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Research article

"Clinical epidemiology of inflammatory bowel disease among adults in the South Asian region: A systematic review and meta-analysis"

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ABSTRACT

Objectives: Inflammatory bowel disease (IBD) is an emerging disease in the South Asia. We conducted a systematic review to determine the characteristics and overall prevalence of IBD among South Asian adults.

Design: We searched the PubMed database and included descriptive, epidemiological studies with satisfactory methodological quality, reporting the epidemiology of IBD with histological confirmation. The quality of the studies was assessed using Joanna Briggs Institute Critical Appraisal Checklist for Prevalence Studies. Two authors screened and extracted data independently. A random-effects meta-analysis of characteristics and overall prevalence of IBD was performed.

Results: This review analysed data from over 9000 IBD patients from 21 studies across multiple South Asian countries. It found a higher prevalence of ulcerative colitis (UC) compared to Crohn's disease (CD) (2:1). There was a male predominance and modest familial aggregation of IBD cases. Left-sided colitis was the most common disease extent for UC. Colonic involvement was more frequent than ileal involvement for CD. The non-stricturing, non-penetrating behaviour was dominant in CD cases. Joint manifestations were commonly reported in both UC and CD. Immunomodulators, such as azathioprine, were used in a significant proportion of patients, particularly for CD. The use of biological agents like infliximab was relatively low. Surgical intervention rates were lower than in Western cohorts but higher in CD compared to UC.

Conclusions: This study provides an epidemiological overview of adult IBD characteristics, phenotypes, and treatment patterns in the South Asian region. There were epidemiological, clinical, phenotypic and treatment differences compared to western IBD.

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Key messages

What is already known on this topic?

- Inflammatory bowel disease (IBD) is emerging as a significant health concern in Asia, Africa, and South America.
- There has been no systematic review and meta-analysis of epidemiological data on IBD solely from the South Asian region.

What this study adds?

- This systematic review and meta-analysis provide a comprehensive overview of IBD characteristics, phenotypes, and treatment patterns in South Asia, analyzing data from over 9000 IBD patients across multiple countries.
- It reveals a higher prevalence of ulcerative colitis compared to Crohn's disease, male predominance, modest familial aggregation, and differences in disease phenotypes and treatment practices compared to Western cohorts.

How this study might affect research, practice or policy?

- These findings provide a foundation for future research on IBD in South Asia and can inform the development of region-specific management strategies.
- The study highlights the need for improved diagnostic capabilities and awareness of IBD in South Asia, which could influence healthcare policies and resource allocation in the region.

1. Introduction

Inflammatory bowel disease (IBD) is a chronic inflammatory disease involving the bowel. The two primary forms of IBD are ulcerative colitis (UC) and Crohn's disease (CD) [1]. Traditionally, IBD was prevalent in Western countries, predominantly affecting Caucasians. In Europe and the United States, the incidence and prevalence rates for UC range from approximately 8-14/100,000 and 120–200/100,000, respectively, while for CD, the rates are 6–15/100,000 and 50–200/100,000, respectively [2]. Over the past two decades, IBD has emerged as a significant health concern in Asia, Africa, and South America [3–5].

The recently published IBD-Emerging Nations Consortium (IBD-ENC) study provided insights into IBD in Asia. In this cohort from newly industrialized countries of South Asia, South-East Asia, and the Middle East, UC is twice as common as CD, the familial disease is uncommon, and surgery rates are low. However, data from similar studies on IBD solely from South Asia is lacking. None of the countries in the South Asian region has a national IBD registry. There are a few dedicated IBD centres in the region. Although the reported prevalence of IBD is low in South Asia, given the high population density, the South Asian region is likely to harbour a large number of IBD patients [6,7].

Though there have been publications evaluating IBD in most of the South Asian countries individually (including Bangladesh, India, Maldives, Nepal, Pakistan, and Sri Lanka), there has yet to be a systematic review and meta-analysis of epidemiological data on IBD solely from the South-Asian region. In the current paper, we searched for and included studies on the prevalence of IBD and its associations in South Asian countries, up to June 2023 in a meta-analysis. The aim was to determine the characteristics and estimate the overall prevalence of IBD among adults in the South Asian region. Further, we investigated the difference in the prevalence between two time periods: up to December 2014 ("historical studies") and from January 2015 onwards ("contemporary studies").

2. Material and methods

2.1. Design

We followed the preferred reporting items for systematic reviews and meta-analysis (PRISMA) guidelines for this study (Fig. 1).

2.2. Literature survey

We conducted a survey on PubMed for articles published up to June 2023, with information on the incidence, prevalence, and associations for IBD in South Asia. The search terms included "Prevalence", "Incidence", "Epidemiology" of "IBD (Inflammatory bowel disease)", "UC (ulcerative colitis)" and "CD (Crohn's disease)" AND "South Asia" AND South Asian countries ("Afghanistan", "Bangladesh", "Bhutan", "India", "Maldives", "Nepal", "Pakistan" and "Sri Lanka"). The evaluated studies were from two time periods: January 1981–December 2014 ("historical studies") and January 2015–June 2023 ("contemporary studies").

