THE PREVALENCE OF COLONIC DIVERTICULAR DISEASE IN PATIENTS WITH BOWEL SYMPTOMS

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Background and Aim: *Colonic diverticular disease is a common disorder worldwide, but its prevalence varies among different countries and regions. The aim of this study was to investigate the prevalence of colonic diverticular disease in adult patients with bowel symptoms in mid-Taiwan.*

Materials and Methods: *We retrospectively analyzed 3885 consecutive patients who received barium enema examinations for a variety of bowel symptoms at the China Medical University Hospital in mid-Taiwan from January 2001 to December 2005.*

Results: *Our study revealed that the prevalence of colonic diverticular disease in an adult population with bowel symptoms in mid-Taiwan was 11.9%. This prevalence was lower than that in Western countries and some developed Asian countries. Moreover, the peak prevalence occurred in the age group of 81-90 years. In contrast to the Caucasian population, right colonic involvement was predominant 63.8%, but left hemicoloic, and bilateral distributions were 20.3%, and 15.9%, respectively. The most common site of involvement was the ascending colon, which occurred in 56.8% of the patients. The prevalence increased with age for both right and left diverticulosis, with right diverticulosis predominating among the younger age groups.*

Conclusion: *The prevalence of colonic diverticular disease in patients with bowel symptoms in mid-Taiwan is lower than that of the other developed Asian countries, but this disease did show a predominance of right-sided involvement similar to other Asian populations.*

Key words: diverticular disease, colon, barium enema

INTRODUCTION

Colonic diverticular disease is a common disorder in Western countries and presents with a wide spectrum of clinical manifestations ranging from asymptomatic disease to potentially lethal complications [1]. In contrast to Western industrialized countries, colonic diverticular disease is not common in Eastern countries, including Taiwan. A wide variation in the prevalence of colonic diverticular disease has been reported in the English literature, ranging from a high prevalence (43%) in adult females in Northern Norway to a low prevalence (< 2%) in Iran and Nigeria [2,3]. The prevalence of colonic diverticular disease has been regarded as low among the Taiwanese population, but to our knowledge only one study has been published regarding Taiwan [4]. Therefore, we attempted to investigate the prevalence of colonic diverticular disease by retrospectively reviewing the findings of barium enema examinations in patients with bowel symptoms in mid-Taiwan.

MATERIALS AND METHODS

We retrospectively investigated 3885 consecu-

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tive patients who underwent barium enema examinations after presenting with abdominal pain, weight loss, hematochezia, constipation, or diarrhea at the China Medical University Hospital in mid-Taiwan from January 2001 to December 2005. Patients aged greater than 18 years old were enrolled in the current study. Written informed consent was obtained from all patients before they underwent barium enema examinations. The same experienced radiologist reviewed all the findings from these examinations. The age, sex, and locations of colonic diverticula were recorded and analyzed. The splenic flexure was used as the dividing point between the left and right colons.

RESULTS

Over a 5-year study period at our hospital, a total of 3885 patients who underwent barium enema examinations were enrolled in this study. Among them, 1603 were male and 2282 were female. Overall, 464 patients (11.9%) demonstrated colonic diverticulosis, including 230 male and 234 female patients. The prevalence among male patients was 14.3%, whereas it was 10.3% among female patients (Table 1).

Analysis of the age distribution of the patients with colonic diverticular disease revealed a bimodal distribution with a peak prevalence at 81-90 years of age (19.9% of patients in this age group) (Fig. 1). Both sexes showed a similar age distribution pattern. There was a relatively lower prevalence of diverticular disease among the age group of 61-70 years for both sexes (Fig. 1).

