

REVIEW ARTICLE

The epidemiology of inflammatory bowel disease in Asia and Asian immigrants to Western countries

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Abstract

Inflammatory bowel disease (IBD), which comprises Crohn's disease and ulcerative colitis, is an idiopathic inflammatory condition of the gastrointestinal tract. The incidence and prevalence of IBD are rapidly increasing worldwide, particularly in newly industrialized regions such as Asia. Although a large medical armamentarium is available for treating this chronic disease, IBD imposes a marked global disease burden. To understand the complex etiopathogenesis of this condition, it is important to consider the rapidly changing trends in its epidemiology in Asia. During the past few decades, the incidence and prevalence of IBD have significantly increased in both Asian countries and Asian immigrants in Western countries. In this review, we aimed to study and update the epidemiology of IBD in diverse Asian regions and among Asian immigrants in North America and Europe. Moreover, we highlighted that this population exhibits a unique disease phenotype, such as male predominance and high frequency of perianal fistula in Crohn's disease. Also, a different disease phenotype including more complicated disease such as perianal complications was noted in Asian Americans and Asian Europeans.

KEYWORDS

Asia, epidemiology, immigrants, inflammatory bowel disease

INTRODUCTION

Inflammatory bowel disease (IBD) is a chronic, relapsing disorder of the intestinal tract.¹ Crohn's disease (CD) and ulcerative colitis (UC) are two subtypes of IBD. The etiopathophysiology of IBD is complex and multifactorial, including genetic, environmental, and microbial components. Although IBD was previously considered a Western disease, industrialization in developing regions, such as Asia, has become a global disease. Considering the genetic and environmental

diversity among different ethnicities, a longitudinal examination of the epidemiological trends of IBD in Asia may facilitate an understanding of IBD etiopathogenesis. Additionally, there are regional disparities among Asian countries, which comprise approximately 60% of the world's population.² Moreover, similar to twin studies, the interaction between genetics and environment can be investigated by evaluating the epidemiology of IBD among Asian immigrants in Western countries. Here, we reviewed and updated the epidemiology of IBD in diverse Asian regions (East, Southeast, South, West, and

Satimai Aniwan and Priscila Santiago contributed equally to this article.

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Central Asia) and among Asian immigrants in North America and Europe. We aimed to update the most recent data on this issue, including articles published within the last 3 years if possible. Of note, North Asia consists of the only Asian part of Russia, which lacks specific epidemiology data; therefore, we did not include it in this review.

INFLAMMATORY BOWEL DISEASE IN ASIAN COUNTRIES

Details on the epidemiology of IBD in Asian regions and countries are shown in Tables 1 and 2.

East Asia

Population

East Asia comprises eight countries with a population of approximately 1689 million, equating to 22% of the world population. More than half of this population is urban, and the median age is 39 years.³

Incidence and prevalence

Recently, a 30-year trend in the IBD incidence in a population-based inception cohort from the Songpa-Kangdong district in Seoul, Korea, was analyzed.⁴ The age- and sex-adjusted annual incidence of both UC and CD has increased continuously throughout the 30-year period: from 0.33/100,000 persons in 1986 to 6.58/100,000 persons in 2015 for UC, and from 0 in 1986 to 2.42/100,000 persons in 2015 for CD. Thus, the UC incidence had increased approximately 20-fold and the CD incidence had increased approximately 40-fold during the past 3 decades in Korea. However, the average annual percentage change in IBD incidence was 12.3% from 1986 to 1995, and 12.3% from 1996 to 2005, whereas it was only 3.3% from 2006 to 2015 ($P < 0.05$), denoting a recent moderation in the continued increase in IBD incidence. Epidemiologic studies in Japan also point to an increasing IBD incidence. In 1955, the annual incidence of UC and CD was 0.03/100,000 persons and 0.002/100,000 persons, respectively.⁵ In 1991, the annual incidence of UC and CD had increased to 1.95/100,000 persons and 0.51/100,000 persons, respectively.⁶ During 1986–1998, the annual incidence of CD was 0.9/100,000 persons.⁷ A recent study based on survey data from 2014 showed an annual UC incidence of 12.2/100,000 persons, and the CD incidence as 2.0/100,000 persons.⁸ In meta-analyses of incidence data from mainland China, the annual CD incidence was 0.28/100,000 persons from 1950 to 2002, which rose slightly to 0.85/100,000 persons for the period 1950–2007, at a national level.^{9,10} In a multicenter study from Hong Kong, based on hospital

and territory-wide administrative coding data, the age-adjusted annual incidence of IBD per 100,000 persons increased from 0.10 in 1985 to 3.12 in 2014.¹¹ Further longitudinal data on IBD incidence in East Asia were reported from Taiwan in 2019.¹² A retrospective analysis of data from the National Health Insurance and the Ministry of Health and Welfare, Taiwan, during 2001–2015 showed that the crude annual incidence of UC increased from 0.54/100,000 persons in 2001 to 0.95/100,000 persons in 2015, while that of CD increased from 0.17/100,000 persons in 2001 to 0.47/100,000 persons in 2015. Of note, the real number is definitely underestimated because this data is based on the catastrophic illness registration.¹²

In terms of IBD prevalence in East Asia, data from Korea and Japan showed that approximately 0.1%–0.2% of the general population likely had IBD in 2014–2015, and that Taiwan and Hong Kong may have had a lower IBD prevalence (0.02%–0.04% in the general population for 2014–2015) than did Korea and Japan.²

Patient characteristics

In terms of demographic characteristics in East Asian IBD patients, data from a Korean population-based study showed that the median age at diagnosis was 36 years for UC and 22 years for CD.⁴ Similar patterns were reported in other East Asian countries and regions such as Japan, Hong Kong, and Taiwan (20 and 30s for UC and late 10s and early 20s for CD in Japan,⁸ 41 years for UC and 30 years for CD in Hong Kong,¹¹ and 20–39 years for IBD in Taiwan¹²). The male-to-female ratio of the adjusted incidence rate was 1.2:1 for UC and 3.3:1 for CD, which showed the male predominance for CD in Korea.⁴ The male predominance of CD was observed in Japan (2:1),⁸ Hong Kong (1.86:1),¹¹ and Taiwan (2.19:1).¹² Also, the recent meta-analysis reported that Asian patients with CD showed male predominance (65%) compared with Caucasians (49%) ($P < 0.01$).¹³ Family history of IBD was reported in 3.0% of patients in Hong Kong¹¹ and 6.6% in Korea.¹⁴

