Inflammatory bowel disease incidence and prevalence in southern Alberta

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ABSTRACT: Incidence and prevalence rates of inflammatory bowel disease were estimated for 1976-81 in southern Alberta. Cases were identified using hospital and physician records and membership lists of the Canadian Foundation for Ileitis and Colitis. A mail survey was conducted to obtain demographic data. Population data were obtained from Statistics Canada. The overall prevalence rate of IBD in men was 69.1 per 105 and 97.6 per 105 in women. Incidence rates of IBD were 6.0 per 105 per year in men and 9.2 per 10 5 per year in women. These sex differences were due to Crohn's disease as female incidence rates were twice that of male rates 6.3 per 105 per year versus 3.1 per 105 per year. A bimodal age distribution and female predominance in the younger age groups was apparent for Crohn's disease. **Can J Gastroenterol 1990;4(5):187-192**

Key Words: *Crohn's disease, Incidence, Prevalence, Ulcerative colitis*

Incidence et prévalence des entéropathies inflammatoires chroniques dans le sud de l'Alberta

RESUME: Les taux d'incidence et de prévalence des entéropathies inflammatoires (IBD) ont été estimés pour la période 1976-81, dans le sud de l'Alberta. Les cas ont été recensés d'après les dossiers des hôpitaux et des médecins, et les listes de membres de la Fondation canadienne pour l'iléite et la colite. Un sondage a également été effectué par correspondance pour obtenir des données démographiques. Les renseignements portant sur la population ont été fournis par Statistique Canada. Les taux de prévalence globale d'IBD étaient de 69,1 pour 105 chez les hommes et de 97,6 pour 105 chez les femmes. Les taux d'incidence annuelle étaient de 6,0 pour 105 chez les hommes et de 9,2 pour 105 chez les femmes. Ces différences liées au sexe étaient attribuables à la maladie de Crohn, pour laquelle le taux féminin d'incidence est deux fois plus élevé (6,3 pour 105 par an) que le taux masculin (3,1 pour 105 par an). Une distribution bimodale en fonction de l'âge et la prédominance féminine dans les groupes plus jeunes étaient apparentes dans la maladie de Crohn.

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INFLAMMATORY BOWEL DISEASE (IBD) has emerged as a spectrum of chronic conditions which share similar clinical, pathologic and biologic features (1). Improved diagnostic criteria in the early 1960s provided a basis for description and comparison of the characteristics of IBD in order to identify risk factors. Since that time a rising incidence of IBD has been reported in several countries. While some of the early increases were possibly an artefact of reporting, increases have been sustained over time and do reflect a real increase in disease. Rates continue to increase in some areas, have stabilized in others, and now appear to show a modest decline in a few (2). Of particular concern are reports suggesting that incidence and mortality rates of Crohn's disease are increasing in younger patients; trends not apparent in ulcerative colitis patients (3-5).

Chronic IBD is more common in industrialized countries. Incidence rates approximate four to six cases per 100,000 and prevalence rates of 40 to 100 per 100,000 are reported for adult Caucasians in high rate regions such as the United States, England and Scandinavia (2). IBD occurs more frequently in females, and onset continues to be highest in adolescents and young adults (1). Rates are thought to be higher in the upper socioeconomic groups, in

professional and white collar workers, and in urban regions (6). This variation in occurrence suggests a role for environmental and lifestyle factors in the pathogenesis of disease. A descriptive epidemiological study was undertaken to examine incidence and prevalence rates for IBD in southern Alberta, a region for which data have not previously been available.

PATIENTS AND METHODS

In 1982 the Division of Gastroenterology at the University of Calgary began systematically to identify IBD patients living in the southern part of the province, defined by specific census divisions used by Statistics Canada. A questionnaire to provide information on demographic, clinical and lifestyle factors was developed, pilot-tested and mailed to all IBD patients who had been identified through three sources: a list of approximately 450 Alberta members of the Canadian Foundation of Ileitis and Colitis; hospital records; and physician records. An alphabetical index of patients (by family name) was created which provided basic identifying information (date of birth and address) and allowed duplicates to be removed.

