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Incidence and initial disease course of inflammatory bowel diseases in 2011 in Europe and Australia: Results of the 2011 ECCO-EpiCom inception cohort

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Abbreviations: IBD, inflammatory bowel diseases; CD, Crohn's disease; UC, ulcerative colitis; IBDU, inflammatory bowel disease unclassified; ECCO, European Crohn's and Colitis Organization; EpiCom, Epidemiological Committee; IRR, incidence rate ratio; CI, confidence interval; EC-IBD, European Collaborative Study on Inflammatory Bowel Disease; ACCESS, Asia-Pacific Crohn's and Colitis Epidemiology Study; SE, standard error

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Abstract

Background and aims: The aim of the present study was to validate the IBD (inflammatory bowel diseases) incidence reported in the 2010 ECCO-EpiCom (European Crohn's and Colitis Organization—Epidemiological Committee) inception cohort by including a second independent inception cohort from participating centers in 2011 and an Australian center to investigate whether there is a difference in the incidence of IBD between Eastern and Western European countries and Australia.
Methods: Fourteen centers from 5 Eastern and 9 Western European countries and one center from Australia participated in the ECCO-EpiCom 2011 inception cohort. Patients' data regarding disease type, socio-demographic factors, extraintestinal manifestations and therapy were entered into the Web-based EpiCom database, www.ecco-epicom.eu.
Results: A total of 711 adult patients were diagnosed during the inclusion year 2011, 178 (25%) from Eastern, 461 (65%) from Western Europe and 72 (10%) from Australia; 259 (37%) patients were diagnosed with Crohn's disease, 380 (53%) with ulcerative colitis and 72 (10%) with IBD unclassified. The mean annual incidence rate for IBD was 11.3/100,000 in Eastern Europe, 14.0/100,000 in Western Europe and 30.3/100,000 in Australia. Significantly more patients were diagnosed with complicated disease at diagnosis in Eastern Europe compared to Western Europe (43% vs. 27%, $p = 0.02$).
Conclusion: Incidence rates, disease phenotype and initial treatment characteristics in the 2011 ECCO-EpiCom cohort were not significantly different from that reported in the 2010 cohort.

1. Introduction

The incidence of inflammatory bowel diseases (IBD) including Crohn's disease (CD) and ulcerative colitis (UC) has changed over time. In the last two decades studies on the epidemiology of IBD in Europe suggest the disappearance of the north–south gradient[1] and increasing incidence values were also reported in some Eastern European countries.[2–4]

The ECCO-EpiCom (European Crohn's and Colitis Organization–Epidemiological Committee) study is a European population-based inception cohort study aimed at exploring the differences in the incidence and disease course of IBD between Eastern and Western European countries as well as the impact of environmental factors.[5,6] In a cohort of patients diagnosed in 2010, incidence rates for both CD and UC were shown to be higher in Western European countries compared to Eastern European countries (in Western European countries: IRR: 1.9 (95% CI 1.5 to 2.4) for CD and 2.1 (95% CI 1.8 to 2.6) for UC compared with Eastern European countries)[7] with the exception of Hungary (24 per 100,000 persons), where incidence rates were in the range reported from high incidence Nordic countries. In addition, the incidence rates reported in the 2010 inception cohort were higher in almost all countries compared to rates reported previously from the same region.

Recently reported incidence rates of IBD in Australia are similar to those of the Western European countries. A prospective population-based incidence study in Australia, Melbourne area conducted between April 2007 and March 2008 reported an incidence rate of IBD of 29 per 100,000 (17.4 per 100,000 for CD and 11.2 per 100,000 for UC).[8]

The aim of our present study was to validate incidence rates and disease characteristics found in the 2010 ECCO-EpiCom inception cohort by including a second inception cohort from the participating centers of patients diagnosed in 2011. In addition, we aimed to investigate the incidence and disease phenotype of newly diagnosed IBD patients in an Australian center.

2. Materials and methods

2.1. Study centers

Out of the thirty-one centers of the 2010 inception cohort 14 (5 centers from Eastern and 9 centers from Western Europe) agreed to continue the inclusion of incident patients in 2011. In addition, one center from Australia participated. The classification of centers as being situated in either Western or Eastern European countries was based on the socioeconomic status of that country before 1990 and was similar to

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the center assignment in the 2010 cohort. The details of the methodology were published in detail in our previous paper.[7] For the participation in the incident cohort a well-defined up-take area with up-to-date demographics on the background population (age and gender distribution) was required. General practitioners and specialists in the local area were informed about the inception cohort by local investigator meetings or letters and centers contacted them twice a year regarding patient file information of incident IBD patients.

2.2. Study population

The methodology of the case ascertainment and the diagnostic criteria of the present cohort were corresponding to the concept of the ECCO-EpiCom 2011 inception cohort.

Newly diagnosed patients between 1 January and 31 December 2011 were included in the study. To ensure uniform establishment of the IBD diagnosis, all participating centers used the Copenhagen Diagnostic Criteria[6] for identifying CD, UC and IBD unclassified (IBDU). Location and disease behavior of CD, as well as the extent of UC were defined according to the Montreal classification.[9] The term IBDU was used for cases in whom not all the Copenhagen Diagnostic Criteria for either CD or UC were fulfilled, but where the introduction of relevant IBD treatment was necessary.

Treatment was grouped into five levels of ascending therapeutical potency: 5-aminosalicylates (5-ASA) (oral and/or topical 5-ASA treatment ± topical steroids), glucocorticosteroids (GCS) (oral steroids ± 5-ASA or topical steroids), immunomodulators (azathioprine, 6-mercaptopurine, cyclosporine or methotrexate ± steroids), biologicals (infliximab or adalimumab in combination with any of the above), and surgery (major abdominal surgery due to IBD regardless of medical treatment prior to surgery). Initial treatment was defined as the highest treatment step reached within the first three months from diagnosis.