Disease characteristics

In Korea, the rate of perianal fistula/abscess before or at the diagnosis of CD was 43.3%. Over a half of the UC patients (54.3%) presented only with proctitis at the time of diagnosis.⁴ In Hong Kong, 34.5% of UC patients had proctitis at diagnosis and 24.5% of patients with CD had perianal disease at diagnosis.¹¹ The high proportion of proctitis among UC patients, and the male predominance and high frequency of perianal disease among CD patients in this geographical region seem to be features that are distinct from those of their Western counterparts.⁴ Also, recent meta-analysis reported that Asian patients with CD showed higher prevalence of perianal disease (0.23; 95% confidence interval [CI], 0.17–0.29) than Caucasians (0.14; 95% CI, 0.12–0.16).¹³

TABLE 1 Summary of studies on the epidemiology of Inflammatory bowel disease (IBD) in Asian countries/regions

Author	Data source	Year of publication	Years studied	Country/region	Incidence of IBD (per 100,000)	Prevalence of IBD (per 100,000)	Incidence of UC (per 100,000)	Incidence of CD (per 100,000)	Prevalence of UC (per 100,000)	Prevalence of CD (per 100,000)
East Asia										
Park et al. ⁴	Population-based	2019	2015	Korea	9.0	108.35	6.58	2.42	76.66	31.59
Okabayashi et al. ⁸	Nationwide survey	2020	2014	Japan	14.2	165.1	12.2	2.0	133.2	31.9
Zheng et al. ¹⁰	Systematic review	2010	1950–2007	China				0.85		
Ng SC et al. ¹¹	Nationwide study	2016	2014	Hong Kong	3.12	44.0	1.51	1.46	24.51	18.63
Yen et al. ¹²	Nationwide study	2019	2001–2015	Taiwan	1.42	16.7	0.95	0.47	12.8	3.9
Southeast Asia										
Hilmi et al. ¹⁸	Population-based	2015	2005–2010	Malaysia	0.69	9.24	0.46	0.20	6.67	2.17
Aniwan et al. ²⁰	Hospital-based	2021	2010–2018	Thailand			0.51		6.22	
South Asia										
Sood et al. ³⁶	Population-based	2003	1999–2000	India			6.02		53.6	
Niriella et al. ³⁷	Hospital-based	2010	2007–2008	Sri Lanka			0.69	0.09	5.3	1.2
West Asia										
Malekzadeh et al. ⁴¹	Systematic review	2016	2012	Iran	3.11	40.67	2.70	0.41	35.52	5.03
Mosli et al. ⁴²	Systematic review	2021	1991–2017	Saudi Arabia Kuwait UAE Lebanon			2.33	1.46		
Stulman et al. ⁴³	Nationwide study	2021	2017	Israel			10.5	14.9		
Central Asia										
Kaibullayeva J et al. ⁵⁰	Nationwide survey	2020	2017	Kazakhstan		113.9			84.4	29.5

Abbreviations: CD, Crohn's disease; IBD, inflammatory bowel disease; UC, ulcerative colitis.

Southeast Asia

Population

Southeast Asia consists of 11 countries that are geographically divided into two regions. Mainland Southeast Asia includes Cambodia, Laos, Myanmar, Peninsular Malaysia, Thailand, and Vietnam, whereas maritime Southeast Asia includes Brunei, East Malaysia, East Timor, Indonesia, and the Philippines. The total population is about 680 million, ranking third in Asia, and accounting for

8.5% of the world population. Half of the population is urban, and the median age is 30 years¹⁵

Incidence and prevalence

Because of the geographic differences in Southeast Asia, the incidence and prevalence of IBD vary among countries. Population-based IBD incidence data from Indonesia, Malaysia, Singapore, and Thailand during the same period have shown that the annual

TABLE 2 Summary of studies on patient and disease characteristics of Inflammatory bowel disease (IBD) in Asian countries/regions

References	Country/ region	Age of diagnosis	Male-to-female ratio	Family history of IBD	Disease extent in UC	Disease location in CD	Disease behavior in CD
East Asia							
4, 14	Korea	36 years (UC) 22 years (CD)	1.2:1 (UC) 3.3:1 (CD)	6.6%	E1: 54.3% E2: 22.5% E3: 23.2%	L1: 24.9% L2: 9.3% L3: 65.8%	B1: 81.1% B2: 8.1% B3: 10.8% p: 43.3%
8	Japan	20 and 30s (UC) Late 10s and early 20s (CD)	2:1 (CD)				
11	Hong Kong	41 years (UC) 30 years (CD)	1.27:1 (UC) 1.86:1 (CD)	3.0%	E1: 34.5% E2: 32.0% E3: 33.5%	L1: 24.5% L2: 32.3% L3: 43.1%	B1: 65.2% B2: 25.1% B3: 16.1% p: 24.5%
12	Taiwan	20–39 years (IBD)	1.62:1 (UC) 2.19:1 (CD)				
Southeast Asia							
16, 18, 22, 23, 29	Myanmar Malaysia Thailand Vietnam Indonesia Philippines	35–42 years (UC) 31–34 years (CD)	Slight female predominance (IBD)	3.0%	E1: 22% E2: 37% E3: 39.5%	L1: 23% L2: 41.7% L3: 33%	B1: 70% B2: 16% B3: 14% p: 16%– 18%
South Asia							
22, 38	India Bangladesh Nepal Sri Lanka	37.5 years (UC) 34.8 years (CD)	1.6:1 (IBD)	2%–3%	E1: 29% E2: 39% E3: 32%	L1: 33% L2: 21% L3: 43%	B1: 63% B2: 23% B3: 13% p: 12.5%
West Asia							
41,42,45, 46, 48	Iran Saudi Arabia Kuwait UAE Lebanon	30 and 40s (UC) 20 and 30s (CD)	1.5:1 (UC) 2:1 (CD)	7%–19%	E2: 48%–55% E3: 42.7%– 45.5%	L1: 22.8%–38.6% L2: 7%–20.5% L3: 40.9%–56%	B1: 49%–60% B2: 32%–40% B3: 7%–18% p: 7%–19%
Central Asia							
50	Kazakhstan	30–39 years (UC) 18–29 years (CD)	Male predominance (IBD)		E2: 44.6%	L1: 41.7% L3: 38.9%	B1: 55.6% p: 2.8%

Abbreviations: B1, inflammatory; B2, stricturing; B3, penetrating; CD, Crohn's disease; E1, proctitis; E2, left-sided colitis; E3, extensive colitis; IBD, inflammatory bowel disease; L1, leum; L2, colon; L3, ileocolon; p, perianal disease; UC, ulcerative colitis.