We next analyzed the anatomical distribution pattern among the 464 patients with diverticular disease. The ascending colon was the most common site (57.3%), followed by the cecum (33.6%), the sigmoid colon (26.5%), the descending colon (20.3%), and the transverse colon (11.9%) (Fig. 2). Thus, 296 (63.8%), 94 (20.3%), and 74 (15.9%) diverticular disease were distributed over right hemicolonic, left hemicolonic, and bilateral colonic segments, respectively (Fig. 3). In terms of the number of involved sites, 328 (70.7%), 94 (20.3%), 16 (3.4%), and 26 (5.6%) patients had 1, 2, 3, or more than 3

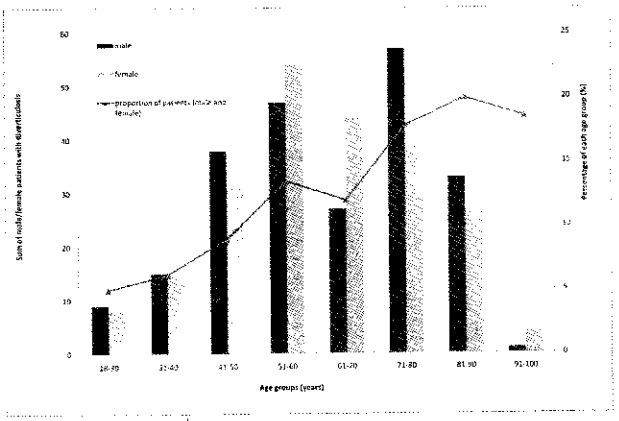

Fig. 1. Proportion of patients with colonic diverticulosis among different sex and age groups and the prevalence of colonic diverticulosis by age group.

Table 1. The prevalence rates of colonic diverticular disease among different sex and age groups

	Barium enema	Barium enema with diverticulosis	
Age (years)	N	N	%
Males	1603	230	14.3
18-30	112	9	8.0
31-40	202	16	7.9
41-50	292	38	13.0
51-60	266	48	18.0
61-70	239	28	11.7
71-80	308	57	18.5
81-90	169	33	19.5
91-100	15	1	6.7
Age (years)			
Females	2282	234	10.3
18-30	230	8	3.5
31-40	287	15	5.2
41-50	478	31	6.5
51-60	486	54	11.1
61-70	357	44	12.3
71-80	300	51	17
81-90	132	27	20.5
91-100	12	4	33.3
Total	3885	464	11.9

diverticula, respectively.

The prevalence of right and left diverticulosis increased with age (Table 2). Right diverticulosis increased from 4.1% among the age group of 18-30 years to 13.9% among the age group of 81-90 years. Left diverticulosis increased from 0.3% among the age group of 18-30 years to 14.6% among the age group of 81-90 years (Table 2). In the younger age groups, particularly below age 40, right diverticulosis was predominant. However, with advancing age, the proportions of left and bilateral diverticulosis increased concomitant with the decreasing proportion of right diverticulosis (Fig. 4). Nonetheless, right diverticulosis was still more prevalent than left diverticulosis among the patient groups up to 80 years of age (Table 2).

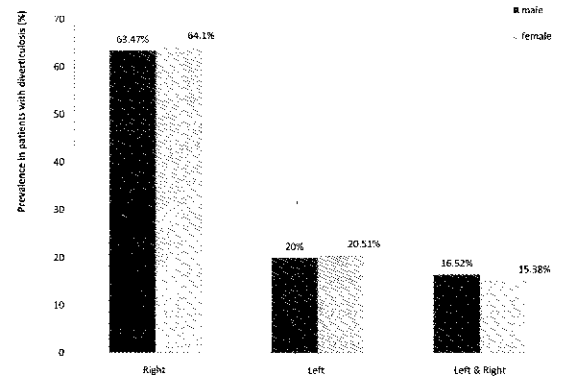

Fig. 2. Distribution of diverticula among different colonic segments (individual patients may have more than one site of involvement).

