Constipation and a Low-Fiber Diet Are Not Associated With Diverticulosis

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BACKGROUND & AIMS: Asymptomatic diverticulosis is commonly attributed to constipation caused by a low-fiber diet, although evidence for this mechanism is limited. We examined the associations between constipation and low dietary fiber intake with risk of asymptomatic diverticulosis.

METHODS: We performed a cross-sectional study that analyzed data from 539 individuals with diverticulosis and 1569 without (controls). Participants underwent colonoscopy and assessment of diet, physical activity, and bowel habits. Our analysis was limited to participants with no knowledge of their diverticular disease to reduce the risk of biased responses.

RESULTS: Constipation was not associated with an increased risk of diverticulosis. Participants with less frequent bowel movements (<7/wk) had reduced odds of diverticulosis compared with those with regular bowel movements (7/wk) (odds ratio [OR], 0.56; 95% confidence interval [CI], 0.40–0.80). Those reporting hard stools also had reduced odds (OR, 0.75; 95% CI, 0.55–1.02). There was no association between diverticulosis and straining (OR, 0.85; 95% CI, 0.59–1.22) or incomplete bowel movement (OR, 0.85; 95% CI, 0.61–1.20). We found no association between dietary fiber intake and diverticulosis (OR, 0.96; 95% CI, 0.71–1.30) in comparing the highest quartile with the lowest (mean intake, 25 vs 8 g/day).

CONCLUSIONS: In our cross-sectional, colonoscopy-based study, neither constipation nor a low-fiber diet was associated with an increased risk of diverticulosis.

Keywords: Diverticular Disease; Risk Factors; Database Analysis.

In the United States, about two-thirds of adults older than the age of 85 have asymptomatic diverticula in the descending or sigmoid colon.[1] Diverticulosis can become complicated by inflammation, hemorrhage, or perforation, so-called diverticular disease. In 2009, Americans spent more than 1.3 million days in the hospital with a diagnosis of diverticular disease.[2] In that same year, diverticular disease was responsible for 283,355 hospitalizations, 2,682,168 ambulatory care visits, and 1,948 in-hospital deaths in the United States.[2] Inpatient costs totaled $2.7 billion for 2009 alone.[2]

Despite the burden of diverticular disease, its pathophysiology remains poorly understood. Several risk factors for symptomatic diverticular disease have been identified including obesity, physical inactivity, and a low-fiber diet.[3–9] However, risk factors for diverticula development are likely different from those for inflammation, bleeding, or perforation. Proponents of the long-standing fiber hypothesis for diverticula formation argue that the colon must generate excessively high pressures to move small-caliber, hard stools.[10] Purportedly, these high pressures lead to mucosal herniation and creation of pseudodiverticula in the descending or sigmoid colon.[10] Consequently, constipation from a low-fiber diet is commonly cited as the etiology of descending or sigmoid colon diverticulosis. Despite limited research or evidence, this hypothesis has been widely accepted.[11,12] Few alternative risk factors for asymptomatic diverticulosis have been studied.[3,12,13]

To explore risk factors associated with diverticulosis, we analyzed comprehensive data from a colonoscopy-based study that collected detailed information on diet, physical activity, and body mass index (BMI). We considered multiple risk factors for diverticulosis including diet (low fiber, high fat, high red meat), frequency of bowel movements, symptoms of constipation, tobacco use, alcohol use, non-aspirin nonsteroidal anti-inflammatory drug (NSAID) use, aspirin use, physical activity, obesity, and race. We limited our analysis to participants who denied a history of diverticulosis or diverticulitis because participants with a history of diverticulosis or diverticular disease may have increased their fiber intake or undertaken other lifestyle changes in response to their diagnoses.

Methods

Study Population

We analyzed data on 2813 enrollees from the Vitamin D and Calcium Polyp Prevention study (Clinical Trials.gov ID NCT00153816). We excluded participants with a history of self-reported diverticulosis or diverticulitis. Cases were participants

found to have colonic diverticula noted in the colonoscopy reports at study entry. Controls were participants without colonic diverticula. A research assistant who was trained in data abstraction and blinded to the exposure variables abstracted reports of colonic diverticula from the participants' baseline colonoscopy report.

The Vitamin D and Calcium Polyp Prevention study is a double-blind, placebo-controlled trial of vitamin D and/or calcium supplementation for the prevention of colonic adenomas. Participants were recruited from 11 study centers in North America between July 2004 and July 2008. Eligible participants had at least one histologically verified colonic adenoma removed in the 4 months before study entry and no remaining polyps in the bowel after complete colonoscopic examination. Eligible participants were between the ages of 45 and 75, with satisfactory preparation for colonoscopy and a complete exam to the cecum.