Thirty-seven of 38 hospitals from the defined region participated in this effort. Because IBD patients receive numerous referrals, the majority recorded at the nonparticipating hospital (a small facility with less than 30 beds) would have been found through records reviewed elsewhere. Medical records librarians provided lists of patients with specific International Classification of Disease codes for discharge diagnoses from admissions between 1976 and 1982 (Table 1) (7,8). Detailed medical records exist in Alberta as a result of the comprehensive health insurance plan which has over 98% of the population registered.

The physician response to a letter requesting participation in this survey was excellent, with all of the gastroenterologists and a majority of other specialists collaborating. Physician records were obtained from larger practices by trained research staff who screened all charts and selected appropriate cases. For smaller practices, the staff searched records and supplied a list of patients to the research centre. Duplicate names, the result of a patient being seen by more than one participating physician, were identified and eliminated. Diagnoses were confirmed using standard radiological and surgical reports. For those who had not had surgery, biopsy reports were obtained and reviewed.

A mail survey of the 1093 identified patients was initiated in the summer of 1983. Each mailing included a covering letter, questionnaire, the Canadian Foundation of Ileitis and Colitis pamphlet and a return envelope. If a response was not received, two reminder mailings were sent out at approximately eight week intervals. Letters not deliverable were returned, searches for current addresses were undertaken (using telephone books, city directories, and telephone calls to next of kin), and second letters were redirected to patients where possible. Seventy-seven per cent of identified subjects returned questionnaires which were coded and entered into a computer file. Prevalence rates are based on all identified cases, while incidence rates are based on survey responses which included the date of diagnosis. The diagnosis used was that based on a review of radiological, surgical and histological evidence. In the few cases for which this was unavailable the diagnosis reported by the respondent was used. Rates for definite, probable and possible diagnoses were estimated to establish potential ranges. Age- and sex-specific rate estimates for Crohn's disease and ulcerative colitis were based on definite diagnoses.

As the majority of gastroenterologists, general surgeons and hospitals likely to serve this population participated in this effort, it was anticipated that the bulk of cases were identified. While some under-ascertainment may occur, this is more likely for ulcerative colitis than Crohn's disease, as ulcerative colitis patients are less likely to have surgery, and have fewer hospital admissions than Crohn's disease patients.

Population data were obtained from Statistics Canada for census work completed in 1976 and 1981. Southern Al-

TABLE 1
Inflammatory bowel disease diagnosis classification numbers using the International Classification of Diseases*

ICDA-8 diagnosis for 1976-78	
Regional enteritis or ileitis	563.0
Ulcerative colitis	563.1
Proctitis	569.0
ICD-9-CM diagnosis for 1979-82	
Regional enteritis – small intestine	555.0
Regional enteritis – large intestine	555.1
Regional enteritis – small and large intestine	555.2
Regional enteritis – unspecified site	555.9
Idiopathic proctocolitis	556.0

A change from ICDA-8 (7) to ICD-9-CM (8) took place in 1979

TABLE 2
Southern Alberta population for 1976 and 1981 by age and sex

	Males		Females	
Age (years)	1976	1981	1976	1981
0-9	76,626	88,555	73,101	83,655
10-19	93,816	96,805	90,060	92,905
20-29	88,169	132,835	84,254	120,440
30-39	57,831	87,580	56,025	81,035
40-49	50,220	55,910	47,231	52,730
50-59	40,014	46,515	41,654	46,335
60-69	27,160	31,175	29,269	34,765
70-79	14,880	17,450	16,659	20,555
>80	6,410	6,515	8,410	10,280
Total	455,126	563,340	446,663	542,700

TABLE 3
Residence patterns of inflammatory bowel disease by diagnosis*

	Crohn's disease		Ulcerative colitis		IBD	
	No.	Percentage	No.	Percentage	No.	Percentage
Residence at diagnosis						
Alberta	439	86	194	82	708	85
Outside Alberta	61	12	37	16	110	3
Outside Canada	9	2	6	3	17	2
Place of birth						
Alberta	274	54	105	44	416	50
Other Canada	172	34	98	41	311	37
Outside Canada/NS	63	12	34	14	108	13
Parent born in Canada						
Mother	347	68	151	64	550	66
Father	301	59	131	55	481	58
Both	509	100	237	100	835	100

