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Prevalence of eosinophilic gastritis, gastroenteritis, and colitis: Estimates from a national administrative database

Elizabeth T. Jensen, MPH PhD^{1,2}, Christopher F. Martin, MPH², Michael D. Kappelman, MD MPH^{2,3}, and Evan S. Dellon, MD MPH^{1,2}

¹Center for Esophageal Diseases and Swallowing, University of North Carolina School of Medicine, Chapel Hill, NC

²Center for Gastrointestinal Biology and Disease, Division of Gastroenterology and Hepatology, Department of Medicine, University of North Carolina School of Medicine, Chapel Hill, NC

³Division of Pediatric Gastroenterology and Hepatology, Department of Pediatrics, University of North Carolina School of Medicine, Chapel Hill, NC

Abstract

Objectives—Eosinophilic esophagitis (EoE) is becoming increasingly more common, but the prevalence of other eosinophilic gastrointestinal disorders (EGIDs) is unknown. Our objective was to estimate the prevalence of eosinophilic gastritis, gastroenteritis, and colitis in the U.S..

Methods—We used the IMS Health LifeLink™, PharMetrics Plus™ Claims Database, data representative of a U.S. national commercially-insured population containing medical and pharmaceutical claims for >75million individuals. We restricted our sample to patients age 0–64 with continuous enrollment between 7/1/2009–6/30/2011. We identified cases of eosinophilic gastritis, gastroenteritis, and colitis as defined by 1 instance of the ICD-9 codes 535.70, 558.41, and 558.42, respectively. We calculated the prevalence of the codes in the database and then standardized the estimates to the U.S. population by age and sex.

Results—The standardized estimated prevalences of eosinophilic gastritis, gastroenteritis, and colitis were 6.3/100,000, 8.4/100,000, and 3.3/100,000, respectively. The prevalence of eosinophilic gastroenteritis was highest among children age < 5 years, whereas eosinophilic gastritis was more prevalent among older age groups. We observed no age differences for eosinophilic colitis. Among affected patients there was a high proportion of co-existing allergic

Corresponding Author: Evan S. Dellon, MD, MPH, CB #7080–4140 Bioinformatics Building, 130 Mason Farm Rd., UNC-CH, Chapel Hill, NC 27599-7080, Phone: (919) 966-2513, Fax: (919) 843-2508, edellon@med.unc.edu.

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Author contributions (all authors approved the final draft):

Jensen: Project conception, study design, data interpretation, manuscript drafting, critical revision, final approval

Martin: Study design, data interpretation, critical revision

Kappelman: Study design, data interpretation, critical revision

Dellon: Project conception, study design, data interpretation, manuscript drafting, critical revision, final approval

conditions, 38.5% for eosinophilic gastritis, 45.6% for gastroenteritis, and 41.8% for colitis. Concomitant allergic disease was most commonly identified in pediatric patients.

Conclusions—The prevalence of non-EoE EGIDs remains rare in the U.S., with less than 50,000 total patients affected. There appears to be a female predominance, as well as a high co-occurrence of atopic comorbidities.

Keywords

eosinophil; prevalence; administrative data; United States

Introduction

Eosinophilic gastrointestinal disorders (EGIDs) are characterized by abnormal eosinophilic infiltration of different segments of the GI tract in the absence of an identifiable secondary cause. Eosinophilic esophagitis (EoE) is the most common of these conditions, (1–3) with a recent prevalence estimate of 57 cases/100,000 persons in the United States. (4) Eosinophilic gastritis, eosinophilic gastroenteritis, and eosinophilic colitis, are thought to be less common than EoE, although the prevalence of these other EGIDs has not been well-described.

Many features of these diseases, including atopic comorbidities or clinical presentation, have been described only in the setting of case series studies or small, single-center studies. (5–10) The population-level burden of these diseases, the age- and gender-based distributions, and associations with other conditions, are unknown. The potential for estimating the prevalence of these other EGIDs, at the national level, was made possible in 2008 with the approval of an International Classification of Diseases, Ninth Revision (ICD-9) codes for eosinophilic gastritis (535.70), eosinophilic gastroenteritis (558.41), and eosinophilic colitis (558.42), but to date there have been no studies utilizing these codes.

The aim of the present study was to use a large health plan claims database to identify and characterize cases of eosinophilic gastritis, eosinophilic gastroenteritis, and eosinophilic colitis and estimate the prevalence of each of these EGIDs in the U.S. We also sought to characterize the epidemiology of these diseases with respect to age, sex, clinical presentation, and concomitant allergic diseases.

Methods

Study design, data source, and case definition

We performed a retrospective analysis of the IMS Health LifeLink™ Claims Database (IMS Health Inc.). This database contains longitudinal, integrated, fully-adjudicated medical and pharmaceutical claims for over 75 million individuals from over 80 health plans, from all 50 states in the U.S., and has been shown to be representative of a U.S. national commercially insured population. (11, 12) These data are aggregated after a sufficient period of time has elapsed to ensure completeness of billing data. Data were not linkable to the patient medical record, however enrollees' demographic data including age, sex, and census region

(northeast, south, midwest, and west) were available. Regional designations correspond to the U.S. census regions.

