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REVIEW ARTICLE

Etiologic Factors of Chronic Constipation—Review of the Scientific Evidence

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Abstract Geriatric patient educational material and a general practice review suggest insufficient dietary fiber intake, inadequate fluid intake, decrease physical activity, side effects of drugs, hypothyroidism, sex hormones and colorectal cancer obstruction may play a role in the pathogenesis of constipation. A search of recent literature, however, reveals that there is a paucity of evidence-based publications that address the etiologic factors of chronic constipation. Much of current writings on the subject may be based primarily on myths handed down from one generation to the next. In the absence of well-designed studies, there do not appear to be sufficient evidence-based information to implicate the above as major etiologic factors in the development of chronic constipation. The etiological role of each of these factors in the development of chronic constipation deserves to be assessed by modern techniques and methodologies. Funding agencies including the government and industry sponsors should support the development of evidence-based data sets. The understanding of the etiology of chronic constipation is the foundation on which cost-effective management strategies are to be built.

Keywords Chronic constipation · Etiology

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Introduction

In a recent patient handout regarding the management of constipation, American geriatric experts listed the following considerations as the main causes of constipation: poor diet, insufficient fluid intake, poor bowel habits, lack of exercise, laxative abuse, travel, prolonged bed rest, medications, and hormonal imbalances [1]. The approach to constipation in the elderly was expressed in one review article in the family practice literature as follows. Ask patient about fluid and food intake, medications, and supplements. Constipation may be a sign of a serious problem such as a mass lesion in the rectum, hypothyroidism, or medication (narcotic analgesics) side effect. In the course of working the patient up, colonoscopy may be useful. Treatment should address the underlying problem (dietary fiber, fluid, immobility). Laxatives, stool softeners, and nonabsorbable solutions may be needed [2]. The above suggests that insufficient dietary fiber intake, inadequate fluid intake, decreased physical activity, side effects of drugs, hypothyroidism, sex hormones, and colorectal cancer obstruction may all play a role in the pathogenesis of constipation. The aim of this review is to determine if there is scientific evidence to support an etiologic role for each of these factors in chronic constipation.

Method

A search of the literature using Medline from 1996 to 2005 was conducted in September 2005. The use of the search term "constipation" yielded 9742 titles. The combination of "constipation" and "etiology" yielded 161 titles. When "evidence based" was added, no title was recovered. To secure articles for review, the search term constipation was

combined in turn with each of the following: "dietary fiber," "fluid intake," "immobility," "side effects of drugs," "hypothyroidism," "sex hormones," and "endoscopy." The result of each of these searches was studied to select articles with content that might be suitable for discussing the scientific evidence supporting or refuting the above potential etiologic factors in the development of chronic constipation.

Results

The contents of 1 patient handout, 2 review articles and 13 original research papers are included.

Do diet, fluid intake, and exercise play a role in the development of chronic constipation? In a survey of 90 community-dwelling subjects, their efforts to use diet, fluid intake, and exercise to prevent constipation were assessed. Most felt that they had been preached to regarding the importance of these three measures. However, they reported constraints that prevented full adherence. Some did gain from diet adjustment, but the majority is disillusioned about these strategies for avoiding constipation [3].

Does inadequate fluid intake cause constipation? Twenty-one thousand twelve nursing home residents with a Minimal Data Set recorded at baseline and at 3 months were assessed. Baseline prevalence of constipation was 12.5%. These subjects were excluded. At 3 months, 7% of the remaining subjects developed constipation. Independent factors, in order of magnitude, that were associated with the development of constipation were race, decreased fluid intake, pneumonia, Parkinson's disease, and presence of allergies [4]. This report appeared to support an association between decreased fluid intake and the development of constipation among nursing home residents (4). The effect of drinking more fluid was assessed in an interview study of 883 elderly patients who were also examined. 71% reported usual fluid intake of 6 or more glasses per day. 29% reported intake of less. The amount of water intake did not reveal significant associations with lying and standing blood pressures, history of falling, frequency of chronic constipation, or fatigue and tiredness [5]. This interview study did not support a link between fluid intake and the development of constipation. One observational study showed that increased water intake enhanced the beneficial effect of fibers. One hundred seventeen adult patients with functional constipation were enrolled. During the study period they all consumed 25 g fiber per day. Group 1 ($n = 58$) was randomized to ad libitum fluid intake. Group 2 drank 2 liters of mineral water per day. Both groups showed a statistically significant increase in stool frequency and decrease in laxative use. These changes were significantly greater in Group 2 [6]. The beneficial effect of fluid was not necessarily reproducible in another clinical study. The effect of increased fluid intake on stool output was assessed in 15 healthy volunteers (age, 23–46 years). Nine were assigned to extra intake of isotonic fluids, and six to extra free water. The increase in fluid intake significantly increased urine output ($P < 0.05$). There was, however, no significant change in stool output [7]. Epidemiological review, interview, and clinical studies have yielded conflicting information to implicate inadequate fluid intake as an etiological factor in the development of constipation. One recent review article noted that "dehydration" due to reduced fluid intake decreases stool frequency and stool weight but not gut transit time. Increased fluid intake in the absence of dehydration does not appear to improve constipation [8].