Includes definite and probable diagnoses; NS Not specified

TABLE 4
Prevalence (per 10^5) and incidence (per 10^5 per year) rates for inflammatory bowel disease by definite and probable diagnosis and by sex (1976-81)

	Prevalence*				Incidence			
	Females		Males		Females		Males	
	No.	Rate	No.	Rate	No.	Rate	No.	Rate
All IBD†								
Definite	419	84.7	311	61.1	200	8.1	138	5.4
Probable‡	64	12.9	41	8.1	28	1.1	16	0.6
Total	483	97.6	352	69.1	228	9.2	154	6.1
Crohn's disease								
Definite	307	62.1	188	36.9	157	6.4	78	3.1
Probable‡	8	1.6	6	1.2	4	0.2	1	0.0
Total	315	63.7	194	38.1	161	6.5	79	3.1
Ulcerative colitis								
Definite	103	20.8	115	22.6	43	1.7	55	2.2
Probable‡	8	1.6	11	2.2	2	0.1	6	0.2
Total	111	22.4	126	24.7	45	1.8	61	2.4

Includes all identified cases; †Includes subjects with other and unspecified IBD diagnoses; ‡Includes probable and possible diagnoses

berta was defined as a geographical area of 164,619 square kilometers which included census divisions 1 to 8 and half of 9, which is a sparsely populated division running north to south on the western border of the province. The total population of southern Alberta in 1976 was 0.89 million; this increased to 1.1 million in 1981 (9). Given this increase, which was primarily a reflection of migration into the province for jobs, rate estimates are based on the population average from both census years. The population distribution by sex and age for southern Alberta are shown in Table 2; this represents 49% of the total Alberta population. In 1976, ethnicity in Alberta (defined by mother tongue), was 81% English, 4% German, 4% Ukrainian, 2% French and 9% other.

RESULTS

A total of 835 patients, 509 with Crohn's disease, 237 with ulcerative colitis and 89 with other, unspecified IBD diagnoses were identified. The majority of IBD patients were born in Canada (87%) and were resident in Alberta (85%) at the time of diagnosis (Table 3). On average, patients had lived in Alberta for 27 years, with 71% having lived at their current address for more than two years.

The overall prevalence rate of IBD in southern Alberta was 97.6 per 10^5 in females and 69.1 per 10^5 in males (Table 4). This sex difference was primarily due to Crohn's disease rates, which were 70% higher in females (63.7 per 10^5) than in males (38.1 per 10^5). Ulcerative colitis prevalence rates were similar in females (20.8 per 10^5) and males (22.6 per 10^5).

In this series, 240 new cases of Crohn's disease and 106 new cases of ulcerative colitis were identified over a five year period. The incidence rate for Crohn's disease in females (6.5 per 10^5) was double that for males (3.1 per 10^5), while the rate for ulcerative colitis was similar in females and males (1.8 and 2.4 per 10^5, respectively). Definite diagnoses made up 97% of the Crohn's disease and 98% of the ulcerative colitis incidence rates. The pattern of prevalence rates by age at diagnosis was similar to the pattern of incidence rates (Figures 1,2). Age-specific rates of Crohn's disease were higher than ulcerative colitis before age 40 years for both sexes and in females up to age 60. A bimodal distribution for Crohn's disease rates was clearly found for females and males, with peaks at ages 20 to 29 and 50 to 59. The 20 to 29 peak was also found for ulcerative colitis in females, but was not as pronounced as that for Crohn's disease, nor was it as evident in males. Male ulcerative colitis rates tended to plateau between the ages of 20 and 59.

The incidence rate of Crohn's disease in females was greater than in males up to age 60 years (Figure 3). This is in contrast to the higher male rates observed for ulcerative colitis cases diagnosed between ages 30 and 60 years.

Overall, the female to male ratio was 2.1 for Crohn's disease and 0.8 for ulcerative colitis.

DISCUSSION

Before discussing how the patterns of IBD in the present study compare to those reported elsewhere, the issue of accuracy in these estimates must be addressed. As birth and residence patterns were similar for ulcerative colitis and Crohn's disease patients and recent migration modest, it seems unlikely

that migration from high or low incidence regions would strongly influence the picture of IBD presented by this series.