We restricted the dataset to subjects continuously enrolled from July 1, 2009 through June 30, 2011 and estimated a two-year, period prevalence, accounting for the delay in uptake for the new code that was noted after its introduction in 2008 and allowing an adequate amount of time for the code to be used. (13) We excluded enrollees age 65 years or older as their claims data are likely to be incomplete due to coinsurance provided through Medicare.

Eosinophilic gastritis, gastroenteritis, and colitis were defined based on a patient having 1 instance of the ICD-9 codes 535.70, 558.41, and 558.42, respectively. We did not include the ICD-9 code of 558.3 as this is a more general code for allergic gastroenteritis and colitis and would potentially lead to over estimation of the number of cases. Eosinophilic esophagitis cases were identified as described previously, for the purposes of comparison for concomitant allergic disease. (4)

Descriptive factors and allergic disease

In addition to the codes for eosinophilic gastritis, gastroenteritis, and colitis, data on other ICD-9 diagnostic codes were extracted. These included ICD-9 codes for the atopic disorders of rhinitis, sinusitis, dermatitis, urticaria, asthma, and food allergies (Supplementary Digital Content – Table 1). Food allergy and other allergic conditions were characterized by at least one instance of the use of the corresponding allergic disease related ICD-9 code during the study period. Because these allergic conditions could represent prevalent conditions, we did not require any accompanying procedure code. We also extracted data on census region of residence, sex, and age. Age was characterized in 5-year increments to allow standardizing of prevalence estimates to the age and sex distribution of residents in the United States per the 2010 Census Data. In each of the non-EoE EGID conditions, we examined the frequency of concomitant functional dyspepsia (536.9) and IBS (564.1). Finally, we extracted data on ICD-9 codes (Supplementary Digital Content – Table 1) for a number of upper and lower gastrointestinal (GI) symptoms of interest.

Statistical analysis

We used descriptive statistics to characterize demographics, symptoms, and concomitant allergic diseases, and to estimate the proportion of patients with >1 EGID condition (for example, superimposed eosinophilic gastritis and eosinophilic colitis). We also estimated the proportion of patients with superimposed EoE, using a previously validated claims-based definition for EoE (1 instance of the ICD-9 code 530.13). (14) Pearson chi-square tests were used to evaluate whether the distributions of sex, age, census region, the presence of allergic diseases, and the proportions of upper and lower gastrointestinal symptoms differed between EGID cases and the source population.

To calculate period prevalence, we divided the number of patients who met the case definition for each EGID during the two year period by the total number of enrolled patients during the same two years (the study population). The overall prevalence, prevalence by sex, prevalence by census region, and prevalence by 5-year age increments were estimated using the source population. We standardized the overall prevalence estimate to the U.S.

population by age and sex using 2010 census data for individuals < 65 years of age, to allow us to estimate the absolute number of patients with eosinophilic gastritis, gastroenteritis, and colitis in the U.S..

We performed sensitivity analyses using more restrictive case definitions for the EGIDs. Specifically, we estimated the prevalence of eosinophilic gastritis, gastroenteritis, and colitis after excluding patients with ICD-9 codes suggestive of possible competing causes of GI tract eosinophilia, including ulcerative colitis (556.x), Crohn's disease (555.x), and diseases with an infectious etiology (ICD-9 codes 120.0–127.9). The University of North Carolina Institutional Review Board exempted this study from review.

Results

Characteristics of patients with EGIDs

Of the 11,569,217 persons continuously enrolled during the study period, 774 (0.007%) met criteria for eosinophilic gastritis, 954 (0.008%) met criteria for eosinophilic gastroenteritis, and just 404 (0.003%) met criteria for eosinophilic colitis. The mean (\pm std) number of claims, on different days, for eosinophilic gastritis, gastroenteritis, and colitis was 1.3 (\pm 1.6), 1.7 (\pm 2.4), and 1.8 (\pm 3.9) claims, respectively. There were 104 patients with >1 non-EoE EGID, representing 4.9% of patients with an EGID (101 with 2 conditions and 3 with all 3 conditions). Of the 954 patients with eosinophilic gastroenteritis, 51 (5.3%) had diagnostic codes for both eosinophilic gastritis and eosinophilic gastroenteritis. The proportion of patients with superimposed EoE was similar across conditions, specifically 10.6% for eosinophilic gastritis, 12.0% for eosinophilic gastroenteritis, and 10.9% for eosinophilic colitis. Assessment of the frequency of concomitant functional dyspepsia and IBS in each of the non-EoE EGID conditions identified that for eosinophilic gastritis 0.7% and 5.6% had co-existing functional dyspepsia and IBS codes, respectively. For eosinophilic gastroenteritis, 0.4% and 8.6% had functional dyspepsia and IBS codes, respectively, and for eosinophilic colitis, 1.2% had concomitant functional dyspepsia and 13.4% had concomitant IBS.