Seven centers included pediatric patients (Czech Republic, Hungary, Italy, Portugal, Cyprus, Spain and Moldova). Patients younger than 15 years were included as pediatric patients. Czech Republic was exception, where patients younger 18 years were included as pediatric patients and patients 18 years and older as adult patients. Patients' data regarding disease characteristics, extra-intestinal manifestations, therapy, disease activity and rare events like surgery, pregnancy, biological therapy, hospitalizations, cancer and death were entered into the Web-based EpiCom database www.epicom-ecco.eu[10].

2.3. Statistical analyses

The statistical analyses were performed using SPSS software v. 20.0 (Chicago, IL). Incidence rates were calculated. Standard descriptive statistics were performed, including frequency distributions for categorical data and calculation of median and range for continuous variables. Differences between groups were analysed by chi-square test for categorical data. A p value of <0.05 was considered statistically significant.

2.4. Ethical statement

The study was approved by the local ethics committees according to local regulations.

3. Results

A total of 639 patients were diagnosed during the inclusion period from 1 January until 31 December 2011 in the participating Eastern and Western European centers; 221 (35%) patients had CD, 353 (55%) had UC and 65 (10%) had IBDU (Table 1.). Out of a total of 639 patients 178 (28%) were diagnosed in Eastern Europe and 461 (72%) in Western Europe. The mean annual incidence rates for IBD were 11.3 per 100,000 persons in the Eastern and 14.0 per 100,000 persons in the Western European centers. In the participating Australian center the mean annual incidence rate per 100,000 persons was 16.0 for CD, 11.4 for UC and 2.9 for IBDU. Patient characteristics are shown in Table 2.

The highest incidence rate was reported on the Faroe Islands, 84.2 per 100,000 persons, while the lowest incidence rate was registered in Moldova, Chisinau, 4.7 per 100,000 persons. Crude incidence rates in the participating centers and the corresponding data in the 2010 cohort are shown in Table 3.

In CD patients, the longest diagnostic delay was 65 months in Eastern, 116 months in Western Europe and 77 months in Australia, while it was 312 months in Eastern 359 months in Western and 29 months in Australia among UC patients.

Twenty-nine pediatric patients in Eastern (76%) and Western Europe (24%) were identified (Table S1).

3.1. Diagnostic procedures

The diagnostic procedures performed in CD and UC patients are summarized in Tables 4 and 5.

In Eastern Europe 101 (95%) UC patients were subjected to colonoscopy compared to 203 (82%) UC patients in Western Europe ($p < 0.01$), whereas 5 (5%) patients in Eastern Europe and 44 (18%) patients in Western Europe had only sigmoidoscopy performed. In Eastern Europe 4 (4%), in Western Europe 7 (3%) UC patients underwent upper gastrointestinal endoscopy ($p = 0.64$). In Australia, all UC patients and 37 (97%) CD patients were subjected to colonoscopy before diagnosis, one (3%) CD patient had only sigmoidoscopy performed.

3.2. Clinical phenotype at diagnosis

The disease location and behavior at diagnosis in CD patients are illustrated in Figs. 1 and 2. No significant difference was found between the disease location and disease behavior of the Australian and the Western European patients (disease location: $p = 0.21$, disease behavior: $p = 0.87$).

A significantly higher number of patients with complicated (stricturing and/or penetrating ± perianal involvement) disease behavior was found at diagnosis in Eastern Europe compared to Western Europe, 43% vs. 27% ($p = 0.02$) (Fig. 2).

The disease extent at diagnosis in UC patients is presented in Fig. 3. In Australia, the disease extent at diagnosis in UC did

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Table 1 Characteristics of the adult incident patients in the Eastern and Western European centers in the ECCO-EpiCom 2011 inception cohort.[7]

Adult patients (≥15 years)	Western European centers (*N* = 461)			Eastern European centers (*N* = 178)		
	CD	UC	IBDU	CD	UC	IBDU
No. of patients, *n* (%) *	151 (33)	247 (53)	63 (14)	70 (39)	106 (60)	2 (1)
Males, *n* (%) *	88 (58)	139 (56)	38 (60)	33 (47)	50 (47)	1 (50)
Age, median (range)	36 (17–79)	39 (15–90)	46 (18–89)	35 (16–72)	35 (15–87)	25 (23–27)
Time from symptoms to diagnosis (months) (median (range))	3.5 (0–116)	2.4 (0–359)	2.2 (0–92)	3.1 (0.3–65)	2.2 (0–312)	1.4 (1.3–1.5)
Smoking status, *n* (%) *						
Never	62 (47)	106 (49)	24 (44)	34 (51)	65 (66)	1 (50)
Current	44 (33)	27 (13)	9 (17)	17 (26)	9 (9)	1 (50)
Former	27 (20)	83 (38)	21 (39)	15 (23)	25 (25)	0 (0)

Adult patients (≥15 years)	Western European centers	Eastern European centers
Educational status, *n* (%)		
Academic education	52 (14)	34 (20)
Non-academic education	252 (67)	109 (64)
Currently in education	51 (14)	24 (14)
No education	19 (5)	3 (2)
Employment status, *n* (%)		
Employed	217 (55)	99 (58)
Self-employed	13 (3)	5 (3)
Unemployed	46 (11)	14 (8)
Student	54 (14)	30 (18)
Retired	68 (17)	23 (13)
Extraintestinal complications		
None	413 (89.6)	159 (87)
Skin	7 (1.5)	3 (2)
Eyes	4 (1)	3 (2)
Joints	30 (6.5)	14 (7)
Primary sclerosing cholangitis	1 (0.2)	0 (0)
Pancreatitis	1 (0.2)	0 (0)
Others	5 (1)	3 (2)

ECCO = European Crohn's and Colitis Organization, EpiCom = Epidemiological Committee CD = Crohn's disease, UC = ulcerative colitis, IBDU = inflammatory bowel disease unclassified.
* $p < 0.05$. *p* Values are given for comparison between the Eastern and Western European centers.

not differ significantly from the Western European centers ($p = 0.51$).