Prevalence rates are conservative given the potential for under-reporting by physicians. Incidence rates are even more conservative given physician under-reporting and the presence of incomplete patient responses to the survey. This implies that the actual rates of IBD are at least as large and probably larger than those reported here. The exclusion of probable and possible diagnoses serves to provide conservative estimates of incidence rates by sex and age for Crohn's disease and ulcerative colitis, and minimizes the potential for misclassification of these diagnoses. In spite of these limitations, the ratio of prevalence to incidence rates is what one would expect (approximately 10) based on other reports (2).

A comparison of respondents and nonrespondents was conducted to evaluate potential biases by sex, diagnosis and age for incidence rates. There was no difference in the proportion responding by sex, but some difference in the proportion of response by diagnosis was evident (Table 5). If it is assumed that this pattern holds for all nonrespondents, the incidence rate of Crohn's disease in this series is underestimated by about 15% (86/581=0.148) and the incidence rate of ulcerative colitis by 12% (29/247=0.117). There were no differences in proportions responding by age at diagnosis for males or females with ulcerative colitis, suggesting that the pattern of rates is unlikely to be biased by these factors. As younger females with Crohn's disease were more likely to respond (68% of respondents and 38% of nonrespondents were younger than 30 years old), the pattern of incidence rates for Crohn's disease in older women may be under-represented, and the age-specific female to male ratios should be interpreted with caution.

Ulcerative colitis is known to be more frequent in US white, British and northern European populations where prevalence rates range from 39 to 117 per 10^5 (2). Prevalence rates observed in southern Alberta tend to be lower than this and lower than rates reported in a similar study in northern Alberta (10). The incidence rate of ulcerative colitis in southern Alberta (2.5 per 10^5) is similar to that reported in Baltimore, Maryland over a comparable time period (2.2 per 10^5 for 1977-79) and lower than that reported in northern Alberta (2,10). This result is consistent with the Canadian mortality rate for ulcerative colitis (0.23 per 10^5) and the US white mortality rate (0.28 per 10^5) (11). The difference in rates between the two regions of Alberta is probably

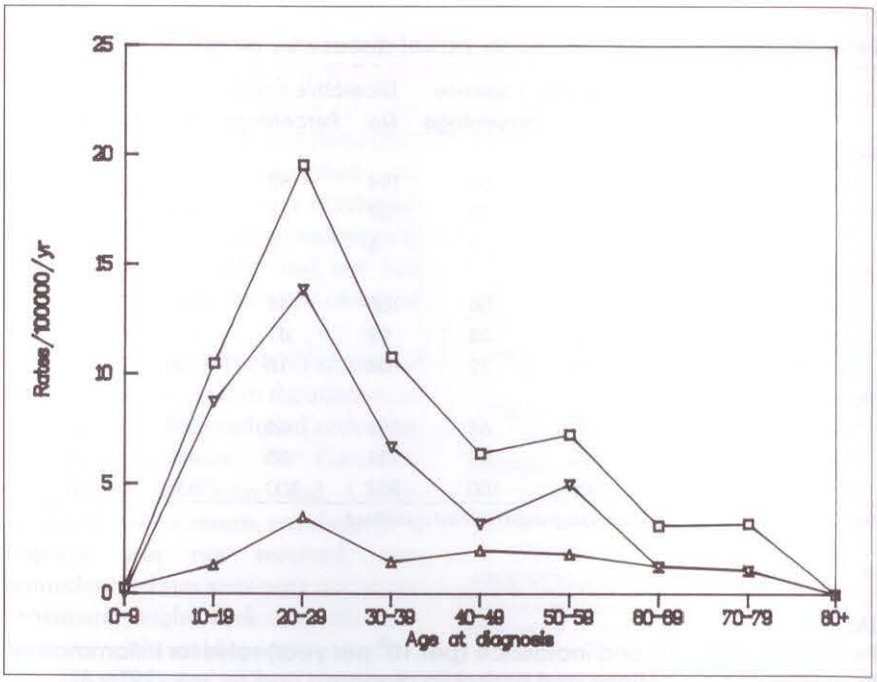

Figure 1) *Incidence rates of inflammatory bowel disease in females in southern Alberta (per 10^5 per year). ❑ Inflammatory bowel disease; Δ Ulcerative colitis; ∇ Crohn's disease*