Table 2. The prevalence of colon diverticular disease of right-sided and left-sided colon among different age groups

Age (Years)	Right (%)	Left (%)
18-30	4.1	0.3
31-40	5.1	0.6
41-50	7.9	1.0
51-60	11.8	2.8
61-70	9.9	5.4
71-80	10.5	8.9
81-90	13.9	14.6
91-100	11.1	14.8
Total	9.2	4.3

DISCUSSION

The prevalence of colonic diverticular disease is high in industrialized societies with a Westernized lifestyle; however, it is low in undeveloped and developing societies [1]. Our study demonstrated that the prevalence of colonic diverticular disease among adult patients with bowel symptoms in mid-Taiwan was 11.9%. This was lower than that of most Western countries and other developed Asian societies if barium enema examination was used as the study method (Table 3) [5-15]. However, the data derived from barium enema examinations in patients with bowel symptoms may not be representative of the general population.

It is well known that the most common location of colonic diverticula in Western countries is the left hemicolon. By contrast, diverticular disease predominantly affects the right-sided colon in Asian countries [12,16-19]. The cause for this geographic difference is not fully understood. Based on the observation that there is no difference in the anatomical distribution of diverticular disease between native Japanese and Hawaiian Japanese, who consume different diets, suggests that the cause of the site predilection for diverticular disease is determined more by genetic or racial predisposition than by environmental influences [16,18]. Similar observations among Chinese in Taiwan, Hong Kong, and Hawaii appear to support this hypothesis.

Ohta et al. reported correlations between decreased dietary fiber intake and colonic diverticular disease in Japan and concluded that right-sided diverticular disease of the colon was associated with lower dietary fiber intake [20]. Moreover, Lin et al. studied the relationship between long-term dietary habits and the prevalence of right-sided diverticulosis in Taiwan [21]. They concluded that the prevalence of right-sided diverticulosis was strongly associated with the frequency of past meat consumption. There was no association with the frequency of vegetable or fruit consumption, laxative use, or supplementary fiber intake [21]. The muscle layer involvement in

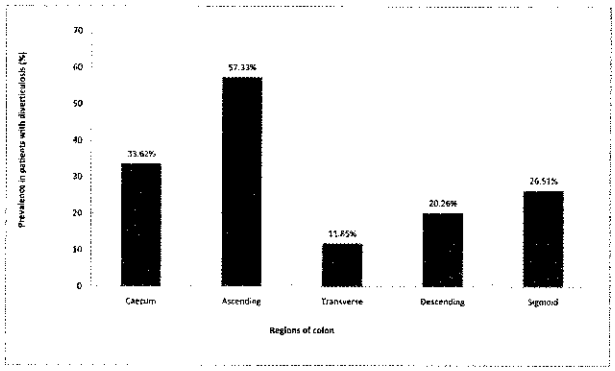

Fig. 3. Distribution of patients with colonic diverticulosis in different sides of the colon.

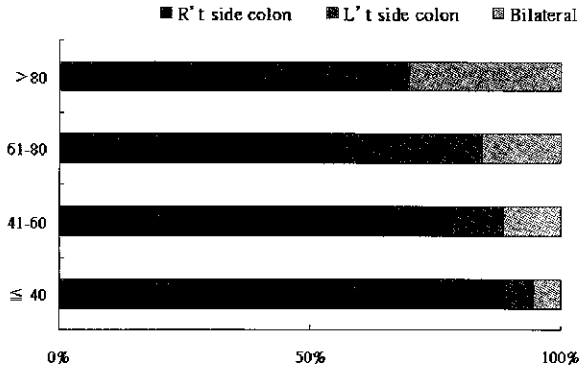

Fig. 4. Proportion of right and left diverticulosis by age group. Right-sided colon diverticula predominate among younger age groups, whereas left-sided and bilateral diverticula increase with age.

colonic diverticular disease is significantly associated with muscular hypertrophy, which often precedes the appearance of muscular herniation [22]. In addition, high intraluminal pressure and abnormal motility in the ascending colon also plays an important role in the pathogenesis of right-sided diverticular disease [23]. Therefore, it has been hypothesized that diet affects the overall incidence of diverticulosis, whereas hereditary factors, such as the structural makeup of the right colon wall, may determine the site of occurrence [11,24].