3.3. Smoking

In both Eastern and Western Europe more CD patients (26% and 33%) than UC patients (9% and 13%) were current smokers at diagnosis ($p < 0.01$). In Eastern Europe 25% of UC patients and 23% of CD patients were former smokers at diagnosis ($p = 0.74$), whereas in Western Europe 38% of UC patients were former smokers compared to 20% of CD patients ($p < 0.01$). Regarding the smoking status of the patients at diagnosis in Australia, 15% of the CD patients were current smokers compared with 5% of UC patients ($p = 0.28$), whereas 53% of UC patients and 24% of CD patients were former smokers ($p = 0.04$).

3.4. Initial medical therapy and surgery

The initial therapy in CD and UC in the Eastern and Western European centers is presented in Figs. 4 and 5.

The initial therapy in both CD and UC differed significantly between Eastern and Western Europe. In CD, 3% in Eastern and 14% in Western Europe had no medical treatment ($p < 0.01$). Twenty-four percent of the Eastern and 19% of the Western European patients received 5-ASA treatment during the first 3 months after diagnosis ($p = 0.32$). The percentage of CD patients with colonic location using 5-ASA therapy was 44% in Eastern, 36% in Western Europe and 67% in Australia.

Nineteen percent of the patients in Eastern and 34% of the patients in Western Europe received systemic steroid treatment ($p = 0.02$) as the highest treatment step during the first 3 months after diagnosis. Thirty-three percent of the Eastern and 22% of the Western European patients were treated with immunomodulators ($p = 0.08$), while the proportion of patients receiving biological therapy was 4% in Eastern and 8% in Western Europe ($p = 0.31$). Corresponding numbers from Australia are presented in Fig. 3. Differences were not significant from the European trends, but there was a numerically higher exposure to 5ASAs in patients with CD.

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Table 2 Characteristics of the Australian adult incident patients in the ECCO-EpiCom 2011 inception cohort.

Adult patients (≥15 years)	CD	UC	IBDU
No of patients, *n* (%) *	38 (53)	27 (37)	7 (10)
Males, *n* (%)	19 (50)	13 (48)	4 (57)
Age, median (range)	37 (17–77)	40 (17–87)	38 (19–59)
Time from symptoms to diagnosis (months) (median (range))	12 (2–77)	3 (0–29)	3 (1–36)
Smoking status, *n* (%)			
Never	20 (61)	8 (42)	1 (25)
Current	5 (15)	1 (5)	2 (50)
Former	8 (24)	10 (53)	1 (25)
Educational status, *n* (%) *			
Academic education	25 (74)		
Non-academic education	1 (3)		
Currently in education	8 (23)		
No education	0 (0)		
Employment status			
Employed	31 (61)		
Self-employed	1 (2)		
Unemployed	2 (4)		
Student	8 (16)		
Retired	9 (17)		
Extraintestinal complications			
None	69 (96)		
Skin	0 (0)		
Eyes	1 (1)		
Joints	2 (3)		
Primary sclerosing cholangitis	0 (0)		
Pancreatitis	0 (0)		
Others	0 (0)		

ECCO = European Crohn's and Colitis Organization, EpiCom = Epidemiological Committee CD = Crohn's disease, UC = ulcerative colitis, IBDU = inflammatory bowel disease unclassified.
* $p < 0.05$. *p* Values are given for comparison between the European centers and Australia.

Among patients with complicated (stricturing and/or penetrating ± perianal involvement) disease behavior, the percentage of patients receiving 5-ASA was 30% in Eastern and 10% in Western Europe. Thirty percent of the Eastern and 35% of the Western European patients received immunomodulators and 10% of the Eastern and 2.5% of the Western European patients were treated with biological therapy.

Among CD patients with perianal involvement, 2 (22%) patients from Eastern and 7 (39%) patients from Western Europe received 5-ASA treatment. Three (33%) Eastern and 2 (11%) Western European patients were treated with systemic steroid. Immunosuppressive therapy was introduced in 2 (22%) Eastern and 1 (6%) Western European patient, while biological treatment was applied in 2 (22%) Eastern and 1 (6%) Western European CD patient with perianal involvement. In Australia, 2 (40%) patients had immunosuppressive therapy, one (20%) patient received 5-ASA and one patient (20%) biological treatment.

Perianal surgery was performed in five Eastern European patients, one Western European patient and 3 Australian patients within 3 months after diagnosis.

Surgical resection was performed in 12 (17%) Eastern and 5 (3%) Western European CD patients within 3 months after diagnosis, $p < 0.01$. In Eastern Europe, the initial disease behavior was stricturing in 7 (58%) and penetrating in 4 (33%) patients, while in Western Europe one (20%) CD patient had stricturing and 4 (80%) patients had penetrating disease behavior. In Australia, 4 (100%) of these patients had penetrating disease behavior.