Does insufficient dietary fiber intake cause constipation? In a cohort study, 18 constipated and 18 control elderly subjects were studied to assess dietary, psychological, and physiological factors on chronic constipation. Constipated subjects consumed fewer meals per day compared with controls ($P < 0.01$). They consumed fewer calories ($P = 0.07$). There were no differences in fiber and fluid intake, or other diets, between the constipated subjects and the controls. Slow colonic transit was unrelated to dietary fiber intake, activity level, or age. Slow colonic transit was significantly related to low caloric intake ($P < 0.0001$), higher percentage of protein in diet ($P < 0.05$), and low fluid intake ($P < 0.05$), and psychological symptoms ($P < 0.05$) of somatization, obsessive-compulsiveness, depression, anxiety, and global severity index [9]. The influence of physical activity, fiber intake, and other lifestyle variables on the development of constipation was evaluated by the responses of 62,036 women (age, 36–61 years) to mailed questionnaires in 1980 and 1982. Three thousand three hundred twenty-seven women (5.4%) had constipation defined as two or fewer bowel movements weekly. Those reporting the highest fiber intake (20 g per day) were less likely to experience constipation (prevalence ratio [PR] = 0.64, 95% confidence interval [CI] = 0.57–0.73) than those reporting the lowest intake (7 g per day) [10]. The potential interactions among pelvic organ prolapse, constipation, and dietary fiber intake were addressed in a case-control study involving 60 women with prolapse and 30 controls. The participants responded to two questionnaires on dietary fiber intake and constipation. The risk of constipation was greater in women with prolapse than controls (odds ratio = 4.03, 95% CI = 1.5–11.4). The median insoluble fiber intake was significantly lower in women with prolapse (2.4 g) than controls (5.8 g; $P < 0.01$) [11]. A recent review suggested that dietary fibers appear to improve constipation. A diet low in fiber may contribute to constipation but is not necessarily the sole cause. Increased dietary fiber may help some, but not necessarily all patients with constipation [8].

Does decreased physical activity result in constipation? When the abstracts or full papers resulting from the Medline search described above were reviewed, not a single paper

Table 1 Regular exercise in management of chronic idiopathic constipation

	Rest period	Exercise period	*P*
Miles/day covered	1.8 ± 0.33	3.24 ± 0.28	0.007
Constipation index	9.11 ± 0.65	8.57 ± 1.08	0.68

with actual data definitively implicating decreased mobility as a causal factor in the development of constipation was identified. Nonetheless, as noted above, there was one study that addressed the influence of physical activity, fiber intake, and other lifestyle variables on the development of constipation [10]. Daily physical activity was associated with lower prevalence of constipation (PR = 0.56, 95% CI = 0.44–0.70) [10]. The role of regular exercise in the management of chronic idiopathic constipation was evaluated in a small study. Eight patients (seven women, one man) took part in a program of 2 weeks of rest and 4 weeks of regular exercise. Participants exercised for 1 hr a day, 5 days a week. Overall physical activity was assessed by pedometer. Diary data included number and consistency of bowel movements as well as amount of straining. An index of bowel function was developed using all three parameters, such that a higher index indicated more severe constipation [12]. Table 1 shows that participants indeed performed more exercises during the exercise period, but there was no dramatic change in the constipation index. The investigators suggest that physical activity, to the extent that people consider "regular exercise," does not play a role in the management of chronic idiopathic constipation [12]. The same review referred to above also pointed out that a decrease in physical activity increases gut transit time, but factors that lead to constipation may also lead to diminished activity, and that modest activity may help individuals with mild but not severe constipation [1]).