IBD incidence was less than 1/100,000 persons, which is lower than that in the West and East Asia.^{16,17} During 2011–2013, the pooled annual incidence of IBD was significantly lower in Southeast Asia than in East Asia (0.8 vs. 1.53/100,000 persons; $p = 0.015$).¹⁷ The pooled annual UC incidence in Southeast Asia was also lower than that in East Asia (0.49 vs. 1.14/100,000 persons; $p = 0.002$), whereas the pooled annual incidence of CD was comparable to that in East Asia (0.36 vs. 0.34/100,000 persons; $p = 0.878$).¹⁷ Per country, the annual IBD incidence was 1.14/100,000 in Singapore, 0.77/100,000 in Indonesia, 0.76/100,000 in Malaysia, 0.63/100,000 in Thailand, and 0.49/100,000 in Brunei.¹⁷ The incidence of UC

(0.28–0.59/100,000) was higher than that of CD (0.24–0.40/100,000) in Southeast Asia.¹⁶

Data on temporal incidence trends from Southeast Asia are limited; however, the incidence appears to be increasing. A population-based study from the Kinta Valley, Malaysia, for the period 1990–2010 reported that the annual IBD incidence increased over these 2 decades, from 0.07/100,000 persons in 1990–1995 to 0.69/100,000 persons in 2005–2010. In 2013, the IBD prevalence rate was 9.24, that of UC was 6.67, and that of CD was 2.17/100,000 persons.¹⁸ The increasing trends were consistent with those of hospital-based cohort studies.¹⁹ A single-center tertiary hospital in Kuala Lumpur,

Malaysia, analyzed IBD incidence over 4 decades. They showed that the IBD incidence per 100,000 persons steadily increased from 0.36 in 1980–1989, 0.48 in 1990–1999, 0.63 in 2000–2009, to 1.46 in 2010–2018. Another two-center study from Bangkok, Thailand, reported that the UC incidence rose from 0.19/100,000 persons during 2000–2009 to 0.51/100,000 persons during 2010–2018.²⁰ The UC prevalence increased 2.5-fold during the past decade from 2.48/100,000 persons in 2009 to 6.22/100,000 persons in 2018.²⁰

Southeast Asia's populations are multiethnic, even within the same country, resulting in various IBD incidences among the different ethnic groups. For example, Malaysia has three major ethnic groups. The annual IBD incidence was 1.91/100,000 among Indian persons, 0.63/100,000 in Chinese persons, and 0.35/100,000 among Malay persons.¹⁸ These findings are consistent with a previous report from Singapore on the IBD prevalence for 1985–1996. There was a high UC and CD prevalence among Indians (16 and 4.9/100,000 persons, respectively) relative to Chinese (6 and 4/100,000 persons) and Malays (7 and 2.9/100,000 persons).²¹ Residents who migrated from a high IBD-incidence area in Asia (India and China) were more likely to develop IBD; however, the incidence rates were still lower than among those who lived in high-incidence countries (IBD incidence in India: 9.31/100,000 persons vs. in China [Guangzhou]: 3.64/100,000 persons).¹⁷ This may be due to different genetic and environmental predisposing factors for IBD development.

Patient characteristics

Among Southeast Asian patients with IBD, the median age at UC diagnosis was 35–42 years, and they were more likely to be older than those diagnosed with CD (median age: 31–34 years).^{16,22,23} This was consistent with the findings in a Western population, in Olmsted County, Minnesota, where the median age at UC diagnosis was 34.9 years and that at CD diagnosis was 29.5 years.²⁴ However, there was no second incidence peak at 60–70 years of age among Southeast Asian patients. Overall, there was a male predominance in both UC and CD.²⁵ In Myanmar, Thailand, and Vietnam, there were slightly more female than male patients.²² This shifting female-to-male ratio was consistent with that seen in a pool of 17 population-based cohorts from Western countries. This demonstrated the rising female:male ratio for CD patients older than 25.²⁶ A family history of IBD was uncommon, seen in approximately 3% of patients,^{16,22} which was lower than that in the Korean population (6%)¹⁴ and a White population (6%–12%).^{27,28} Only three CD patients had first-degree relatives with IBD, and no UC patients with a family history were reported in the Southeast Asian population.^{18,21,23,29} This finding supports the emerging nature of IBD in this region.

Disease characteristics

In terms of disease characteristics in Southeast Asian IBD patients, UC disease extent was comparable across six countries in Southeast

Asia. For UC, extensive colitis was present in 39.5% of patients (range, 28%–56%), and left-sided colitis in 37% (range, 22%–58%), while ulcerative proctitis was present in 22% (range, 9%–37%) at diagnosis.^{18,22,23} For CD, at diagnosis, ileum, colon, and ileocolonic distribution was seen in 23% (range, 14%–33%), 41.7% (range, 29%–50%), and 33% (range, 30%–44%), respectively. These findings were similar to those in the West,^{30–32} and in contrast to studies from East Asia, where ulcerative proctitis and ileocolonic CD were the most common type of disease location in the Korean population.⁴ Inflammatory (B1), stricturing (B2), and penetrating (B3) CD phenotypes were reported in 70%, 16%, and 14% of patients, respectively. Perianal CD was seen in about 16%–18% of CD patients.^{22,29} These data were concordant with population-based European and Asian cohorts: 66%–75% had an inflammatory type, 10%–21% had stricturing (B2), and 8%–17% had penetrating (B3) lesions.^{4,16,33} Approximately one-fifth of CD patients (18.0%–22.5%) had perianal disease.³² Therefore, complicating CD at diagnosis in Southeast Asia appears to be as severe as in the West and Asia.