In UC, 74% of the Eastern, 57% and 56% of the Western European and Australian patients received 5-ASA treatment ($p < 0.01$ for both). Seventeen percent of the Eastern versus 30% and 44% of the Western European and Australian patients had systemic steroids ($p = 0.01$) and 7% of the patients in Eastern and 4% of the patients in Western Europe received immunomodulators ($p = 0.24$). One percent versus 2% of the patients in Eastern and Western Europe were treated with biological agents as an initial treatment ($p = 0.62$).

In 15 (47%) UC patients with extensive location in Eastern and 30 patients (33%) in Western Europe 5-ASA therapy was applied. Steroid treatment was introduced in 12 (37%) Eastern and 52 (57%) Western European patients. The percentage of patients receiving immunosuppressive treatment was 16% in Eastern and 7% in Western Europe and 2 (2%) patients from Western Europe had biological therapy. In Australia, 1 patient (14%) had 5-ASA therapy, while 6 patients (86%) received systemic steroid treatment.

One (0.4%) UC patient in Western Europe underwent a total colectomy during the first 3 months after diagnosis.

4. Discussion

The mean adjusted incidences for IBD in the 2011 ECCO-EpiCom cohort were 11.3 per 100,000 persons in the Eastern and 14.0 per 100,000 persons in the Western European centers.

These results correspond to the findings in the 2010 inception cohort on the individual center level while the mean incidence was somewhat lower in 2011 in the Western European centers combined. However, this is rather the consequence of the differences in the contributing centers, i.e. some centers from the Nordic countries were not participating in the 2011 cohort. The highest incidence rate was found on the Faroe Islands (84.2 per 100,000 persons) similarly to the results in the 2010 ECCO-EpiCom cohort.[7] Interestingly, a retrospective population-based study between 2005 and 2009 reported a mean annual IBD incidence of 35.5 per 100,000 persons in this island.[11] The exceptionally high incidence rates remain an unexplained phenomenon but may advocate the importance of both environmental and – because of the closed community – possibly genetic factors. The mean annual incidence rate for IBD found in the Australian center was consistent with previous reports from Australia.[12]

Similarly to the previous cohort, in the 2011 cohort age at diagnosis, time interval between the onset of symptoms and diagnosis and socioeconomic status of IBD patients did not differ between the Eastern and Western European centers.

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Table 3 Incidence rates per 100,000 persons in Eastern and Western European centers and Australia in the ECCO-EpiCom 2010 and 2011 cohort in the population above 15 years of age.[7]

	No. of incident patients		IBD adjusted (SE)		CD adjusted (SE)		UC adjusted (SE)		IBDU adjusted (SE)	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Western European centers										
Cyprus, Nicosia	27	25	11.4 (2.2)	10.4 (0.7)	6.3 (1.6)	5 (0.6)	3.0 (1.1)	3.3 (0.6)	2.2 (1.0)	2.1 (0.5)
Denmark, Amager	23	29	16.3 (3.4)	21.4 (1.2)	4.8 (1.8)	5.2 (1.0)	7.4 (2.4)	9.6 (1.1)	4.1 (1.7)	6.6 (1.0)
Denmark, Herlev	48	45	24.4 (3.6)	21.5 (0.8)	7.0 (1.9)	3.8 (0.7)	8.3 (2.1)	11.5 (0.8)	9.2 (2.2)	6.2 (0.7)
Faroe Islands	31	32	83.1 (15.0)	84.2 (4.4)	11.1 (5.6)	10.5 (3.2)	31.8 (9.3)	57.9 (4.2)	40.2 (10.5)	15.8 (3.5)
Greece, Ioannina	15	12	10.2 (2.6)	7.2 (0.9)	3.5 (1.6)	3.6 (0.8)	6.0 (2.0)	3.6 (0.8)	0.7 (0.7)	0 (0)
Israel, Beer Sheva and Northern Negev	51	46	13.0 (1.9)	11.9 (0.4)	8.4 (1.5)	4.9 (0.4)	4.4 (1.1)	6.5 (0.4)	0.2 (0.2)	0.5 (0.3)
Italy, Northern Italy	182	142	11.6 (0.9)	10.5 (0.1)	4.3 (0.5)	3.3 (0.1)	6.4 (0.7)	6.2 (0.1)	0.9 (0.3)	1 (0.1)
Portugal, Vale de Sousa	31	33	10.8 (2.0)	11.8 (0.6)	7.0 (1.6)	5.7 (0.5)	3.8 (1.2)	6.1 (0.6)	0 (0)	0 (0)
Spain, Vigo	102	97	21.4 (2.1)	19.6 (0.4)	10.8 (1.5)	6.9 (0.3)	9.4 (1.4)	9.9 (0.3)	1.2 (0.5)	2.8 (0.3)
Australia		72		30.3 (0.7)		16 (0.7)		11.4 (0.7)		2.9 (0.6)
Eastern European centers										
Czech Republic, Prague	22	21	12.7 (2.8)	11.6 (0.9)	5.6 (1.8)	5.5 (0.8)	5.8 (1.9)	5 (0.8)	1.3 (0.9)	1.1 (0.6)
Hungary, Veszprém province	58	67	24.0 (3.2)	26.5 (0.7)	12.0 (2.2)	14.6 (0.7)	10.7 (2.1)	11.9 (0.7)	1.3 (0.7)	0 (0)
Lithuania, Kaunas city and district	32	42	9.1 (1.6)	12.2 (0.5)	2.6 (0.9)	1.4 (0.4)	6.5 (1.4)	10.8 (0.5)	0 (0)	0 (0)
Moldova, Chisinau	10	11	3.9 (1.2)	4.7 (0.6)	0.4 (0.4)	0.8 (0.4)	3.5 (1.2)	3.9 (0.6)	0 (0)	0 (0)
Romania, Timis	24	37	4.2 (0.9)	6.5 (0.3)	1.7 (0.5)	2.8 (0.3)	2.5 (0.7)	3.7 (0.3)	0 (0)	0 (0)

IBD = inflammatory bowel diseases, CD = Crohn's disease, UC = ulcerative colitis, IBDU = inflammatory bowel disease unclassified, SE = standard error.

