

# Incidence, Outcomes, and Health Services Burden of Very Early Onset Inflammatory Bowel Disease

Eric I. Benchimol,<sup>1,2,3,4</sup> David R. Mack,<sup>1,2</sup> Geoffrey C. Nguyen,<sup>4,5,7</sup> Scott B. Snapper,<sup>8,9</sup> Wenbin Li,<sup>4</sup> Nassim Mojaverian,<sup>4</sup> Pauline Quach,<sup>1,4</sup> and Aleixo M. Muise<sup>6,10</sup>

<sup>1</sup>Children's Hospital of Eastern Ontario Inflammatory Bowel Disease Centre, Division of Gastroenterology, Hepatology and Nutrition, Children's Hospital of Eastern Ontario, Ottawa, Canada; <sup>2</sup>Department of Pediatrics, <sup>3</sup>Department of Epidemiology and Community Medicine, University of Ottawa, Ottawa, Canada; <sup>4</sup>Institute for Clinical Evaluative Sciences, Toronto, Canada; <sup>5</sup>Department of Medicine, <sup>6</sup>Department of Paediatrics, University of Toronto, Toronto, Canada; <sup>7</sup>Mount Sinai Centre for Inflammatory Bowel Disease, Toronto, Canada; <sup>8</sup>Division of Pediatric Gastroenterology, Hepatology, and Nutrition, Children's Hospital Boston, Boston, Massachusetts; <sup>9</sup>Department of Medicine, Harvard University, Boston, Massachusetts; <sup>10</sup>SickKids Inflammatory Bowel Disease Center, Division of Gastroenterology Hepatology and Nutrition, Cell Biology Program, Research Institute, Hospital for Sick Children, Toronto, Ontario, Canada

This article has an accompanying continuing medical education activity on page e14. Learning Objective: Upon completion of this exam, successful learners will be able to understand the differences in epidemiology, outcomes, and health services burden of children with very early onset IBD (VEO-IBD), compared with patients with older-onset pediatric IBD.

**BACKGROUND & AIMS:** The Paris pediatric modification of the Montreal classification defines very early onset inflammatory bowel disease (VEO-IBD) as a form of IBD distinct from that of older children. We compared the incidence and outcomes of VEO-IBD with those of IBD in older children.

**METHODS:** We performed a population-based retrospective cohort study of all children diagnosed with IBD in Ontario, Canada, from 1994 through 2009. Trends in standardized incidence were calculated using Poisson regression. We compared outpatient and emergency department visits, hospitalizations, and surgeries among children diagnosed with IBD when they were younger than age 6, ages 6–9.9, and older than age 10 years. Multivariable models were adjusted for income and stratified by sex. **RESULTS:** The incidence of IBD increased from 9.4 per 100,000 children (95% confidence interval [CI], 8.2–10.8/100,000 children) in 1994 to 13.2 per 100,000 children (95% CI, 11.9–14.6/100,000 children) in 2009 ( $P < .0001$ ). The incidence increased by 7.4% per year among children younger than 6 years old and 6–9.9 years old, and by 2.2% per year among children  $\geq 10$  years old. IBD-related outpatient visits were less frequent among children  $< 6$  years old than  $\geq 10$  years old (odds ratio for female patients, 0.67; 95% CI, 0.58–0.78; odds ratio for male patients, 0.86; 95% CI, 0.75–0.98). Hazard ratios [HRs] for hospitalization were lower for children  $< 6$  years old (female HR, 0.70; 95% CI, 0.56–0.87; male HR, 1.12; 95% CI, 0.94–1.33) than for older children. HRs for surgery among children  $< 6$  years old with Crohn's disease were 0.35 for female patients (95% CI, 0.16–0.78) and 0.59 for male patients (95% CI, 0.34–0.99). HRs for children  $< 6$  years old with ulcerative colitis were 0.88 for female patients (95% CI, 0.47–1.63) and 0.42 for male patients (95% CI, 0.21–0.85). There was no difference in hospitalization or surgery rates among children 6–9.9 years old vs those  $\geq 10$  years old. **CONCLUSIONS:** Based on a retrospective cohort study, the incidence of VEO-IBD increased from 1994 through 2009. Children diagnosed with IBD before they were 6 years old used fewer health services and had lower rates of surgery than children diagnosed when they were 10 years or older.

**Keywords:** Pediatrics; Epidemiology; Health Administrative Data; Disease Progression.

Watch this article's video abstract and others at <http://bit.ly/1q51BIW>.



Scan the quick response (QR) code to the left with your mobile device to watch this article's video abstract and others. Don't have a QR code reader? Get one by searching 'QR Scanner' in your mobile device's app store.

The incidence of childhood-onset inflammatory bowel disease (IBD) is increasing internationally,<sup>1</sup> with the most striking increase in Ontario, Canada, described in children younger than 10 years of age.<sup>2</sup> A small number of unique genetic mutations<sup>3–6</sup> have been identified in children with a diagnosis of IBD at a very young age, but genome-wide association studies have not detected large differences between adult-onset and early onset disease.<sup>7,8</sup> However, the phenotype of children with onset of Crohn's disease (CD) occurring younger than the age of 10 is predominantly colonic, with a lower risk of ileal disease.<sup>9–12</sup> In children with earlier onset of ulcerative colitis (UC), the requirement for second-line therapy (biologics or colectomy) was reported to be lower than for those diagnosed in the second decade of life.<sup>13</sup> These findings led to a change in the classification of pediatric patients with IBD. Although the Montreal classification of IBD previously denoted all children diagnosed at younger than 17 years as having

**Abbreviations used in this paper:** CD, Crohn's disease; CI, confidence interval; ED, emergency department; HR, hazard ratio; IBD, inflammatory bowel disease; OHIP, Ontario Health Insurance Plan; VEO, very early onset; UC, ulcerative colitis.