South Asia

Population

South Asia, which consists of eight countries (Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka), is the most densely populated geographical region globally. As of May 2022, the total population in this region was about 1980 million, which ranked first among Asian regions and accounted for one-fourth of the world population. One-third of this population lives in urban areas, and the median age is 27 years.³⁴

Incidence and prevalence

There is much genetic and ethnic diversity within the South Asian region. The IBD incidence reported among South Asian countries differs widely due to population density, study design, and study period. In a prospective population-based study between 2011 and 2013, Sri Lanka had a low annual incidence of IBD (1.68/100,000 persons). In contrast, India had a high annual incidence of IBD (9.31/100,000 persons) among South Asian countries.¹⁷ However, this IBD incidence rate in indigenous Indians was lower than that in migrant Indians living in Ontario, Canada, between 1999 and 2015 (14.6/100,000 persons).³⁵ These findings suggest the importance of environmental factors, urbanization, and socioeconomic status in IBD incidence.

Sood et al. conducted the first population-based study in Punjab, North India, using a house survey to identify symptomatic patients and invited those patients for a diagnostic endoscopy, aiming to assess the UC epidemiology between 1999 and 2000.³⁶ The annual incidence and prevalence of UC were 6.02 and 53.6/100,000 persons, respectively. A hospital-based survey in two districts of Sri

Lanka, conducted during 2007–2008, demonstrated that UC's annual incidence and prevalence were 0.69 and 5.3/per 100,000 persons, respectively. CD's annual incidence and prevalence were 0.09 and 1.2/per 100,000 persons, respectively.³⁷ These reports are consistent with updated data from a population-based study in 2011–2013, which showed crude annual incidence rates for UC and CD of 5.40 and 3.91/100,000 persons in India and 1.16 and 0.52/100,000 persons in Sri Lanka, respectively.¹⁷ The Indian nationwide IBD registry for 2014–2015 reported that UC was more common than CD, at a 5:1 ratio.³⁸ Of note, North India had a higher ratio (11.4:1) than South India (1.4:1). This may be due to the different proportions of Ancestral North Indians, who share previously reported UC genetic risk factors with Caucasians.³⁹

Patient characteristics

In terms of demographic characteristics, data from the Indian population showed that the median age at diagnosis was 37.5 years for UC and 34.8 years for CD.³⁸ A cross-sectional study from the IBD-Emerging Nations Consortium consisting of 15 countries in South Asia, Southeast Asia, and the Middle East reported that there were slightly more male than female patients with IBD in India, Bangladesh, and Nepal, at a 1.6:1 ratio.²² In Sri Lanka, IBD patients had equal gender distribution (1:1 ratio). First-degree relatives with IBD were found in 2%–3% of IBD patients in India, Bangladesh, Nepal, and Sri Lanka. Overall, the South-Asia (5%) and Southeast Asia (2%) had fewer patients with a family history of IBD than the Middle East (17%).²²

Disease characteristics

According to the IBD-ENC study, left-sided colitis was present in 39% of UC patients (range, 32%–46%), extensive colitis in 32% (range, 24%–42%), and proctitis in 29% (range, 20%–44%). For CD, CD extent was typically ileocolonic (43%), followed by ileal (33%) and colonic (21%). One-third of patients with CD had complex disease behavior (i.e., stricturing or penetrating disease). The proportions of patients with inflammatory, stricturing, and penetrating phenotypes and perianal disease were 63%, 23%, 13%, and 12.5%, respectively.²² Both UC and CD characteristics of South-Asian patients were similar to those of patients in Southeast Asia.¹⁶ The reason for this observation is not entirely apparent, but it is probably due to shared ancestor genetic and socioeconomic factors.

West Asia

Population

The West Asia region comprises 18 countries. The most populous countries in West Asia are Turkey and Iran, with the two largest

ethnic groups being Arabs and Turks. The current total population is about 280 million, which ranks fourth in Asia and accounts for 3.59% of the world population. Three-quarters of this population is urban, and the median age is 28.⁴⁰

Incidence and prevalence

A systematic review of IBD epidemiology from Iran includes two population-based studies and two hospital-based studies that showed a three-fold increase in the incidence of IBD over 2 decades (1990–2012).⁴¹ The annual incidence rate for IBD increased from 0.62 to 3.11/per 100,000 persons from 1990 through 2012. Ulcerative colitis and CD annual incidence rates increased from 0.42 to 2.70 and from 0.19 to 0.41/100,000 persons, respectively, while the IBD prevalence rose from 4.69 to 40.67/100,000 persons during the study period. The UC prevalence was higher than the CD prevalence (35.52 and 5.03/100,000, respectively) in 2012. Ulcerative colitis was, therefore more prevalent than CD in this region, similar to the rest of Asia. A systematic review and meta-analysis of the IBD incidence in Arab countries, including Saudi Arabia, Kuwait, the United Arab Emirates (UAE), and Lebanon, between 1991 and 2017 showed that the pooled annual incidence of UC was 2.33 (95% CI, 1.2–3.4)/100,000 persons and that of CD was 1.46 (95% CI, 1.03–1.89)/100,000 persons.⁴²

In Israel, the recent nationwide Epi-Israeli IBD Research Nucleus study reported incidence rates for CD and UC of 14.9 and 10.5/100,000 persons, respectively, in 2017, which was the highest incidence of IBD in West Asia.⁴³ These results were comparable to those from the Olmsted County, Minnesota, IBD cohort in 2000–2010 (CD: 10.7; UC: 12.2/100,000 person-years).²⁴ Additionally, the temporal trend in Israel showed a decreasing UC incidence and a plateauing CD incidence. The CD incidence in 2005 was 15.9/100,000 persons, which essentially remained stable at 14.9/100,000 persons in 2017, whereas there was a significantly decreased in UC incidence, from 15.4 to 10.5/100,000 persons, over this period. The temporal trends in Israel mirror the IBD epidemiology in Western populations, showing stable or decreasing incidence.⁴⁴ Of note, Israel's population, which consists of Arab Israelis and Jewish Israelis, has many cultural and dietary dissimilarities. The incidence of CD and UC among Jewish Israelis was approximately twice that among Arab Israelis (CD: 16/100,000 Jewish persons; 9.6/100,000 Arab persons; UC: 11.4/100,000 Jewish persons; 6.2/100,000 Arab persons).⁴³ These findings suggest the role of genetic factors as major but environmental factors as a minor in IBD development.