These data provide a validation of the individual IBD incidences reported in the 2010 cohort and confirm management and monitoring similarity between Eastern and Western Europe.[7,13] Similar findings were described also in the EC-IBD (European Collaborative Study on Inflammatory Bowel Disease) study in the Northern and Southern European countries implying the uniformity of IBD patients in terms of clinical presentation in Europe.[14] The median time interval between the onset of symptoms and diagnosis in CD patients was longer in Australia, however this difference did not reach statistical significance.

The distribution of IBD diagnoses was virtually the same in the 2010 and 2011 inception cohort: in 2011, 35% of the patients were diagnosed with CD, 55% with UC and 10% with IBDU, while in 2010 35% of the patients presented with CD, 54% with UC and 11% with IBDU. A similar distribution was also reported in the EC-IBD, where the differences in the incidence of IBD between Northern and Southern Europe were investigated: 63% of the patients had UC, 32% had CD and 5% had IBDU[1].

In concordance with previous studies[15–17] and the 2010 cohort we observed a higher percentage of CD patients being current smokers at diagnosis compared to UC patients in both Eastern and Western Europe. In contrast, the higher frequency of former smoking in UC patients compared to CD patients was confirmed only in Western Europe.

Interestingly, significantly more patients presented with complicated disease behavior in Eastern Europe compared to Western Europe in the 2011 cohort ($p = 0.02$). This may represent a year-to-year variation, however further follow-up of this trend is warranted. Of note, the relatively quick development of complicated disease behavior is not a unique phenomenon, in a previous study from the Olmstead County only a low percentage of patients presented with a complicated disease behavior, but this rate was doubled at 90 days.[18] In contrast, a high percentage of CD patients presented with non-stricturing, non-penetrating disease behavior in Australia: 79% of the patients with B1 including 10% with B1 and concomitant perianal disease. In a comparative study of the clinical characteristics and management of IBD patients from

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Table 4 Diagnostic procedures in adult patients with Crohn's disease.

	Western European centers	Eastern European centers	Australia
None	0 (0%)	0 (0%)	0 (0%)
Upper gastrointestinal endoscopy	33 (22%)	11 (16%)	14 (37%)
Colonoscopy	136 (90%)	67 (96%)	37 (97%)
Proctoscopy/Sigmoidoscopy	5 (3%)	1 (1%)	1 (3%)
Capsule endoscopy *	13 (9%)	1 (1%)	2 (5%)
Trans rectal ultrasound	2 (1%)	0 (0%)	0 (0%)
MRI	29 (19%)	12 (17%)	11 (29%)
CT	57 (38%)	18 (26%)	12 (32%)
Bowel X-ray *,**	17 (11%)	2 (3%)	0 (0%)

MRI = magnetic resonance imaging, CT = computed tomography.
* $p < 0.05$ between Eastern and Western European centers.
** $p < 0.05$ between Western Europe and Australia.

Melbourne and Hong Kong by Prideaux et al.[19] only approximately half of the CD patients presented with inflammatory disease behavior (52.9%). In contrast, a similarly high B1 frequency (88%) was reported in the Australian center in the Asia-Pacific Crohn's and Colitis Epidemiology (ACCESS) study.[15] In addition, disease location in CD and disease extent in UC patients was not significantly different between Australia, Eastern and Western European centers and they are comparable to those reported in previous studies.[20–22]

In the ECCO-EpiCom database, we had information about extraintestinal manifestations at the time of diagnosis, but not before.

Previous studies described an equal proportion of male and female patients affected by CD and UC with a slight female predominance in CD and a male predominance in UC.[1,23,24] In the present study the male-to-female ratio was almost the same in both CD and UC in the Eastern and Western European centers.

Table 5 Diagnostic procedures in adult patients with ulcerative colitis.

	Western European centers	Eastern European centers	Australia
None	0 (0%)	0 (0%)	0 (0%)
Upper gastrointestinal endoscopy **	7 (3%)	4 (4%)	4 (15%)
Colonoscopy *,**	203 (82%)	101 (95%)	27 (100%)
Proctoscopy/ Sigmoidoscopy	48 (19%)	10 (9%)	2 (7%)
Capsule endoscopy	0 (0%)	0 (0%)	0 (0%)
Trans rectal ultrasound	0 (0%)	0 (0%)	0 (0%)
MRI	4 (2%)	2 (2%)	1 (4%)
CT	13 (5%)	2 (2%)	3 (11%)
Bowel X-ray	4 (2%)	3 (3%)	0 (0%)

MRI = magnetic resonance imaging, CT = computed tomography.
* $p < 0.05$ between Eastern and Western European centers.
** $p < 0.05$ between Western Europe and Australia.

The need of surgical resections during the first 3 months after diagnosis was higher among CD patients in Eastern Europe (17% vs. 3%, $p < 0.01$), corresponding to the high frequency of complicated disease behavior. Mean surgical resection rates within 3 months after the diagnosis were in concordance with previous studies and with the rates from the 2010 cohort (8%). Similarly to the 2010 inception cohort, the majority of the patients did not receive medical therapy before surgery (12/17 patients) and 16 (94%) patients had complicated disease behavior at diagnosis, underlining the idea of unavoidable surgery.[7] Similarly, in the 1-year follow up of the 2010 inception cohort[25] and previous Danish (2003–2005)[9] and Hungarian (2002–2006)[3] population based cohorts 15%, 12% and 9.8% of CD patients needed a surgical resection within the first year after diagnosis.

