong, Nutritional Epidemiologist at the Nuffield Department of Population Health, University of Oxford, and the lead author said: "This is the first comprehensive study on the risks of both total and site-specific fractures in people of different diet groups. We found that vegans had a higher risk of total fractures which resulted in close to 20 more cases per 1000 people over a 10-year period compared to people who ate meat. The biggest differences were for hip fractures, where the risk in vegans was 2.3 times higher than in people who ate meat, equivalent to 15 more cases per 1000 people over 10 years."

A team of researchers at the Universities of Oxford and Bristol, UK analysed data from nearly 55,000 people in the EPIC-Oxford study, a prospective cohort of men and women living in the UK, who were recruited between 1993 and 2001, many of whom do not eat meat. Prospective cohort studies identify a group of people and follow them over a period of time to understand how certain factors (in this case diet)

may affect certain outcomes (in this case fracture risk).

Out of the 54,898 participants included in the present study, 29,380 ate meat, 8,037 ate fish but not meat, 15,499 were vegetarians, and 1,982 were vegans when they were recruited. Their eating habits were assessed initially at recruitment, then again in 2010. Participants were followed continuously for 18 years on average, until 2016 for the occurrence of fractures. During the time of the study, 3,941 fractures occurred in total, including 566 arm, 889 wrist, 945 hip, 366 leg, 520 ankle and 467 fractures at other main sites, defined as the clavicle, ribs and vertebrae.

In addition to a higher risk of hip fractures in vegans, vegetarians and pescetarians than the meat eaters, vegans also had a higher risk of leg fractures and other main site fractures. The authors observed no significant differences in risks between diet groups for arm, wrist or ankle fractures once BMI was taken into account. The authors found that the differences in risk of total and site-specific fractures was partly reduced once BMI, dietary calcium and dietary protein intake had been taken into account.

Dr. Tong said: "Previous studies have shown that low BMI is associated with a higher risk of hip fractures, and low intakes of calcium and protein have both been linked to poorer bone health. This study showed that vegans, who on average had lower BMI as well as lower intakes of calcium and protein than meat eaters, had higher risks of fractures at several sites. Well-balanced and predominantly plant-based diets can result in improved nutrient levels and have been linked to lower risks of diseases including heart disease and diabetes. Individuals should take into account the benefits and risks of their diet, and ensure that they have adequate levels of calcium and protein and also maintain a healthy BMI, that is, neither under nor overweight."

The authors caution that they were unable to differentiate between

fractures that were caused by poorer bone health (such as fractures due to a fall from standing height or less) and those that were caused by accidents because data on the causes of the fractures were not available. No data were available on differences in calcium supplement use between the different diet groups, and as in all dietary studies the estimates of nutrients such as dietary calcium or dietary protein are subject to measurement error. As the study predominantly included white European participants, generalisability to other populations or ethnicities may be limited, which could be important considering previously observed differences in bone mineral density and fracture risks by ethnicity, according to the authors.

More studies are needed from different populations, including from non-European populations, as well as cohorts with a larger proportion of men to explore possible differences in risk by sex, as around three-quarters of participants in the EPIC-Oxford cohort are women.

More information: Tammy Y. N. Tong et al, Vegetarian and vegan diets and risks of total and site-specific fractures: results from the prospective EPIC-Oxford study, *BMC Medicine* (2020). DOI: 10.1186/s12916-020-01815-3

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