The mean (std) age of patients with eosinophilic gastritis, gastroenteritis, and colitis was 39.8 (\pm 17.4), 30.2 (\pm 19.9), and 33.5 (\pm 20.5) years, respectively. The case distribution of age (pediatric or adult), census region (northeast, south, midwest, and west), and sex (male or female) was statistically different from that of the source population (Table 1).

Upper and lower gastrointestinal symptoms differed according to condition (Table 2). Eosinophilic gastritis patients were more likely than patients with eosinophilic gastroenteritis or colitis, to have had chest or throat pain. Patients with eosinophilic colitis more commonly had presented with diarrhea (41%) and gastrointestinal bleeding (14%). However, abdominal pain was present in a high proportion of patients across all conditions, and in nearly 60% of those with eosinophilic colitis. For all disease conditions, more than one fourth of patients had presented with nausea and/or vomiting. The proportion of upper and lower gastrointestinal symptoms was significantly higher than observed in the source population (Table 2).

Co-existing allergic conditions were relatively common in patients with eosinophilic gastritis, gastroenteritis, and colitis, at 38.5%, 45.6%, and 41.8% respectively, and these comorbidities were significantly higher than in the source population (Supplementary Digital Content – Table 2). The most commonly reported allergic condition was rhinitis (28–30%). Asthma was reported in 16% of patients with eosinophilic gastritis, 19% of patients with eosinophilic gastroenteritis, and 15% of patients with eosinophilic colitis (Supplementary Digital Content – Table 2). Similar to that which has been documented in EoE, (15) the proportion of patients with concomitant allergic disease was higher among pediatric patients (age < 19 years). For example, 58.9% of pediatric patients with eosinophilic gastritis also had documentation of an allergic condition, compared to 33.6% of adults with eosinophilic gastritis. For eosinophilic gastroenteritis, 51.6% of pediatric patients had allergic disease compared to 41.8% of adults. With eosinophilic colitis, 52.0% of pediatric patients had concomitant allergic disease compared to 35.9% of adults.

Prevalence and distribution of EGIDs in the United States

In the source population the prevalence of eosinophilic gastritis, gastroenteritis, and colitis was 6.7, 8.2, and 3.5 cases/100,000, respectively (Table 3). The female predominance for disease was most evident for eosinophilic gastritis, where the prevalence for females was 7.9 cases/100,000 as compared to 5.4 cases/100,000 for males. Regional differences were observed for eosinophilic gastritis and gastroenteritis, where the prevalence in the south and midwest was nearly twice that of the prevalence in the northeast and west. In contrast, no regional difference in prevalence was observed for eosinophilic colitis (Table 3).

Examination of the prevalence, by age and sex, for each of the EGIDs suggested differences between the conditions. For eosinophilic gastritis, particularly among females, the prevalence increased with age, with a peak prevalence in the oldest age group (14.4 cases/100,000 in females for ages 60–64 years) (Figure 1A). Eosinophilic gastroenteritis prevalence gradually decreased with age, with highest prevalence for both males and females in patients under the age of 5 years, 17.6 cases/100,000 and 16.7 cases/100,000 respectively (Figure 1B). There was little difference in prevalence of eosinophilic colitis by age and sex (Figure 1C).

When age- and sex-standardized to the U.S. population, the estimated prevalence of eosinophilic gastritis was 6.3/100,000, the prevalence of eosinophilic gastroenteritis was 8.4/100,000, and the prevalence of eosinophilic colitis was 3.3/100,000. Applying these prevalences to the 2010 U.S. population, we estimate there are 16,952 cases of eosinophilic gastritis, 22,548 cases of eosinophilic gastroenteritis, and 8,982 cases of eosinophilic colitis, for a total of just 48,482 affected individuals between ages 0–64 years in the U.S., during the study period.

In sensitivity analyses, where a more restrictive case definition was used to exclude patients with possible competing conditions, we observed similar prevalence estimates to those obtained using the primary definitions for eosinophilic gastritis and gastroenteritis, but not colitis. Eosinophilic gastritis prevalence was 6.0/100,000 after excluding 34 patients with inflammatory bowel disease (IBD) codes and 2 patients with infectious disease codes, and the prevalence of eosinophilic gastroenteritis was 7.7/100,000, after excluding 72 patients

with IBD codes and 8 patients with infectious disease codes. However, nearly 30% of patients with eosinophilic colitis had codes for either IBD (n=114) or infectious disease (n=6), reducing the prevalence to just 2.4 cases/100,000. Using these more restrictive prevalence estimates, an estimated 43,203 individuals are affected by one of these conditions in the United States.

Discussion

In the present study, we estimated the prevalence of eosinophilic gastritis, eosinophilic gastroenteritis, and eosinophilic colitis in the United States. To our knowledge, estimates of the prevalence of each of these conditions in the U.S. have not been directly calculated from national level data. Our results indicate that these conditions are rare and much less common than EoE. For the first time, we are also able to present age- and sex-specific prevalence for these conditions, show a female predominance for eosinophilic gastritis, gastroenteritis, and colitis, and demonstrate an association with allergic diseases. Because of the large database that we used, we were able to identify many-fold more EGID patients than have been described previously.