In the 2011 cohort the increasing use of immunomodulators and biological therapy was also confirmed. Interestingly, immunomodulators were more frequently used in the first 3 months after the diagnosis in the Eastern European CD patients (33%) compared to Western European centers (22%). This rate is significantly higher compared to the 2010 cohort and may partly represent the differences in the disease behavior distribution between these two geographic regions and confirms also the use of early accelerated treatment strategies. The 8% and 4% use of biological therapy in CD should also be interpreted as high.

In conclusion, in the present population-based inception cohort of the second year of the ECCO-EpiCom study, the incidence rates of IBD in the participating Eastern and Western European centers were similar to those reported in the first year of this Pan-European collaborative cohort. The initial disease phenotype showed some differences compared to the previous year with a higher frequency of complicated disease behavior in Eastern Europe in the 2011 cohort. The initial treatment strategy suggests an accelerated use of immunomodulators and biologicals in CD while the early surgical rates remain unchanged. In contrast, the treatment strategy in UC has not changed significantly compared to previous reports. The inclusion of an Australian center provides the possibility to compare the disease characteristics and management of the patients between the European countries and a country geographically distant from the Europe. We did not find clinically significant differences between Australia and Western Europe, accepting the limitations due to the low cohort size from Australia.

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.crohns.2014.06.004.

Conflict of interest statement

No author reported any potential conflict of interest.

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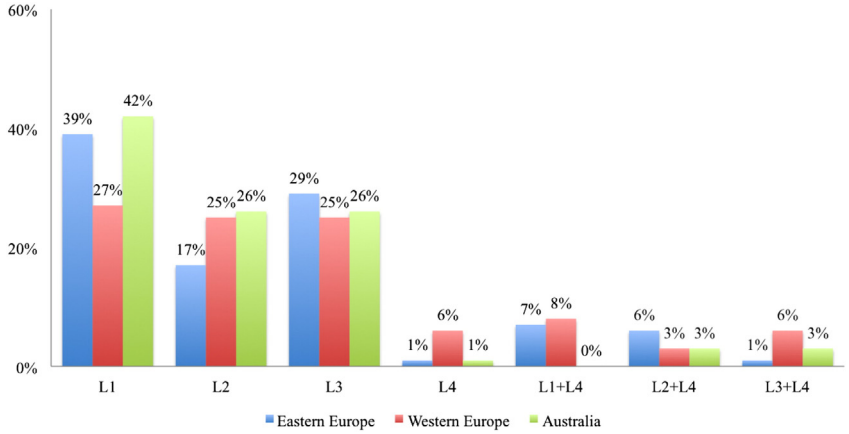

Figure 1 The disease location at diagnosis in adult patients with Crohn's disease, $p = 0.19$; p values are given for comparison between the Eastern and Western European centers (L1 = ileal, L2 = colonic, L3 = ileocolonic, L4 = isolated upper disease).

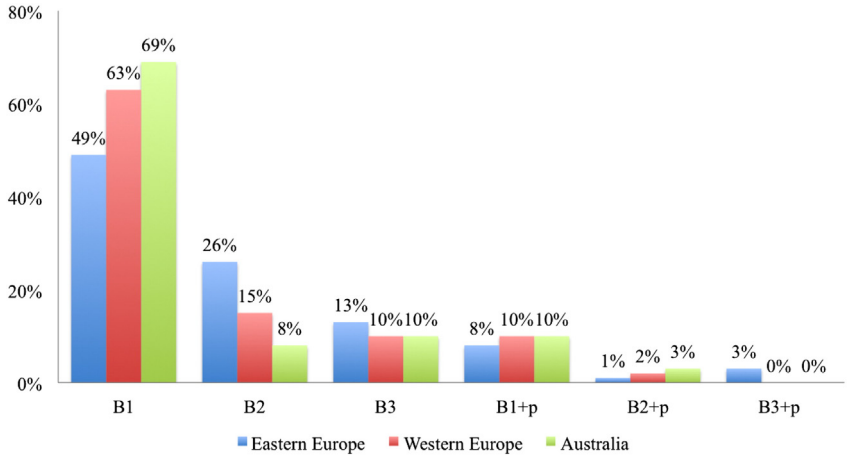

Figure 2 The disease behavior at diagnosis in adult patients with Crohn's disease, $p = 0.09$; p values are given for comparison between the Eastern and Western European centers (B1 = non-stricturing, non-penetrating, B2 = stricturing, B3 = penetrating, p = perianal disease modifier).