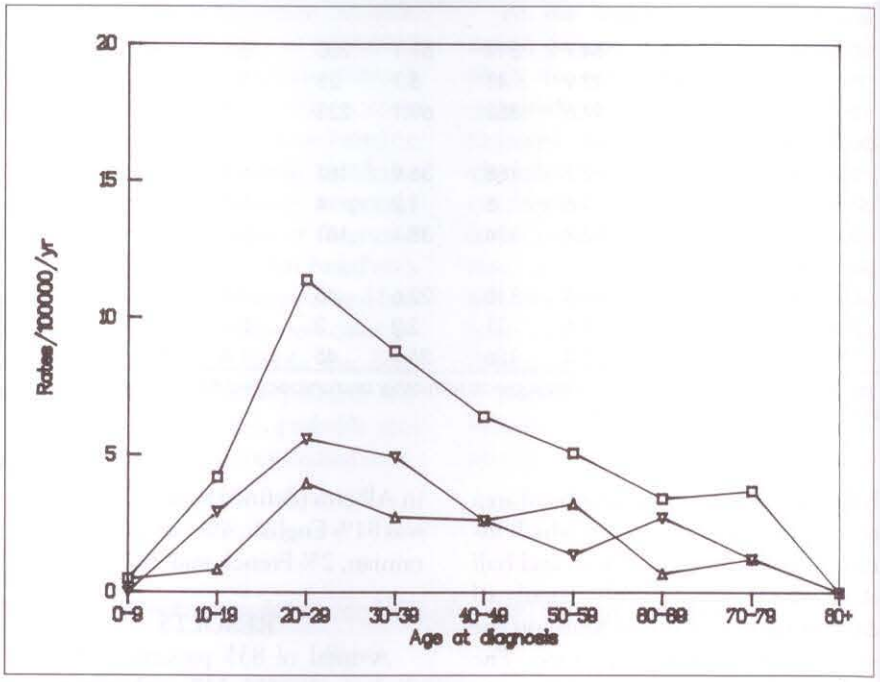

Figure 2) *Incidence rates of inflammatory bowel disease in males in southern Alberta (per 10^5 per year). ❑ Inflammatory bowel disease; Δ Ulcerative colitis; ∇ Crohn's disease*

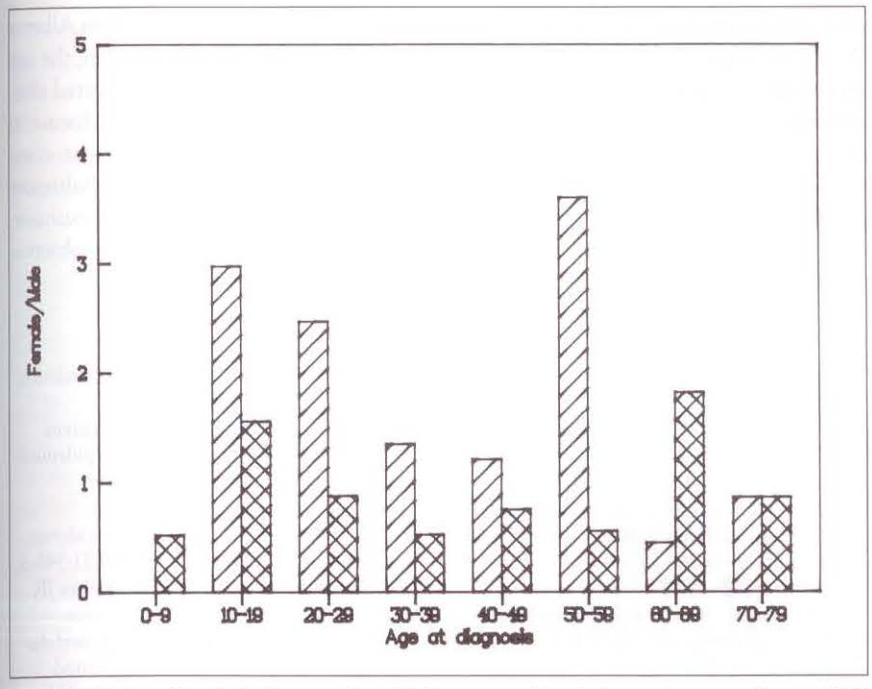

Figure 3) *Male to female incidence ratios of inflammatory bowel disease by age at diagnosis. Ulcerative colitis; Crohn's disease*