One other study estimated the overall prevalence of the non-EoE EGIDs using a methodology where allergists and gastroenterologists were surveyed about their practice data, and the results were extrapolated nationally. (16) They found a prevalence of 28/100,000 for combined cases of eosinophilic gastroenteritis and eosinophilic colitis, higher than our estimate. They also found higher prevalence in the northeast region, whereas we found higher prevalence in the south and midwest.

The age distribution of patients in our study suggested that most patients were adults. The ability to identify a larger set of cases than previously described, from which age distributions could be examined, was a strength of this study. Although often associated with young children, the age distribution of eosinophilic colitis was 33.5 and just 11 of the 404 cases were among children <2 years of age at the time of diagnosis (3 cases were <1 year of age). Adult patients with eosinophilic colitis have been described in smaller, single center studies, including a recent study of 11 patients with eosinophilic colitis where the mean age was 22. (17, 18)

There have been several published case series of patients with EGIDs. (8, 9,19–21) Case series from single centers suggest that these EGIDs are associated with significant morbidity and that the clinical presentation differs depending on the location of the eosinophilia in the GI tract, and the depth of inflammation through the bowel wall.(9, 19, 20)Patients with eosinophilic colitis may present with abdominal pain, diarrhea, and rectal bleeding. Eosinophilic gastritis and gastroenteritis patients may present with abdominal pain, nausea and vomiting.(7–9,20–22) The upper and lower gastrointestinal symptoms described for patients in these smaller studies is consistent with the patient symptoms documented in the present study.

Our data show that patients with the non-EoE EGIDs have frequent associated atopic conditions, though the proportion is not as high as has been previously reported for EoE.

(23–25) In our own data, the proportion of non-EoE EGID patients with concomitant EoE was also less than the proportion of EoE patients with atopy (Table 3). Several case series or single center studies have identified allergic disease comorbidity in many patients with eosinophilic gastritis and gastroenteritis.(5, 6,8, 26, 27) In a case series of 42 patients, Zhang et al. found that 30% of the patients with eosinophilic gastroenteritis had concomitant allergic rhinitis or asthma. (10) Similarly, Caldwell et al. found that 7 of 14 patients diagnosed with eosinophilic gastritis tested positive for food or aeroallergens with skin prick testing. This same study provided molecular profiling data to support the assertion that eosinophilic gastritis is a Th2-associated disease. (5) Still, some patients with EGIDs have no evidence of concomitant allergic disease and there is some suggestion there may be an autoimmune component to these diseases. (28, 29) Our finding of increased diagnosis of atopy among patients with eosinophilic colitis is a novel finding, possibly a reflection of the larger sample from which these association could be examined. It may also be that patients with a chronic health condition are more likely to seek care for other co-morbidities and that the increased diagnosis of atopic illness is reflecting increased health care utilization among these patients.

There are some limitations to the estimates presented. Although this is the first, large-scale administrative claims-data approach to estimating the prevalence of these conditions, there is the potential that we may have under- or over-estimated the number of cases. Of note, the ICD-9 codes for the non-EoE EGIDs have not been validated against other data sources, therefore misclassification of identified cases may be possible. Given the rarity of these diseases and the relative newness of these diagnostic codes, however, we would hypothesize that our estimates are most likely an underestimate of the true number of cases. In our previous study validating the ICD-9 code for EoE, we found that it was highly specific, but much less sensitive.(14) We would postulate that it would be similarly unlikely for a provider to use one of the EGID ICD-9 codes for a patient without an EGID, but cannot confirm this in the present study as our claims data are de-identified and not linked to patient records. To attempt to account for this potential misclassification, we performed sensitivity analyses using a more restrictive coding case definition, excluding patients with codes for possible competing conditions. With this, the estimates changed minimally. In addition, the validity of our definitions are supported by the observation that the associated symptom codes for patients with these disorders are consistent with what is known about the clinical presentation of these conditions. Nonetheless, it is important that, to date, there are no published guidelines on case definitions for these conditions, so clinical diagnosis of these relatively new entities is likely a heterogeneous process as well. While there are some investigations assessing eosinophil levels in the GI tract (29) there are no formal cut-points for the number of eosinophils in the stomach, small intestine, and colon in the EGIDs, and there are no published guidelines as of yet for the diagnosis of these non-EoE EGIDs.

In addition to potential misclassification, we are limited in our analyses to the data captured in the claims database. Therefore, we cannot comment on patient race/ethnicity, socioeconomic status, practice setting, endoscopic findings, histologic features, or depth of involvement in the wall of the GI tract. Time trends and incidence calculations are also not possible given the recent introduction of these ICD-9 codes. The patients in this database are representative of a commercially insured population. It is possible that some patients are

underinsured, and thus less likely to obtain the services necessary to reach a diagnosis, and we do not capture patients who are uninsured, on Medicaid, or on Medicare. This could result in an under-ascertainment of the number of cases.