Patient characteristics

In terms of demographic and disease characteristics, the peak ages at diagnosis in Iran, Lebanon, and Saudi Arabia were 30–40 years for UC and 20–30 years for CD.^{41,42,45} Data from Lebanon, Qatar, the UAE, and Saudi Arabia showed that there was a male

predominance.^{22,44,45} Studies of Lebanon and Saudi Arabia cohorts reported that the male-to-female ratio was 1.5:1 for UC and 2:1 for CD.^{42,45} Family aggregation varied among countries in West Asia. It appears to have a higher familial clustering frequency than in Southeast Asia and South Asia. A family history of IBD was reported in 19% of Lebanese patients,⁴⁵ 13% of Iran patients,⁴⁶ followed by 7%–9% of Saudi Arabian patients.⁴²

Disease characteristics

For UC, extensive colitis predominated (42.7%–45.5%) in Lebanon and Saudi Arabia.^{45,47} Left-side colitis was the most frequent disease extent (48%–55%) in Qatar and the UAE.²² These findings suggested that UC patients in West Asia generally have similar disease extent compared to patients in Southeast Asia and South Asia. For CD, homogeneity in the disease location was observed within West Asia. Lebanon, Saudi Arabia, Qatar, and the UAE cohorts reported the predominance of ileocolonic involvement (40.9%–56%), followed by ileal involvement (22.8%–38.6%) and colonic involvement (7%–20.5%).^{22,45,48} Forty-nine to 60 percent of CD patients had an inflammatory behavior, 32%–40% had stricturing, 7%–18% had penetrating behavior, and 7%–19% had perianal disease.^{22,48} West Asian patients were more likely to present with complicated CD than Southeast and South Asia patients. However, comparing the disease phenotype across studies in Asia is challenging, given the differences in time points of disease assessment and hospital-based analysis, which may have yet to include mild disease.

Central Asia

Population

In Central Asia, there are five countries: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan, which are predominately Islamic. About 1% of the world's population lives in Central Asia (in 2022). The estimated population of Central Asia is 76 million. Half of the population is Urban. The median age is 27.6 years⁴⁹

Incidence and prevalence

There is minimal data published on IBD epidemiology from Central Asia. The prevalence of IBD in Kazakhstan was first reported in 2020 by Kaibullayeva J et al.⁵⁰ Using 135,000 IBD alert questionnaires distributed across the country in 2017, 115,556 subjects completed the survey (85% responded). Subjects with IBD diagnosis or suspected IBD were reviewed and verified for diagnosis. The IBD prevalences was 113.9 (95% CI, 69.0–158.9)/100,000 persons. The UC prevalences was 84.4 (95% CI, 44.8–123.9)/100,000 persons, and for CD were 29.5 (95% CI, 8.2–50.9)/100,000 persons. However, no data on the incidence of IBD was available.

Patient characteristics

Based on Kazakhstan data, the highest UC prevalence was in the age group of 30–39 years, while the CD cases were more prevalent at 18–29. Similar to other parts of Asia, there was more male predominance among IBD and UC patients, whereas CD was more commonly present in females.⁵⁰

Disease characteristics

In Kazakhstan, most patients with UC had left-side colitis (44.6%), and most patients with CD had ileal location (41.7%) and ileocolonic location (38.9%) with non-stricturing and non-penetrating behavior (55.6%).⁵⁰ Perianal CD was uncommonly found (2.8%) in Kazakhstan.

INFLAMMATORY BOWEL DISEASE IN ASIAN AMERICANS AND ASIAN EUROPEANS

The distribution of IBD among Asian immigrants in Western countries is shown in Table 3.

Inflammatory bowel disease affects approximately 3.1 million (1.3%) adults in the US, based on the 2015 National Health Interview Survey (NHIS) data,⁵¹ which was around three times higher than that reported in previous studies focusing on restricted US regions or using administrative data.^{24,52,53} However, the reliance on self-reported diagnoses of IBD may have inflated the prevalence in this study. The burden of the disease is also high in Europe, with approximately 0.3% of the population, that is, around 3 million people, suffering from IBD.^{54,55} According to a European population-based inception cohort, the incidence of IBD in 2010 ranged from 8.1/100,000 (Eastern centers) to 18.5/100,000 (Western centers), which showed the presence of a West–East gradient of 2 in Europe.⁵⁶ Additionally, Canada has one the highest IBD rates globally, with forecasting models projecting a significant increase in prevalence from 0.7% in 2018 to 1.0% in 2030.⁵⁷

Despite prior knowledge of the natural history of IBD, and with epidemiology emerging mainly from Caucasian populations in industrialized countries, emphasis has been placed on underrepresented minorities and developing countries in recent years, as these groups are experiencing increasing numbers of IBD cases.^{58,59} Unlike previous epidemiologic studies, current literature has shown that the incidence and prevalence of IBD in Asian countries have been increasing in the last few decades.²² This phenomenon has followed shifts toward industrialization and globalization in Asia. Furthermore, immigrants relocating from low to high-IBD-incidence countries have a high risk of being affected with this new disease burden, particularly first- and second-generation immigrants.⁶⁰ Interestingly, data suggest that immigrants develop IBD at similar or even higher rates than that of the high-incidence Western countries to which they have moved. These trends have been demonstrated in Asian immigrants to North America and to European countries.