Chen et al. reviewed the occurrence of colonic diverticular disease in Taiwan. They reported that the sigmoid colon was the most common location (45.4%), followed by the ascending colon (36.4%), cecum (33.3%), descending colon (18.2%), transverse colon (12.1%), and the rectum (1.5%). The prevalence of left-sided diverticular lesions (46.9%) was approximately equal to that of right-sided lesions (43.9%) [4]. By contrast, our study demonstrated that the distribution of diverticular disease in the cecum, ascending colon, transverse colon, descending colon, and the sigmoid colon was 33.6%, 57.3%, 11.9%, 20.3%, and 26.5%, respectively. Right-sided lesions occurred in 63.8% of patients, while left-sided lesions occurred in 20.3% of patients with diverticular disease. The difference in the distribution pattern of diverticular disease between Chen's study and our report may be a result of the methods used for investigation. In Chen's study, they used either colonoscopy or barium enema to evaluate the presence of colonic diverticula. Colonoscopy is not sensitive enough to visualize diverticula because of insufficient withdrawal times or lack of a detailed investigation by an endoscopist throughout the examination. The overall detection rate of diverticular disease in the colon was 4.3% among the 7913 patients who received colonoscopic examinations over a period of 5 years from January 2001 to December 2005 at our hospital (personal unpublished observation). The detection rate of diverticular disease of the colon by colonoscopy is significantly lower than that by the barium enema examination. Thus, the barium enema examination is a more sensitive modality than colonoscopy for detecting diverticular disease of the colon.

Increasing frequencies of diverticulosis with age have been reported in most studies [25-29]. Wess et al. reported that older patients have increased collagen cross-linking of the colon wall, which makes the colon wall more rigid and promotes colonic diverticular disease [30]. Interestingly, we showed that the prevalence of diverticulosis was relatively lower in the 61-70 year age group compared to other groups. One possibility was due to a bias during case selection. Alternatively, this age group was born around the time of World War II, and perhaps a higher maternal vegetable diet in their fetal life during war time was associated with a lower development of colonic diverticulosis later in their life. Wess and

Table 3. The prevalence of colonic diverticular disease in different countries

Reference	Country	Year of study	Prevalence (%)	Method
Havia T[5]	Finland	1969	12	BE
Manousos ON et al.[6]	England	1967	7.6 (< 60 years) 34.9 (> 60 years)	BE
Levy N et al.[7]	Israel	1984	9.5	BE
Sim GP et al.[8]	New Zealand	1982	35.3	BE
Dabestani A et al.[2]	Iran	1981	1.6 (> 20 years)	BE
Burkitt DP et al.[9]	United states	1985	60	BE
Calder JF[10]	Kenya	1978	6	BE
Ogunbiyi OA[3]	Nigeria	1985	1.8	BE
Chia JG et al.[11]	Singapore	1991	20	BE
Vajrabukka T et al.[12]	Thailand	1980	4	BE
Kim EH[13]	Korea	1964	0	BE
Chan CC et al.[14]	Hong Kong	1998	25.1	BE
Miura S et al.[15]	Japan	2000	28.3	BE
Current study	Taiwan	2009	11.9	BE

BE, barium enema

colleagues carried out a study with rats to investigate the relationship between maternal dietary fiber intake during pregnancy and colonic diverticular disease in the offspring later in life. The incidence of colonic diverticulosis was greater in the offspring of maternal rats consuming fiber-deficient diets [30]. The association between a high-fiber diet and a lower prevalence of colonic diverticulosis needs to be confirmed in a prospective population study.

In conclusion, our study demonstrated that Taiwanese patients with bowel symptoms showed a lower prevalence of colonic diverticular disease compared to other Asian populations. The ascending colon was affected most frequently, the prevalence of right and left diverticulosis increased with age, and right diverticulosis was predominant among the younger age groups.

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