The cases examined also represented prevalent cases and use of the diagnostic codes could reflect care received during follow-up treatment for the EGID, rather than at initial diagnosis. Therefore, we felt that requiring a procedure code for histopathologic examination could underestimate case prevalence. It is possible too, that patients may have been misclassified as having one EGID, later to be diagnosed with a different condition. The proportion of patients with both eosinophilic colitis and an IBD diagnosis may be indicative of diagnostic confusion for eosinophilic colitis. We found little evidence to support increased functional disorders in patients with an EGID, and minimal overlap in the proportion of patients with more than one EGID.

In examining presence of upper and lower gastrointestinal symptoms, we were only able to evaluate symptom codes. Furthermore, we did not restrict occurrence of these symptom codes to before or on the date on which the claims was made. Therefore, some of these symptoms may be unrelated to the EGID diagnosis. However, because these are prevalent cases, we anticipate that there may be instances where the gastrointestinal symptom may occur after the diagnosis is made. In future studies, with additional years of follow-up after introduction of the code, incident cases may be examined and a more complete description of presenting symptoms at diagnosis can be ascertained.

There are several strengths of this study, including that we have used a large, national database demonstrated to be representative of all patients in the U.S. with commercial insurance. (11, 12) This allowed us to present details on the largest population of EGID patients yet reported in the literature, as well as make national prevalence estimates standardized to the population of the U.S., aged 0–64 years.

In conclusion, we demonstrate that the non-EoE EGIDs are very rare diseases, with prevalences ranging from 3.3 to 8.4 cases/100,000, and with fewer than 50,000 people affected in the U.S. with one of these conditions. Moreover, we find that the conditions tend to be more common in females- and are associated with high upper and lower gastrointestinal morbidity. The high proportion of co-existing atopic illness suggests these conditions may arise, in some instances, from a similar pathogenesis as EoE. However differences in sex ratios (female predominance for these other EGIDs as compared to male predominance for EoE) indicates that there may be important pathogenic differences for these conditions. As the time since introduction of these diagnostic codes increases, it will allow for additional studies to be conducted which examine incidence and prevalence changes over time, as well as long term disease sequelae.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Abbreviations

ICD-9 CM	International Classification of Disease, Ninth Revision, Clinical Modification diagnosis codes
CPT	Current Procedural Terminology codes
NDC	National Drug Codes
EoE	Eosinophilic Esophagitis

