

COMMENTARY

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# Vegetarian diets and cancer risk

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## Background

Vegetarian diets contain vegetables, fruits, whole grains, legumes, nuts, and seeds [1]. They are devoid of flesh foods (such as meat, poultry, wild game and their products) and may or may not include eggs and dairy products (vegan diet) [1]. A pescatarian diet is a vegetarian diet that includes fish and is devoid of flesh foods [1]. In many countries, the number of people who adopt a vegetarian diet is increasing, and there are several main reasons for this [2]. Ethical concerns about animal welfare and environmental sustainability motivate the adoption of a vegetarian diet [3]. Vegetarian diets are associated with increased environmental sustainability through reduced greenhouse gas emissions, deforestation and water use [4]. Health improvements and weight loss are other strong motivators for the adoption of a vegetarian diet [3]. According to the Academy of Nutrition and Dietetics of the USA, vegetarian diets are associated with better health outcomes, an increased life expectancy, and a reduced risk of coronary heart disease, type 2 diabetes, hypertension and obesity [1]. Furthermore, vegetarian diets are also considered to reduce the risk of certain types of cancer [1].

## Vegetarian diets and cancer

Previous studies on the association of dietary patterns and specific types of cancer led to partially conflicting results. The pooled analysis of data obtained from the Oxford Vegetarian Study and the EPIC-Oxford cohort,

including 61,647 participants, revealed that vegetarians and pescatarians have an overall reduced risk of developing cancer compared to meat eaters [5]. Additionally, the database study also identified a reduced risk of stomach cancer, cancers of the lymphatic and haematopoietic tissue and multiple myeloma among vegetarians and pescatarians and a reduced risk of colorectal cancer among pescatarians [5]. Based on 69,120 participants, the Adventist Health Study-2 revealed that vegetarians were protected from cancers of the gastrointestinal tract compared to nonvegetarians [6]. A vegan diet reduced the overall cancer incidence and the risk of female-specific cancers [6]. In contrast, a recent meta-analysis that included nine studies did not identify any benefit of a vegetarian diet on the risk of breast, colorectal or prostate cancer [7]. Another recent meta-analysis attributed a reduced risk of cancer mortality to a vegetarian diet without showing any association between diet and a specific type of cancer [8].

The reports presented by Parra-Soto et al. [9] and Watling et al. [10] are based on 409,110 and 472,377 UK Biobank participants, respectively, recruited between 2006 and 2010. The mean follow-up was 10.6 and 11.4 years [9, 10], respectively. To date, both papers represent the largest database studies ever to address the question of vegetarian and pescatarian diets and the risk of cancer. The design and results differ substantially in some aspects between both studies. In contrast to Parra-Soto et al. [9], Watling et al. [10] distinguished between regular and low meat eaters as those who consume processed, red meat (beef, pork, lamb) or poultry >5 or ≤5 times a week, respectively. Low meat eaters had a reduced risk of colorectal cancer compared to regular meat eaters [10]. Vegetarians had a lower risk of all cancers, prostate cancer and postmenopausal breast cancer, and pescatarians

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had a lower risk of all cancers than regular meat eaters [10]. The authors indicated that the reduced risk of postmenopausal breast cancer may be largely attributed to the lower mean body mass index (BMI) of vegetarian women. The authors also performed subgroup analysis for sex and smoking. After removing lung cancer cases from the analysis, the reduced risk of all cancers for vegetarians, pescatarians and low meat eaters was only found among ever-smokers [10]. Furthermore, a reduced risk of colorectal cancer among dietary groups compared to regular meat eaters was only found among men [10].

Due to the exclusion of all participants with cancer at baseline and those with missing data about diet and important covariates, the study group of Parra-Soto et al. [9] was smaller. Meat eaters form a single group, and the results are also represented for a separate dietary group of fish-poultry eaters [9]. In their maximally adjusted model, vegetarians had a lower risk of all cancers, and prostate cancer and pescatarians had a lower risk of all cancers than regular meat eaters [9]. In contrast to the study of Watling et al. [10], vegetarians did not have a reduced risk of breast cancer but did have a reduced risk of colorectal cancer [9]. Furthermore, pescatarians also had a reduced risk of melanoma [9]. Additionally, in a meta-analysis, authors pooled their UK Biobank data with eight prospective cohort studies [9]. In the pooled analysis, vegetarians and pescatarians had a reduced risk of all cancers and a borderline reduced risk of colorectal cancer [9].

## Conclusions

The different outcomes of the two studies are explained by varying sample sizes, categories of diet groups and distinct modelling strategies. The subgroup analysis in one study indicated that important additional variables, such as smoking, can modulate the risk of cancers and can confound the results of dietary cancer associations. Both papers are based on large datasets and undoubtedly reveal that vegetarian diets can indeed decrease the risk of specific types of cancer. The risks of prostate cancer and colorectal cancer among men are decreased by a vegetarian diet. In the case of postmenopausal breast cancer, the protective effect may be an indirect one that acts through the modification of the BMI. The diet may only have an impact on certain types of cancer, as neither study detected any effect of the vegetarian diet on the risk of lung cancer. However, the protective effects of vegetarian diets on rare types of cancer may not have been detected in these studies because the numbers of affected patients were low. It is predictable that future studies will probably reveal further associations between vegetarian diets and risk reduction in other cancer types.

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