Is constipation due to side effects of drugs a serious problem? One cohort study involving 2355 patients focused its attention on constipation as the consequence of adverse drug effects in the nursing home. The study estimated the incidence relative risk of constipation. The technique of prescription sequence analysis of pharmacy records was employed. Data on morbidity and mobility were also recorded. Moderately to strongly constipating drugs were associated with a relative risk of 1.59 (95% CI = 1.24–2.04). Mildly to moderately constipating drugs were associated with a relative risk of 1.13 (95% CI = 0.93–1.38). The results revealed that the risk of drug-induced constipation was not as high as in previous studies. The authors suggested that the high prevalence of constipation among nursing home residents is only partly due to adverse drug effects [13].

Are there more hypothyroid patients among the constipated? One prospective study evaluated anorectal physiology

Table 2 Anorectal physiology and gut transit in hypothyroid patients

	Hypothyroid	Control
Maximum resting pressure (MRP; mm Hg)	55	41
Maximum squeeze pressure (MSP; mm Hg)	83	88
Threshold sensation for impending evacuation	+ +	+
Maximum tolerable rectal volumes	+	+ +
Prevalence of delayed whole-gut transit	+	+

in hypothyroid patients with constipation using anal manometry, rectal balloon sensation, and whole-gut transit markers. Thirty patients (24 females; median age, 59 years;range, 23–80 years) and 22 healthy controls (13 females; median age, 51 years; range, 24–65 years) were enrolled. Thirty-three percent had symptoms of bowel dysfunction prior to the onset of hypothyroidism. Table 2 shows that hypothyroid patients with constipation had altered rectal sensation (14). The relationship between thyroid hormones and gut function was quite appropriately summarized recently as follows. Many hypothyroid patients have constipation, but few young or middle-aged patients with constipation without other signs and symptoms of hypothyroidism in fact have hypothyroidism [8].

Do sex hormones alter gut function? The relation between sex hormones and gut function is best illustrated by the data on progesterone. Progesterone is increased during pregnancy. Gut transit time is also significantly prolonged during pregnancy. The association suggests that sex hormones such as progesterone may alter gut function during pregnancy [8]. A recent report added that in females with chronic constipation, there is overexpression of progesterone receptors compared with that in controls [15].

Does lower endoscopy yield more cancers in patients with constipation? The yield of lower endoscopy in patients with constipation was studied by a search of three hospital databases for colonoscopies or sigmoidoscopies performed with constipation as one of the procedure indications. The main outcome of interest was neoplasia. Of 19,764 sigmoidoscopies or colonoscopies, 563 patients (age 61 years; 52% women) had constipation as one of the procedure indications; 58% had other procedure indications. Table 3 shows that the finding of colorectal cancers, adenomas, or advanced lesions was as expected in asymptomatic screening subjects [16].

Table 3 Yield of lower endoscopy in patients with constipation

Overall diagnosis (*N* = 563)		*Colonoscopy diagnosis* (*N* = 358)	
Colorectal cancer	1.4%	Cancer	1.7%
Adenomas	14.6%	Adenomas	19.6%
Advanced lesions	4.3%	Advanced lesions	5.9%

Discussion and conclusion

A search of the recent literature revealed that there is a paucity of evidenced-based publications that address the etiologic factors of chronic constipation. Much of what has been popularized in the past, and even to the present, may be based primarily on myths handed down from one generation to the next [3, 8]. In the absence of well-designed studies, there does not appear to be sufficient evidence-based information to implicate insufficient dietary fiber intake, inadequate fluid intake, reduced physical activity, side effects of drugs, hypothyroidism, sex hormones, or cancer obstruction as a major etiologic factor in the development of chronic constipation. Researchers interested in the study of constipation should consider reassessing the etiological role of each of these factors in the development of chronic constipation using modern techniques and methodologies. Funding agencies including the government and industry sponsors should not hesitate to support the development of evidence-based data sets to address the etiological role of these factors in the development of chronic constipation. An understanding of the etiology of chronic constipation is the foundation on which cost-effective management strategies are to be built.

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