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The study was initiated by the EpiCom study group. The guarantors of the manuscript are Z.V., J.B., P.M. and P.L. J.B., Z.V. and the ECCO EpiCom centers performed the data collection. Z.V. performed the statistical analyses. Z.V. drafted the manuscript, which was critically revised by all co-authors. All authors approved the final version of the manuscript. This work is a part of Z.V.'s PhD. We are grateful to J. Williams (Australia), N. Procopiou (Cyprus), P. Weimers (Denmark), R. Seerup (Denmark), K. Stroggili (Greece), G. Demenyi (Hungary), S. Kramli (Hungary), S. Lombardini (Reggio Emilia, Italy), G.C. Sturniolo (Padua, Italy), G. Kiudelis

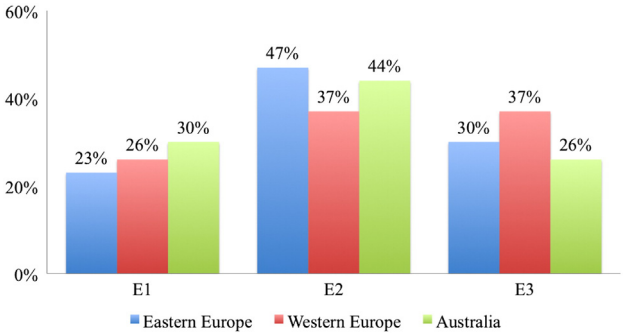

Figure 3 The disease extent at diagnosis in adult patients with ulcerative colitis, $p = 0.21$; p values are given for comparison between the Eastern and Western European centers (E1 = proctitis, E2 = left-sided colitis, E3 = extensive colitis).

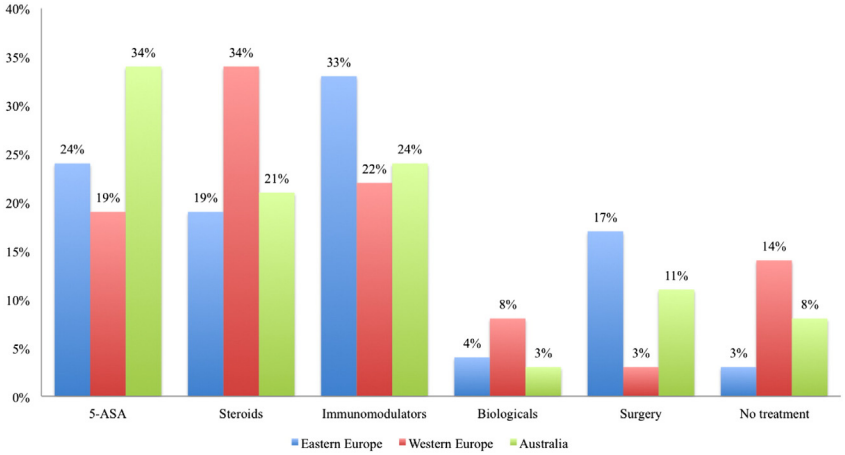

Figure 4 Initial treatment during the first 3 months in adult patients with Crohn's disease; $p < 0.01$; p values are given for comparison between the Eastern and Western European centers (5-ASA = 5-aminosalycilates).

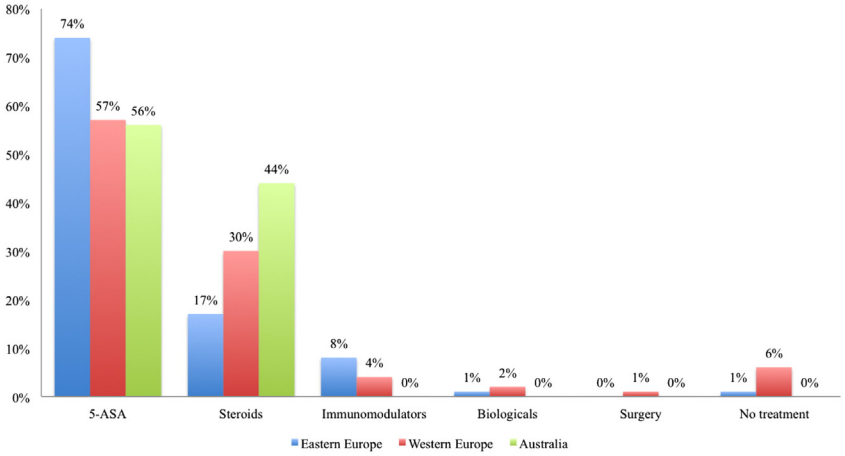

Figure 5 Initial treatment during the first 3 months in adult patients with ulcerative colitis; $p = 0.01$; p values are given for comparison between the Eastern and Western European centers (5-ASA = 5-aminosalycilates).

(Lithuania), I. Valantiene (Lithuania), M. Luisa de Castro (Spain) and J. Ramon Pineda (Spain) for their contribution to patient inclusion and entering of data.

References

1. Shivananda S, Lennard-Jones J, Logan R, Fear N, Price A, Carpenter L, et al. Incidence of inflammatory bowel disease across Europe: is there a difference between north and south? Results of the European Collaborative Study on Inflammatory Bowel Disease (EC-IBD). *Gut* 1996;**5**:690–7.
2. Lakatos L, Mester G, Erdelyi Z, Balogh M, Szipocs I, Kamaras G, et al. Striking elevation in incidence and prevalence of inflammatory bowel disease in a province of western Hungary between 1977–2001. *World J Gastroenterol* 2004;**10**:404–9.
3. Lakatos L, Kiss LS, David G, Pandur T, Erdelyi Z, Mester G, et al. Incidence, disease phenotype at diagnosis, and early disease course in inflammatory bowel diseases in Western Hungary, 2002–2006. *Inflamm Bowel Dis* 2011;**12**:2558–65.
4. Sincić BM, Vucelić B, Persić M, Brncić N, Erzen DJ, Radaković B, et al. Incidence of inflammatory bowel disease in Primorsko-goranska County, Croatia, 2000–2004: a prospective population-based study. *Scand J Gastroenterol* 2006;**4**:437–44.
5. Nielsen KR, Jacobsen S, Olsen K, Jess T, Gaini S. P637 Incidence and clinical characteristics of inflammatory bowel disease in the Faroe Islands during 2005–2009. *J Crohns Colitis* 2013;**7**:S266.
6. Burisch J. Crohn's disease and ulcerative colitis. Occurrence, course and prognosis during the first year of disease in a European population-based inception cohort. *Dan Med J* 2014;**61**:B4778.
7. Burisch J, Pedersen N, Cukovic-Cavka S, Brinar M, Kaimakliotis I, Duricova D, et al. East-West gradient in the incidence of inflammatory bowel disease in Europe: the ECCO-EpiCom inception cohort. *Gut* 2013:1–10.
8. Wilson J, Hair C, Knight R, Catto-Smith A, Bell S, Kamm M, et al. High incidence of inflammatory bowel disease in Australia: a prospective population-based Australian incidence study. *Inflamm Bowel Dis* 2010;**16**(9):1550–6.
9. Satsangi J, Silverberg MS, Vermeire S, Colombel JF. The Montreal classification of inflammatory bowel disease: controversies, consensus, and implications. *Gut* 2006;**55**:749–53.
10. Burisch J, Cukovic-Cavka S, Kaimakliotis I, Shonová O, Andersen V, Dahlerup JF, et al. Construction and validation of a Web-based epidemiological database for inflammatory bowel diseases in Europe An EpiCom study. *J Crohns Colitis* 2011;**5**:342–9.
11. Nielsen KR, Jacobsen S, Olsen K, et al. P637 Incidence and clinical characteristics of inflammatory bowel disease in the Faroe Islands during 2005–2009. *J Crohns Colitis* 2013;**7**:S266.

