No Association between Adherence to a Healthy Nordic Food Index and Colorectal Cancer: Results from a Swedish Cohort Study

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Abstract

Background: Recently, the Nordic diet has gained interest, and a healthy Nordic food index has been developed, which has been found inversely related to colorectal cancer among Danish women. This single finding, however, requires replication in other cohorts.

Methods: We conducted a prospective study in the Women’s Lifestyle and Health cohort, including 45,222 women, recruited in 1991–92, and followed up ever since through Swedish registries. Participants were classified according to the Nordic food index (consisting of whole grain bread, oatmeal, apples/pears, cabbages, root vegetables, and fish/shellfish), and the association between adherence and colorectal cancer was assessed using the Cox proportional hazards models.

Results: In the fully adjusted models, we found no association, neither with the continuous index score [incidence rate ratio (IRR), 1.04; 95% confidence interval (CI), 0.95–1.12, per 1-point increment] nor in the categorical analyses (IRR, 1.09; 95% CI, 0.78–1.52 for highest vs. lowest adherers).

Conclusion: The present study does, thus, not support a previous finding of an inverse association between a healthy Nordic food index and colorectal cancer.

Impact: This article adds new evidence to the field of the Nordic diet in disease prevention. Cancer Epidemiol Biomarkers Prev; 24(4); 1–3. ©2015 AACR.

Introduction

Several individual dietary factors have been found inversely associated with colorectal cancer risk, most notably dietary fiber (1). Recently, however, nutritional epidemiology has turned to investigation of dietary patterns, rather than individual components, as this allows for interactions between several components in the diet examined (2).

A Nordic dietary pattern has been proposed, which includes products with health-beneficial effects, which can grow in the Scandinavian climate. Items included are, e.g., whole grain (rye and oats), cabbages, root vegetables, apples/pears, fish, and berries (3, 4).

Only one previous study examined the association between a healthy Nordic food index (HNFI) and colorectal cancer, showing an inverse association in middle-aged, Danish women (5). This finding requires replication in further cohorts to investigate its generalizability. The present study investigates the association between the HNFI and colorectal cancer in a cohort of Swedish women.

Materials and Methods

The Swedish Women’s Lifestyle and Health study includes 49,259 women aged 29 to 49 years at recruitment (1991–92), who completed questionnaires on diet, lifestyle, and socioeconomic factors (6). Colorectal cancers (ICD-7: 153, 154) were defined through the Swedish Cancer Registry. Participants were followed from inclusion into the study and until date of colorectal cancer or death, censoring because of loss to follow-up, or December 31, 2012, whichever occurred first.

The HNFI included six food groups: Whole-grain bread, oatmeal, apples/pears, cabbages, root vegetables, and fish/shellfish. One point was given for above-median intake and 0 point for below-median intake for each item. Thus, participants could score as 0–6 points on the HNFI.

In the fully adjusted models, we found no association, neither with the continuous index score [incidence rate ratio (IRR), 1.04; 95% confidence interval (CI), 0.95–1.12, per 1-point increment] nor in the categorical analyses (IRR, 1.09; 95% CI, 0.78–1.52 for highest vs. lowest adherers).

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intake (kJ/day) (model 4). The procedure PHREG in SAS 9.3 was used for all statistical analyses.

**Ethics**

The study was approved by the regional Ethical Committee at Uppsala University, and the Ethical Committee at Karolinska Institutet, Stockholm.

**Results**

We excluded participants who emigrated before final enrollment ($n = 41$), had an energy intake outside the first and 99th percentiles ($n = 1,072$), lacked information on any covariate ($n = 2,896$), or had a colorectal cancer diagnosis before baseline ($n = 28$), leaving 45,222 women.

During follow-up, 314 women developed colorectal cancer (187 colon cancers and 127 rectal cancers). Several of the potential confounding factors were unevenly distributed across adherence to the HNFI: Participants who scored high on the index were less likely to smoke and more likely to be highly educated, never-users of oral contraceptives, and postmenopausal, have a higher energy intake, and a higher intake of red/processed meats and dietary fiber (Table 1).

A 1-point increment in the score was not associated with colorectal cancer (IRR, 1.04; 95% CI, 0.95–1.12) in the fully adjusted model; high adherers had an IRR of 1.09 (0.78–1.52) compared with low adherers ($P_{\text{trend}} = 0.40$; Table 2).

Stratification by cancer type, colon/rectum, did not reveal any difference in the effect of the HNFI between the two subgroups (results not shown).

**Discussion**

In this large prospective study among Swedish women, a higher adherence to the HNFI was not associated with risk of colorectal cancer.

The lack of association may be due to the relatively few colorectal cancers in the cohort. It may also be explained by residual confounding: High adherers to the index had the highest intake of red/processed meats, dietary components that are associated with an increased risk of colorectal cancer (1).

The strength of the study includes the virtually complete follow-up, detailed information on intake of the dietary items included in the HNFI, and adjustment for potentially confounding variables. The study is limited by modest statistical power, and the assessment of dietary intake at only one time point, as the diet may change over the follow-up period. Most likely, however, such changes will be unsystematic, biasing the estimates toward unity.

The only previously published study on the HNFI and colorectal cancer (5) found an inverse association in women. However, these women were older than women in the present study (median age at baseline 56 years vs. 39 years). Age is likely to affect the type of colorectal cancer in the two cohorts, as colorectal cancers with a strong genetic component debut at a younger age.
In conclusion, we found no association between a HNFI and colorectal cancer among adult Swedish women. We were unable to confirm the findings of a previous cohort study.

Disclosure of Potential Conflicts of Interest
No potential conflicts of interest were disclosed.

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Conception and design: N. Roswall, Y. Li, S. Sandin, M. Löf, H.-O. Adami, E. Weiderpass
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References
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