TABLE 3 Summary of studies on the epidemiology of Inflammatory bowel disease (IBD) in Asian Americans and Asian Europeans

Author	Year of publication	Years studied	Country	Type of population	Asian population (N)	Incidence of IBD (per 100,000)	Prevalence of IBD (per 100,000)	Incidence of UC (per 100,000)	Incidence of CD (per 100,000)	Prevalence of UC (per 100,000)	Prevalence of CD (per 100,000)
Wang et al. ⁶²	2013	1996–2007	U.S.	Asians	7367				40	45	
Kurata et al. ⁶³	1992	1982–1988	U.S.	Asians	-						5.6
Betteridge et al. ⁶⁴	2013	2008–2009	U.S.	Asians	282,682	162				202	146
Malhotra et al. ⁶⁵	2015	2008–2013	U.S.	Indian and East Asian	17,227 and 2176		^a Indian: 9.1% East Asian: 1.4%			^a Indian: 7.0% East Asian: 1.1%	^a Indian: 1.2% East Asian: 0.2%
Probert et al. ⁶⁷	1992	1972–1980; 1981–1989	UK	SA	93,401			1970s: 9.3 1980s: 10.8			
Jayanthi et al. ⁶⁸	1992	1972–1980; 1981–1989	UK	SA	93,401				1970s: 1.24 1980s: 3.1		
Probert et al. ⁶⁹	1993	1989	UK	SA	93,401					136	33.2
Carr et al. ⁷⁰	1999	1991–1994	UK	SA	64,000			17.2			
Tsironi et al. ⁷³	2004	1997–2001	UK	Bangladeshi	58,988			8.2	7.3		
Misra et al. ⁷⁵	2019	2016–2017	UK	SA	443,303	Indian: 25.2 Pakistani: 14.9		Indian: 20.5 Pakistani: 11.2	Indian: 4.7 Pakistani: 3.1		
Li et al. ⁷⁶	2011	1964–2007	Sweden	Asians	-			1 st generation: SIR 0.75 2 nd generation: SIR 0.93	1 st generation: SIR 0.64 2 nd generation: SIR 1.03		
Pinsk et al. ⁷⁷	2007	1996–2001	Canada	Pediatric SA	1996: 33,627 2001: 44,200	15.19		6.70	6.41		

TABLE 3 (Continued)

Author	Year of publication	Years studied	Country	Type of population	Asian population (N)	Incidence of IBD (per 100,000)	Prevalence of IBD (per 100,000)	Incidence of UC (per 100,000)	Incidence of CD (per 100,000)	Prevalence of UC (per 100,000)	Prevalence of CD (per 100,000)
Benchimol et al. ⁸⁰	2015	1994–2010	Canada	SA and EA Children of SA and EA	SA: 512,686 EA: 564,793 Children of SA: 120,543 Children of EA: 97,876	SA: 7.3 EA: 2.9 Children of SA: 6.0 Children of EA: 0.8	SA: 5.0 EA: 1.8 Children of SA: 2.9 Children of EA: 0.3	SA: 2.0 EA: 0.9 Children of SA: 2.4 Children of EA: 0.5			
Dhalwani et al. ⁸¹	2021	1999–2015	Canada	SA and Chinese	SA: 982,472 Chinese: 764,397	SA: 14.6 Chinese: 5.4	SA: 9.56 Chinese: 3.54	SA: 4.28 Chinese: 1.58			

Abbreviations: CD, Crohn's disease; EA, East Asians; IBD, inflammatory bowel disease; SA, South Asians; SIR, standardized incidence ratio (when compared with native-born Swedes); UC, ulcerative colitis.
^aPrevalence was reported in %.

United States

In the US, the highest IBD prevalence rates have been observed among Whites; however, most of these studies have included limited information on non-White populations, with sparse data on diverse ethnic and racial groups.^{52,53} One study reported that the overall age- and sex adjusted incidence rates for IBD in whites and nonwhites were 21.6 cases/100,000 person-years (95% CI, 20.0–23.1) and 13/100,000 (95% CI, 8.3–17.5), respectively.⁶¹ Most of the studies related to Asians have been performed in Asia, and those do not accurately represent the disease distribution and phenotype in the US. Therefore, we here focus on the few studies published in the US. A recent systematic review of racial and ethnic minorities with IBD in the US included 15 studies involving Asians (*n* = 2668), in addition to 42 studies of African Americans and 24 studies of Hispanics.⁵⁹ However, only three studies reported data on disease incidence and/or prevalence in Asians.^{62–64} Wang et al. used the national Medical Expenditure Panel Survey (1996–2007) and estimated the prevalence of CD and UC among Asians as 45/100,000 and 40/100,000, respectively, although they included only a small sample of Asians.⁶² Among 202,468 individuals surveyed, 316 new cases of IBD were found, of which only five were Asians. Kurata et al. studied CD in a large health maintenance organization from 1982 to 1988 and found a prevalence rate of 5.6/100,000 among Asians, which was lower than that in Whites (43.6/100,000), Blacks (29.8/100,000), and Other ethnicities (8.4/100,000).⁶³ The third study used the US military healthcare system database from 1 October 2008, to 30 September 2009, to establish the IBD prevalence.⁶⁴ The UC and CD prevalence in the military system was 202 and 146/100,000, respectively. Racial data was reported for 3.5 million subjects, including 282,682 Asians (8% of the total population). The overall IBD prevalence among Asians was 162/100,000, which was higher than the historically believed rate. Ulcerative colitis and CD prevalence rates among these Asians were 100 and 62/100,000, respectively. Of all ethnicities analyzed, Asians and Hispanics (UC and CD: 100 and 47/100,000, respectively) had the lowest IBD prevalence rates, while Caucasians had the highest rates (UC 194, and CD 130/100,000). Another study focused on estimating the prevalence of IBD in ileocolonic biopsies of 1,005,915 patients of different ethnicities in the US and found that patients with an Indian origin had the greatest risk of IBD when compared with other American groups (odds ratio: 3.18, 95% CI 2.75–3.69).⁶⁵ The prevalence of IBD, UC, and CD among Indians was 9.1%, 7.0%, and 1.2%, respectively, while IBD was present in only 3.0% of other Americans, and an even lower prevalence was found in East Asian immigrants: IBD, 1.4%; UC, 1.1%; and CD, 0.2%. Lastly, Nguyen et al. used the NHIS data to study minorities and reported that the IBD prevalence was lower in Non-Hispanic Blacks (324/100,000), Hispanics (383/100,000), and Non-Hispanic Other ethnicities (314/100,000), as compared with Non-Hispanic Whites (1099/100,000).⁶⁶ Nonetheless, the group “Non-Hispanic Other” was diverse and included not only non-Hispanic Asians, but non-Hispanic American Indians and Alaskan Natives, non-Hispanic Native Hawaiians and Pacific Islanders, and non-Hispanic multiple-race individuals.