The parent study excluded patients with a history of previous colon resection or a diagnosis of familial colorectal cancer syndrome, inflammatory bowel disease, chronic intestinal malabsorption, invasive colon cancer, or severe lung, heart, kidney, or liver disease.

The parent study was approved by the Institutional Review Boards of each study center. Secondary data analysis at the University of North Carolina was limited to data with no direct patient identifiers and was exempt from Institutional Review Board review. The STROBE guidelines for reporting descriptive observational studies were followed.[14]

Assessment of Variables

Within 120 days after the colonoscopy, each participant had an intake visit for the parent study in which information was collected on demographics, diet, bowel habits, physical activity, smoking history, alcohol use, prescription and over-the-counter medication use, and comorbidities. Race was self-reported. Height and weight were either measured (70% and 72.3%, respectively) or collected by self-report (29.6% and 24%, respectively) at this visit.

A baseline history of diverticulosis or diverticulitis was assessed as one of a series of questions of the form, "Has a doctor ever told you that you have any of the following?" "Diverticulitis/Diverticulosis?" was one of the disorders listed. Responses were captured as either no, yes, don't know, or refused. Dietary information was collected by using the Block Brief 2000 Food Frequency Questionnaire, a food frequency questionnaire with 60 food items.[15] Participants were asked to report their usual diet during the 1 year before their colonoscopy to avoid seasonal variation in diet.

Physical activity was measured by using the validated International Physical Activity Questionnaire.[16] All physical activity was classified into metabolic equivalents. Sedentary behavior was assessed with the question, "During the last 7 days, how much time did you usually spend sitting on a week day?"

Aspirin use was assessed with the question, "In the last four months, have you taken any medicines containing aspirin?" If yes, "How often, on average, on a weekly basis, were you taking it?" Regular aspirin use was defined as 1 or more days of aspirin use per week. NSAID use was assessed with the question, "In the last four months, have you taken any other medications for aches, fevers, pain, swelling or inflammation?" If yes, "How often, on average, on a weekly basis, were you taking it?" Regular NSAID use was defined as 1 or more days of NSAID use per week.

Smoking was assessed with the question "Have you smoked at least 100 cigarettes in your entire life?" Those who were categorized as "never" smoked less than 100 cigarettes in their entire life. Alcohol use was assessed with number of alcoholic drinks per day during the last year.

Abdominal pain was assessed as one response to the question, "In the past year, have you experienced any of the following?" "Pain in your abdomen?" was one of the listed symptoms. The response was captured as none, some, severe, don't know, or refused.

Bowel habits during the past year were assessed with the following questions: "What percent of the time did you have to strain during a bowel movement?", "What percent of the time did you have a feeling that you did not empty your bowels completely or that you were not finished?", and "What percent of the time did you have hard or lumpy stools?" These responses were captured as less than 25% of the time, 25% or more, don't know, or refused. Last was "How many bowel movements did you have?" The response was captured as either number per day or number per week.

Prescription and over-the-counter laxative use was captured. Data regarding supplemental fiber use were also obtained.

Statistical Analysis

Means and standard deviations were reported for continuous variables. Medians were reported for skewed distributions of continuous variables. Proportions were reported for categorical data. Dietary data, alcohol use, physical activity, and sedentary behavior were converted into categories (quartiles) for analyses. Categorical indictor variables were created to summarize bowel movement patterns. The 4 categories were (1) <7 bowel movements per week, (2) 7 bowel movements per week, (3) 8–14 bowel movements per week, and (4) ≥15 bowel movements per week. The 10% change-in-estimate approach was used to assess the following variables for confounding: age, sex, race, education, BMI, NSAID use, aspirin use, tobacco use, alcohol use, physical activity, abdominal pain, dietary fiber intake, and laxative use. Multivariate analyses were performed by using logistic regression to estimate odds ratios (ORs) and 95% confidence intervals (CIs) while adjusting for age and sex. Fiber, dietary fat, and red meat intake were adjusted for total caloric intake by using regression residuals.[17] All tests of significance were two-tailed, and P values <.05 were considered significant. The analysis was performed by using SAS 9.2 (SAS, Cary, NC).

Results

Our analysis began with 2813 enrolled study participants. We excluded 698 subjects who reported a history of diverticulosis or diverticulitis and 7 participants with no data on diverticular history, leaving 539 who met our case definition of having colonic diverticula and 1569 controls without diverticula. Most cases (88%) had descending or sigmoid colon diverticula. The rest had pancolonic diverticula (6%), cecal or ascending colon diverticula (2%), or diverticula in an undocumented location (4%). Participants with diverticulosis were older, more likely to be male and white, had a higher mean BMI, and used tobacco, aspirin, and alcohol more frequently than controls (Table 1).