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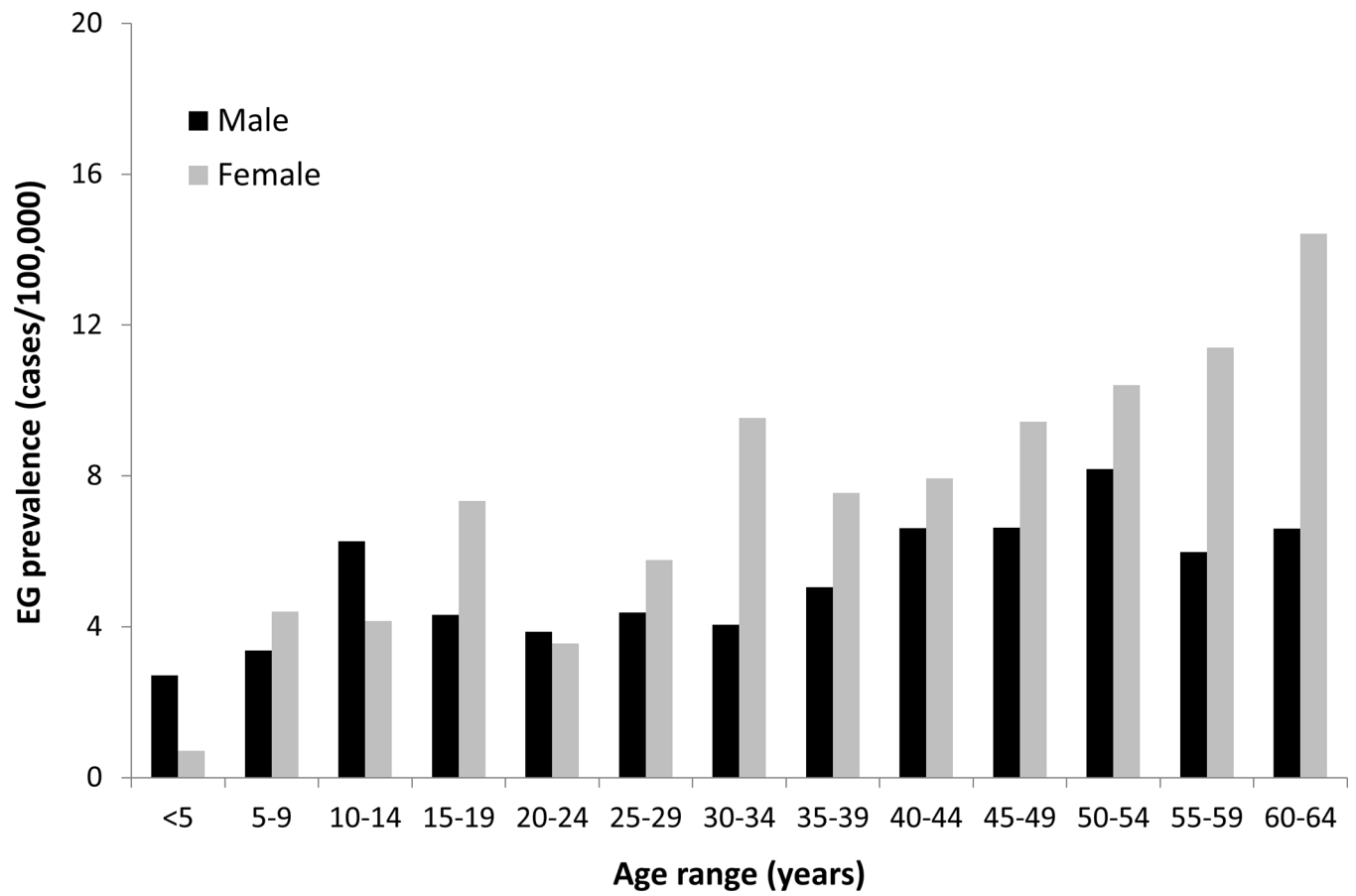
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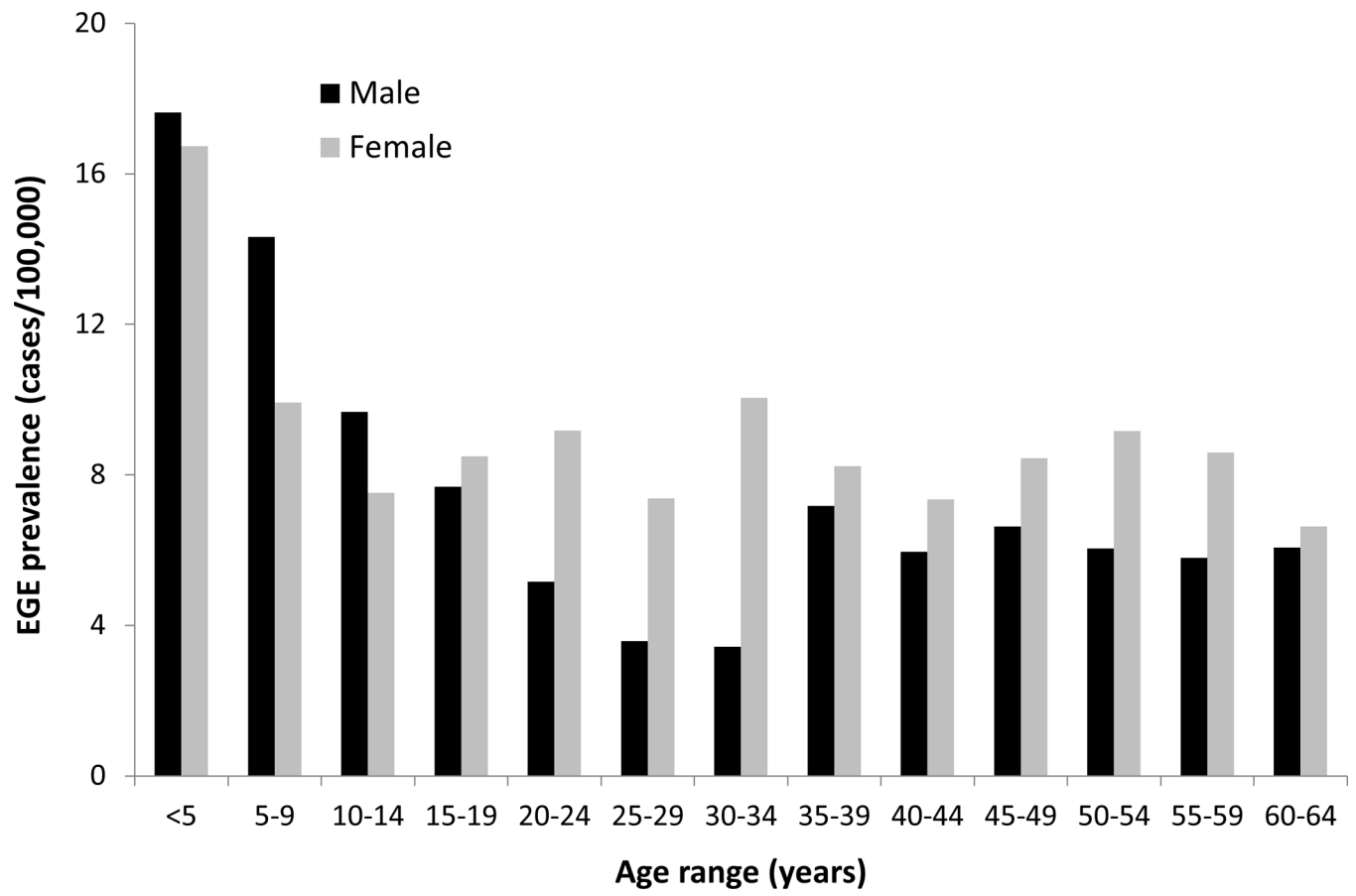
What is known about this subject?