TABLE 5
Respondent status by sex and inflammatory bowel disease diagnosis

	Respondents		Nonrespondents	
	Number	Percentage	Number	Percentage*
Sex				
Male	352	42	107	43
Female	483	58	142	57
Unknown†	0		9	
Diagnosis‡				
Crohn's disease	495	59	86	68
Ulcerative colitis	218	26	29	23
Other	122	15	12	6
Unknown††	0		131	
Total	835		258	

**Percentage with information; †Sex was unknown on 3% and diagnosis unknown on 51% of the nonrespondents; ‡Includes definite and probable diagnoses*

due to variation in disease definitions, with rates in this study restricted to definite rather than definite and probable diagnoses.

Crohn's disease is common in the United States, the United Kingdom and Sweden, with prevalence rates that range from 9 to 106 per 10^5 and incidence rates that range from 0.3 to 13.5 per 10^5 (2). Rates from southern and northern Alberta were similar to each other and placed in the middle of this range (10). Male incidence rates were 3.1 per 10^5 in southern Alberta compared to 2.4 per 10^5 in Baltimore. The equivalent female rate in southern Alberta is 6.4 per 10^5, which is 70% higher than the rate (3.8 per 10^5) reported in Baltimore (2). The Alberta incidence rate is also higher than the 0.7 per 10^5 incidence rate reported in a Quebec community between 1969 and 1971 (12). The reported mortality rate for Crohn's disease in Canada (0.14 per 10^5) also seems similar to that in the US (0.17 per 10^5) (11). As these conservative estimates of incidence are similar to or higher than those in Baltimore, these data are consistent with Alberta being a high rate region for Crohn's disease.

The peak at age 20 to 29 years reported by others (2) was evident in this series. A second peak was evident for Crohn's disease and suggested for ulcerative colitis in males. This bimodal age distribution has been reported in other series, although it seems to be more consistently found in North American data and for Crohn's disease (2). Currently, no etiological or clinical factors have been identified which are markedly different by age, although diagnosis made after age 50 years may be accompanied by disease of a less severe nature (13-16). These variations do suggest that different risk factors may be operating across age and sex groups, and a number of hypotheses have been developed which are consistent with this (17). For both ulcerative colitis and Crohn's disease, female incidence rates are about 30% higher than male rates (2). In the present series, the female preponderance is stronger for Crohn's disease than for ulcerative colitis and is strikingly different in the younger age groups. The fact that early studies reported Crohn's disease rates in males and females to be similar while later studies show inconsistent patterns by gender suggests that some lifestyle factor specific to females may have been introduced in some populations but not others (18). A preponderance of female to male rates have been reported in Capetown, Israel (19), England (20) and Great Britain (21,22) but not in Texas or Illinois (23,24).

The age distribution of IBD combined with the male/female differences in rates for the lower age groups suggests that further work to identify risk factors by gender may be warranted, particularly for disease appearing in young adulthood. At least one suspected risk factor unique to females, oral contraceptives, has been reported in the literature (25,26). While a large association with this potential risk factor may have been ruled out (27), continued evaluation of surrogate measures for hormonal changes in women – such as age at menarche, first birth, endogenous and exogenous changes at menopause and weight changes – may further elucidate understanding of disease variation.

A second lifestyle factor which was adopted by women later than by men is smoking. Studies now suggest that smoking may be a risk factor for Crohn's disease and a protective factor for ulcerative colitis (2,28,29). These observations and the general pattern of smoking is consistent with an increase in Crohn's disease and a decrease in ulcerative colitis, as recently suggested. While smoking may be a factor in this spectrum of disease given its apparent opposing impact on Crohn's disease and ulcerative colitis, it seems unlikely to account for the female preponderance of both ulcerative colitis and Crohn's disease in the younger population.

While the rates for southern Alberta are subject to underestimation, the age patterns do follow those reported elsewhere. The rate for Crohn's disease in females was higher in Alberta compared to that reported in Baltimore and, as this is a conservative estimate, further investigation of these observations seems warranted.

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