United Kingdom

In Europe, the United Kingdom (UK) has provided several illustrative epidemiological studies of South Asian immigrants. There has been a lack of data focused on the epidemiology of IBD in Asian immigrants to European countries other than UK. A landmark retrospective study, from 1972 to 1989, in Leicestershire, UK, studied the incidence of UC in their population of 930,600, of whom 93,401 were South Asians (SA) from India, Pakistan, and Bangladesh.⁶⁷ This was the first study to report the incidence of UC in South Asian immigrants (mostly first generation). This incidence was 9.3/100,000 persons/year, as compared with 3.6/100,000 in Europeans, during 1972–1980. From 1981 to 1989, the standardized incidence per year was 10.8 (SA) versus 5.3 (Europeans) per 100,000 persons, indicating that SA had twice the risk of UC than did Europeans. Incidence rates also varied among different religious groups, with the greatest rates in Hindus and Sikhs. The incidence rate of CD in SA in the same county in the 1970s was 1.24/100,000/year, and increased to 3.1/100,000/year in the 1980s.⁶⁸ Another study in the same population showed that the prevalence of CD and UC in Europeans was 75.8 and 90.8/100,000, respectively, while the prevalence of CD and UC in South Asian immigrants was 33.2 and 136/100,000, respectively.⁶⁹ A subsequent prospective study of UC in the Leicester area was conducted from 1991 to 1994, and included a growing number of second-generation SA, as compared with the prior retrospective studies.⁷⁰ This study demonstrated that extensive colitis became more common in second-generation patients and that the incidence was comparable to that in the host (European) population. The annual incidence of UC in SA was 17.2/100,000, as compared with only 7.0/100,000 in Europeans, confirming that the incidence in Asians continued to rise at an alarming rate. Those findings suggested that environmental factors played an important role in influencing the epidemiological shift.

A large phenotypic study of IBD in the UK South Asian population in North West London ($n = 367$) showed that UC was more common than CD (74.4% vs. 25.6%) and that SA had significantly more extensive colitis than did the European cohort (63.0% vs. 42.5%, $p < 0.0001$).⁷¹ CD was predominantly non-stricturing and non-penetrating (B1) in both SA and Europeans; however, penetrating lesions were significantly less common among SA ($p = 0.04$). Contradicting the traditional concept that SA in the UK more commonly have UC than CD, and have a more benign CD phenotype, a study showed that Bangladeshi individuals in East London more commonly had CD than UC, as compared to their White Caucasian counterparts ($p < 0.01$), developed more perianal complications ($p = 0.02$), and needed biologic escalation earlier ($p = 0.02$).⁷² In addition, a formal epidemiological survey in this area showed that the incidence of UC among Bangladeshis increased to 8.2/100,000/year during 1997–2001 (from 2.4 during 1981–1989), and that the CD incidence increased to 7.3/100,000/year (from 2.3), while the abdominal tuberculosis incidence decreased (2.5/100,000/year).⁷³ In accordance with these trends, a British birth cohort of all those born on 5–11 April 1970 showed that members of the Asian group

(Indians and Pakistanis) were at significantly higher risk of developing IBD by the age of 26 years than the British group, with a relative odds of 6.10 (95% CI, 2.14–17.33).⁷⁴ More recently, a multicenter prospective cohort study was performed in the UK to describe the current incidence of IBD in a highly ethnic population.⁷⁵ Misra et al. observed different annual incidence rates among the various ethnic groups, where Indians had a UC incidence almost double the age-adjusted incidence of Pakistanis (20.5 vs. 11.2/100,000) and both groups had higher UC rates than the White European group (8.2/100,000). For CD, the annual incidence rates were 4.7 (Indians), 3.1 (Pakistanis), and 6.5 (White Europeans) per 100,000 persons.

Sweden

Other than the UK in Europe, a nationwide study from Sweden reported the risk of IBD in first- and second-generation immigrants from 1 January 1964, to 31 December 2007.⁷⁶ The standardized incidence ratios for CD and UC in first-generation Asian immigrants were 0.64 (95% CI 0.54–0.74) and 0.75 (95% CI 0.65–0.75), respectively, compared with native-born Swedes. The standardized incidence ratios for CD and UC in second-generation Asian immigrants were 1.03 (95% CI 0.90–1.17) and 0.93 (95% CI 0.80–1.08), respectively. The study observed that the risk of IBD was generally lower in multiple groups of first-generation immigrants than in the native-born Swedish reference group, including the Asian group. However, the lower risk dissipated in the majority of groups of second-generation immigrants.

Canada

Similar trends have been observed in Canada. A landmark study in British Columbia described an average IBD annual incidence rate of 15.2/100,000 South Asian children-years from 1996 to 2001, which was almost three-fold higher than the observed incidence in the rest of their pediatric population (5.19/100,000 children/year).⁷⁷ This was among the highest pediatric incidences reported in literature at that time. In addition, they noted increasing annual rates over the study period: from 5.95/100,000 in 1996 to 18.01/100,000 in 2001. The average incidence rates for UC, CD, and indeterminate colitis were 6.70, 6.41, and 2.08/100,000 South Asian children/year, respectively. Most of the children were second-generation immigrants and 84% of patients' families had immigrated directly from Punjab in India. Interestingly, the first population-based study of UC incidence in Punjab, India, was published around the same time, and reported a lower crude incidence rate of 6.02 cases/100,000 person-years.³⁶ The same Canadian group more recently published a study focused on the IBD clinical course and disease phenotype of 160 South Asian children in British Columbia.⁷⁸ South Asian children presented with a shorter symptom duration, more extensive colonic disease (UC and CD), more complicated CD with stricturing and penetrating behavior (B2/B3), more severe UC, and an earlier need to escalate IBD