Please cite this article as: Vegh Z, et al, Incidence and initial disease course of inflammatory bowel diseases in 2011 in Europe and Australia: Results of the 2011 ECCO-EpiCom inception cohort, *J Crohns Colitis* (2014), http://dx.doi.org/10.1016/j.crohns.2014.06.004

12. Ng SC, Tang W, Ching JY, Wong M, Chow CM, Hui AJ, et al. Asia–Pacific Crohn's and Colitis Epidemiologic Study (ACCESS) Study Group. Incidence and phenotype of inflammatory bowel disease based on results from the Asia-pacific Crohn's and colitis epidemiology study. *Gut* Jul 2013;**145**(1):158–65.
13. Burisch J, Vegh Z, Pedersen N, Cukovic-Cavka S, Turk N, Kaimakliotis I, et al. Health care and patients' education in a European inflammatory bowel disease inception cohort: an ECCO-EpiCom study. *J Crohns Colitis* 2014 [in press, pii: S1873-9946(13)00471-6].
14. Lennard-Jones JE, Shivananda S. Clinical uniformity of inflammatory bowel disease a presentation and during the first year of disease in the north and south of Europe. EC-IBD Study Group. *Eur J Gastroenterol Hepatol* Apr 1997;**9**(4):353–9.
15. Mahid SS, Minor KS, Soto RE, Hornung CA, Galandiuk S. Smoking and inflammatory bowel disease: a meta-analysis. *Mayo Clin Proc* 2006;**81**:1462–71.
16. Bernstein CN, Rawsthorne P, Cheang M, Blanchard JF. A population-based case control study of potential risk factors for IBD. *Am J Gastroenterol* 2006;**101**(5):993–1002.
17. Lakatos PL, Vegh Z, Lovasz BD, David G, Pandur T, Erdelyi Z, et al. Is current smoking still an important environmental factor in inflammatory bowel diseases? Results from a population-based incident cohort. *Inflamm Bowel Dis* Apr 2013;**19**(5):1010–7.
18. Thia KT, Sandborn WJ, Harmsen WS, Zinsmeister AR, Loftus Jr EV. Risk factors associated with progression to intestinal complications of Crohn's disease in a population-based cohort. *Gut* Oct 2010;**139**(4):1147–55.
19. Prideaux L, Kamm MA, De Cruz P, Williams J, Bell SJ, Connell WR, et al. Comparison of clinical characteristics and management of inflammatory bowel disease in Hong Kong versus Melbourne. *J Gastroenterol Hepatol* 2012;**27**(5):919–27.
20. Vind I, Riis L, Jess T, Knudsen E, Pedersen N, Elkjaer M, et al. Increasing incidences of inflammatory bowel disease and decreasing surgery rates in Copenhagen City and County, 2003–2005: a population-based study from the Danish Crohn colitis database. *Am J Gastroenterol* 2006;**101**:1274–82.
21. Munkholm P, Langholz E, Nielsen OH, Kreiner S, Binder V. Incidence and prevalence of Crohn's disease in the county of Copenhagen, 1962–87: a sixfold increase in incidence. *Scand J Gastroenterol* Jul 1992;**27**(7):609–14.
22. Langholz E, Munkholm P, Nielsen OH, Kreiner S, Binder V. Incidence and prevalence of ulcerative colitis in Copenhagen county from 1962 to 1987. *Scand J Gastroenterol* Dec 1991;**26**(12):1247–56.
23. Lakatos PL. Recent trends in the epidemiology of inflammatory bowel diseases: up or down? *World J Gastroenterol* 2006;**12**:6102–8.
24. Loftus CG, Loftus Jr EV, Harmsen WS, Zinsmeister AR, Tremaine WJ, Melton III LJ, et al. Update on the incidence and prevalence of Crohn's disease and ulcerative colitis in Olmsted County, Minnesota, 1940–2000. *Inflamm Bowel Dis* 2007;**13**:254–61.
25. Burisch J, Pedersen N, Cukovic-Cavka S, Turk N, Kaimakliotis I, Duricova D, et al. Initial disease course and treatment in an inflammatory bowel disease inception cohort in Europe: the ECCO-EpiCom cohort. *Inflamm Bowel Dis* Jan 2014;**20**(1):36–46.

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