- The prevalence of non-EoE EGIDs is poorly described in the literature.
- The introduction of ICD-9 codes for these conditions provided the opportunity to estimate the prevalence of these conditions in the U.S..

What are the new findings and/or what is the impact on clinical practice?

- Eosinophilic gastritis, gastroenteritis, and colitis are rare, with a standardized prevalence of 6.3/100,000, 8.4/100,000, and 3.3/100,000, respectively.
- The prevalence of eosinophilic gastroenteritis was highest among children age < 5 years, whereas eosinophilic gastritis was more prevalent among older age groups. We observed no age differences for eosinophilic colitis.





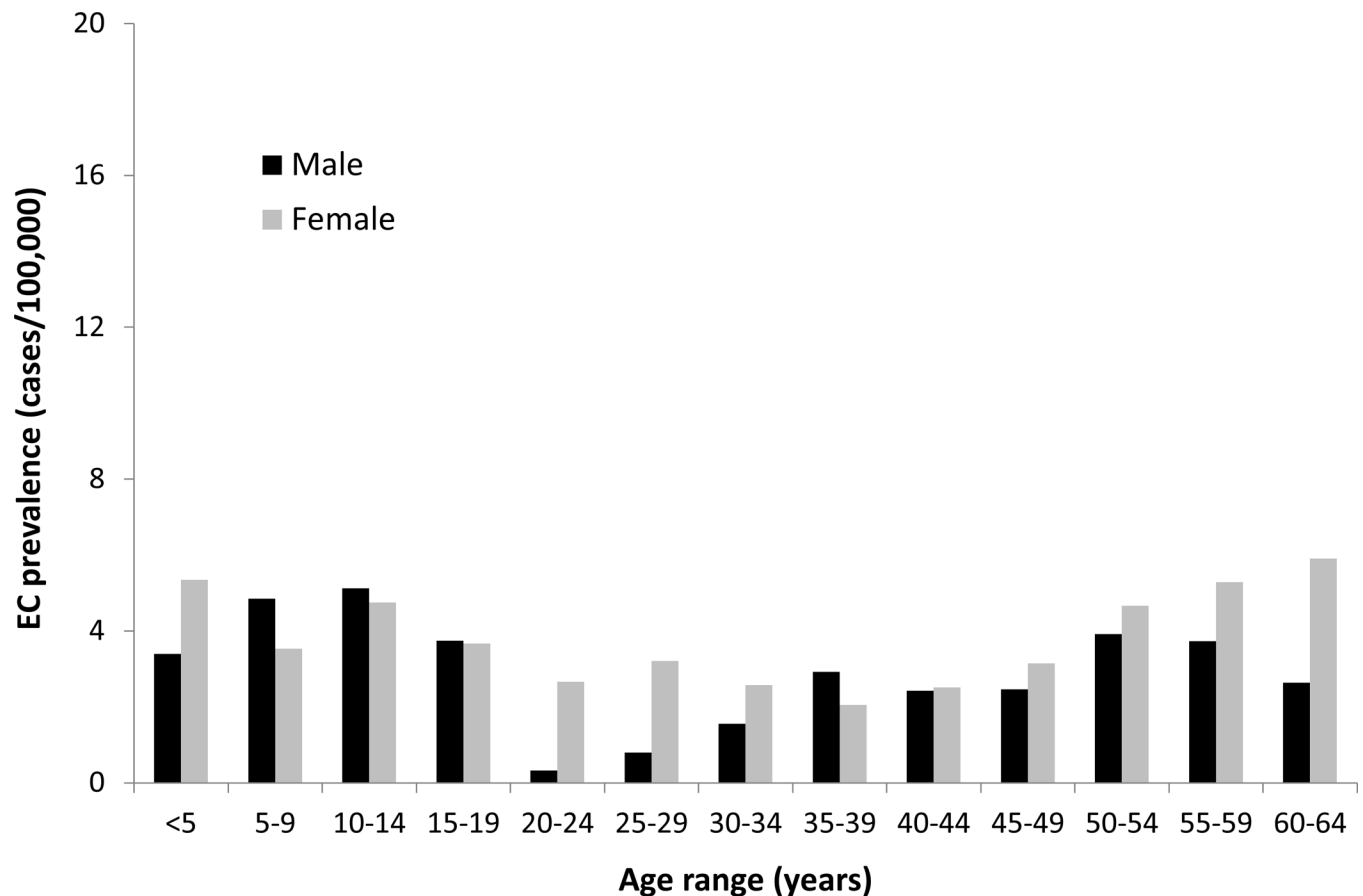


Figure 1.

(A) Prevalence of gastritis (cases per 100, 000) in the database between July 1, 2009 through June 30, 2011 for those enrolled continuously for 24 months, as stratified by sex (males are the black bars and females are the gray bars) and by 5 year increments of age. (B)

Prevalence of eosinophilic gastroenteritis (cases per 100, 000) in the database between July 1, 2009 through June 30, 2011 for those enrolled continuously for 24 months, as stratified by sex (males are the black bars and females are the gray bars) and by 5 year increments of age.