therapy, when compared with non-South Asian children. Another study of IBD in Ontario children observed that the age- and sex-standardized incidence per 100,000 had increased from 9.5 in 1994 to 11.4 in 2005. They also noted that the increase in incidence occurred after 2001, when Ontario observed a change in immigration patterns, with an expansion of the South Asian immigrant population.⁷⁹ A large population-based cohort study in the province of Ontario evaluated the risk of IBD in immigrants and in their Canadian-born children from 1994 to 2010.⁸⁰ The total immigrant population was 2,154,676, with predominant groups being from East Asian/Pacific (564,793) and South Asian (512,686) regions. The standardized incidence (per 100,000 person-years) of IBD, CD, and UC in people with a South Asian origin was 7.3, 2.0, and 5.0, respectively, and 2.9, 0.9, and 1.8 in those with an East Asian/Pacific origin. The lowest risk was noted among East Asian/Pacific immigrants, and the highest in Western Europe/North America, and Middle East/North Africa immigrants. In addition, the incidence rates in immigrants from all regions were lower than those among non-immigrants: IBD 23.9, CD 11.4, UC 11.3/100,000 persons. A younger age at arrival in Canada was also associated with a higher risk of IBD. The children of immigrants from East Asian/Pacific regions had a lower incidence of IBD than the children of non-immigrants (0.8 vs. 7.2/100,000). However, the children of South Asian immigrants had a similar incidence of IBD as the children of non-immigrants (6.0 vs. 7.2/100,000). They suggested that different early life environmental exposures in Canada, along with genetic predisposition, might account for the differences in the risk of IBD among children from various immigrant groups. An updated population-based study conducted in Ontario, Canada, for the years 1999–2015, demonstrated that the standardized incidence rate of IBD per 100,000 person-years was 14.6 in individuals of South Asian ethnicity and 5.4 in those of Chinese ethnicity, as compared with 24.7 in the general population.³⁵ Consistent with previous adult studies, the standardized incidence of CD among the general cohort (10.6/100,000 person-years) was significantly higher than that in the SA and Chinese populations (4.28 and 1.58/100,000 person-years, respectively). Ulcerative colitis incidence rates were 9.54 and 3.54/100,000 South Asian and Chinese persons, as compared with 12.9/100,000 person-years in the general population. However, the risk of IBD development in SA was comparable to that in the general population after adjusting for immigration status (adjusted incidence rate ratio [aIRR] 1.00, 95% CI 0.95–1.05), and the risk of UC was 1.5-fold higher than that in the general population (aIRR 1.47, 95% CI 1.34–1.61). Conversely, Chinese residents had a significantly lower risk of IBD after adjustment, in both immigrants and non-immigrants. In agreement with other Canadian studies,^{77,78} a Canadian nationwide prospective inception cohort observed that the phenotypic spectrum of newly diagnosed IBD in South Asian children differed from that in Caucasian children.⁸¹ South Asian children presented with the disease at a younger age and more frequently with the UC/IBD-unclassified subtype than with CD. They also presented with more colonic-only IBD, and with a higher proportion of perianal fistulizing CD (27% vs. 18%). However, medical therapy and outcomes were

similar between the two groups, and around two-thirds of children were in corticosteroid-free clinical remission at 18 months, independent of ethnicity.

CONCLUSIONS

This review highlighted the evolution of IBD epidemiology among the Asian population. As IBD is a chronic, incurable disease, it is prevalent globally. In the 21st century, IBD has become a burdensome disease with an accelerating incidence around Asia, which is rapidly becoming more industrialized and westernized. The incidence of UC in East Asia countries ranged from 0.95 to 12.2, while the incidence of CD in this region was as high as 2.42. Also, a unique CD phenotype with male predominance and high rates of perianal fistula was identified in the Asian population. A recent projection study of the IBD epidemic in Asia showed that, by 2035, the projected IBD prevalence in India would increase four-fold, while there would be a 2.3–2.5-fold increase in the prevalence in West Asia and a 1.6–1.7-fold rise in the prevalence in East and Southeast Asia.⁸² Therefore, there is a need for research to prevent the development of IBD and to help the local healthcare system face this costly and complex disease. In addition, there is an unmet need for a standardized method to address the epidemiology of IBD in Asian countries and subsequently compare them directly as there has been a variety of data resources among reports from Asian countries.

Moreover, future research is needed to study and describe IBD characteristics and epidemiology in the Asian population now residing in North America and Europe. This ethnic minority deserves particular attention as the incidence and prevalence of IBD among Asian immigrants have significantly increased in the past few decades and this population exhibits a unique disease phenotype with more disabling disease including perianal complications. More comprehensive and inclusive epidemiological studies and clinical trials will help to identify characteristics from the Asian population that can be targeted to reduce the disease burden and improve clinical outcomes.

AUTHOR CONTRIBUTIONS

Satimai Aniwani: Literature review, manuscript drafting. **Priscila Santiago:** Literature review, manuscript drafting. **Edward V. Loftus:** Study concept, manuscript revision. **Sang Hyoung Park:** Study concept, literature review, manuscript drafting, manuscript revision, study supervision. All authors read and approved the submission of the paper.

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CONFLICTS OF INTEREST

Edward V. Loftus has consulted for AbbVie, Amgen, Arena, Boehringer Ingelheim, Bristol-Myers Squibb, CALIBR, Celgene, Eli Lilly, Fresenius Kabi, Genentech, Gilead, Gossamer Bio, Iterative Scopes, Janssen, Morphic, Ono Pharma, Pfizer, Protagonist, Scipher Medicine, Sun Pharma, Surrozen, Takeda, and UCB; and has received research support from AbbVie, Bristol-Myers Squibb, Celgene/Receptos, Genentech, Gilead, Gossamer Bio, Janssen, Pfizer, Robarts Clinical Trials, Takeda, Theravance, and UCB.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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