(C) Prevalence of eosinophilic colitis (cases per 100, 000) in the database between July 1, 2009 through June 30, 2011 for those enrolled continuously for 24 months, as stratified by sex (males are the black bars and females are the gray bars) and by 5 year increments of age.

Data source: IMS Health LifeLink™, PharMetrics Plus™Health Plan Claims Database, January 2001–November 2011, IMS Health Incorporated. All Rights Reserved.

Table 1

Demographic characteristics of patients with eosinophilic gastrointestinal disease

	Source population n=11,569,217 (%)	Eosinophilic gastritis Cases n=774 (%)	p [‡]	Eosinophilic gastroenteritis Cases n=954 (%)	p [‡]	Eosinophilic colitis Cases n=404 (%)	p [‡]
Age < 20 [†]	3,587,571 (31.0)	159 (20.5)	<0.01	385 (40.4)	<0.01	153 (37.9)	<0.01
Male	5,544,574 (47.9)	299 (39.6)	<0.01	423 (44.3)	0.03	173 (42.8)	0.05
Region of country [§]							
Northeast	2,226,470 (19.2)	111 (14.3)		126 (13.2)		78 (19.3)	
South	4,529,151 (39.1)	346 (44.7)		401 (42.0)		197 (48.8)	
Midwest	3,569,432 (30.9)	263 (34.0)	<0.01	366 (38.4)	<0.01	92 (22.8)	<0.01
West	1,244,164 (10.8)	54 (7.0)		61 (6.4)		37 (9.2)	

^{*} Data calculated for the time frame July 1, 2009 through June 30, 2011 for those enrolled continuously for 24 months[†] Children were defined as age < 20 years for purposes of standardization in 5 year increments of age[‡] p-value for chi-square test for difference in distributions among cases versus source population[§] U.S. census regions (https://www.census.gov/geo/maps-data/maps/pdfs/reference/us_regdiv.pdf)

Data source: IMS Health LifeLink™, PharMetricsPlus™ Claims Database, January 2001–November 2011, IMS Health Incorporated. All Rights Reserved.

Table 2

Upper and lower gastrointestinal symptoms of patients with eosinophilic gastrointestinal disease

Symptom	Source population n (%) n=472,222	Eosinophilic gastritis n (%) n=774	Eosinophilic gastroenteritis n (%) n=954	Eosinophilic colitis n (%) n=404
Dysphagia	52 (0.01)	0 (0.0)	0 (0.0)	0 (0.0)
Heartburn	2,649 (0.6)	41 (5.3)	21 (2.2)	20 (5.0)
Abdominal pain/dyspepsia	66,578 (14.1)	402 (51.9)	474 (49.7)	239 (59.2)
Chest pain/throat pain	49,799 (10.6)	226 (29.2)	200 (21.0)	94 (23.3)
Nausea/vomiting	29,289 (6.2)	195 (25.2)	276 (28.9)	113 (28.0)
Failure to thrive	797 (0.2)	13 (1.7)	25 (2.6)	14 (3.5)
Diarrhea	18,426 (3.9)	131 (16.9)	293 (30.7)	165 (40.8)
Gas/bloating	3,846 (0.8)	42 (5.4)	52 (5.5)	32 (7.9)
Gastrointestinal bleeding	7,074 (1.5)	69 (8.9)	66 (6.9)	58 (14.4)

* Data calculated for those enrolled continuously from July 1, 2009 through June 30, 2011 for claims arising within this period, claims data for the source population represent claims for a 5%, random sample of the total study population

[†] p-value for test for difference in proportions between patients with eosinophilic gastritis, gastroenteritis, and colitis, as compared to a random sample of the source population meeting study eligibility criteria for enrollment period

Data source: IMS Health LifeLink™, PharMetricsPlus™ Claims Database, January 2001–November 2011, IMS Health Incorporated. All Rights Reserved.

Table 3

Prevalence of eosinophilic gastrointestinal diseases by age, sex, region

	Source population	Eosinophilic gastritis		Eosinophilic gastroenteritis		Eosinophilic colitis	
	(n)	Cases (n)	Prevalence (per 100,000)	Cases (n)	Prevalence (per 100,000)	Cases (n)	Prevalence (per 100,000)
Age [†]							
	< 20	3,587,571	159	4.4	385	153	4.3
	20–64	7,981,646	615	7.7	569	251	3.1
Sex							
	Male	5,544,574	299	5.4	423	173	3.1
	Female	6,024,643	475	7.9	531	231	3.8
Region [#]							
	Northeast	2,226,470	111	5.0	126	78	3.5
	South	4,529,151	346	7.6	401	197	4.3
	Midwest	3,569,432	263	7.4	366	92	2.6
	West	1,244,164	54	4.3	61	37	3.0
	Overall prevalence	11,569,217	774	6.7	954	404	3.5

^{**} Data calculated for those enrolled continuously from July 1, 2009 through June 30, 2011 for claims arising within this period

[†] Children were defined as age < 20 years for purposes of standardization in 5 year increments of age

[#] U.S. census regions (https://www.census.gov/geo/maps-data/maps/pdfs/reference/us_regdiv.pdf)

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