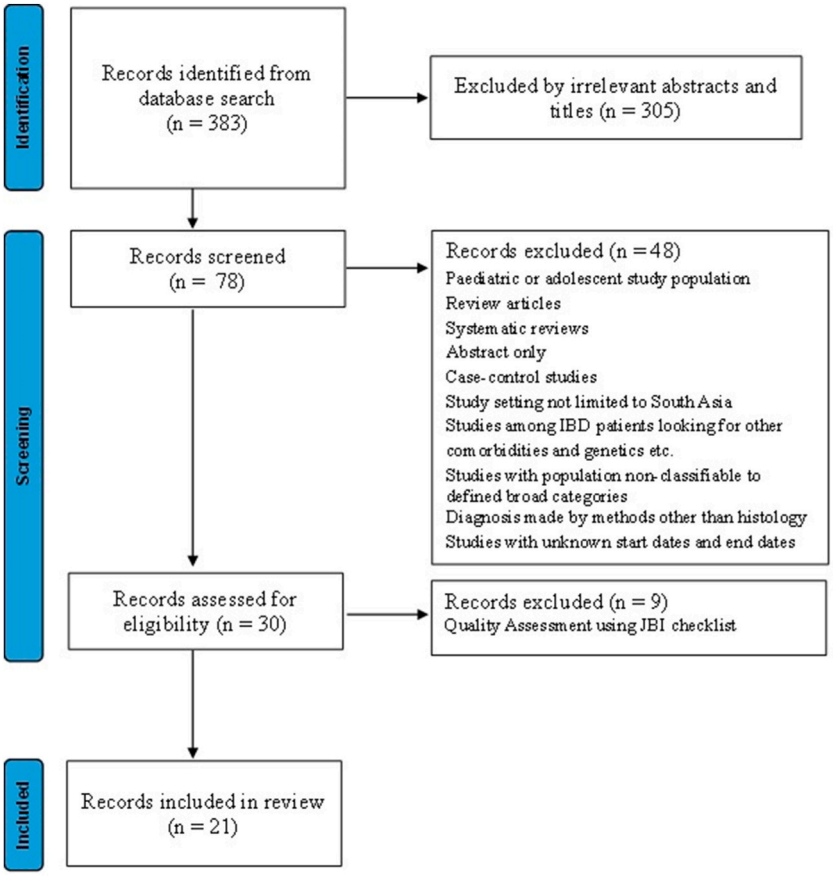

Fig. 1. PRISMA flow diagram.

2.3. Inclusion and exclusion criteria

The following inclusion criteria were used to select eligible studies: (1) descriptive studies reporting the epidemiology of IBD, (2) conducted in South Asia (Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka), (3) including adults 18 years of age and over, (4) confirmed IBD with histology and (5) published in the English language. The exclusion criteria were: (1) duplicate records, (2) abstract only, (3) paediatric studies, (4) studies without histological confirmation of IBD, (5) studies reporting on animal models or laboratory experiments on IBD (6) articles in a non-English language, (7) review articles and guidelines (8) clinical trials, and (9) studies where the data collection start and end dates were not known.

2.4. Selection of studies

Two authors (MYW, SD) screened the title and abstract of all the studies identified to select potentially eligible studies for the systematic review and meta-analysis. Next, bibliographies of the chosen articles, specifically the available relevant review articles, were cross-checked and searched by hand to identify additional studies. Finally, full texts of eligible articles were retrieved and studied in depth. The final decision to include an article was in line with the agreed criteria, and disagreements and disparities were resolved by a third author (MAN).

Articles selected for the systematic review were further evaluated for the synthesis of meta-analysis in two main steps: pooling the cases of UC and CD and comparison of the progression of patient and disease characteristic over the two time periods ("historical studies" and "contemporary studies"). After the selection of the articles for the systematic review, it was apparent that 2015 was the time that divided the studies equally into two time periods while allowing sufficient time for observation of any disease demographic transition. In the first step (pooling the cases UC and CD), studies reporting the epidemiology UC and CD were selected, and relevant data was extracted. In the second step (comparison between the two time periods), available data on patient and disease characteristics were analysed to get pooled values and to compare between the two periods.

2.5. Quality assessment for individual studies

The quality of the studies was assessed using Joanna Briggs Institute Critical Appraisal Checklist for Prevalence Studies [8] (Supplementary Table 1). Two authors (CKM, MAN) completed quality assessments for the studies considered eligible for inclusion. Any discrepancies in judgements regarding inclusion were resolved through discussion. Based on overall quality, studies with several positive responses ('yes') greater than six were included in the systematic review and meta-analysis. A study with ≥3 'no' or 'unclear' quality categories was excluded from the analysis. The appraisal outcomes are presented in a table (Supplementary Table 2).

2.6. Data extraction

We extracted the following data from the studies: country, author name, year of publication, study designs, study setting, sample size, male-to-female ratio, mean age at diagnosis, risk factors, extraintestinal features, disease severity, disease extent, treatment methods used and presence of disease complications. Data from selected studies were extracted for the estimation of pooled rates for the prevalence of UC and CD and their associations. Pooled estimates of UC extent and severity of the disease and CD location and behaviour of the disease were estimated. Two authors performed data extraction independently (HRP, MI), and any discrepancies were resolved by discussion with a third author (DSE).

Clinical epidemiological factors of UC and CD were extracted from the selected articles, after which frequently reported factors were considered for pooling in the second step of the study. The selected factors were gender, mean age and age at diagnosis (in years), extent and severity for UC, location and disease behaviour for CD, presence of risk factors such as cigarette smoking, family history of IBD, treatment modalities and disease complications.

2.7. Statistical analysis and visualization tools

The overall proportion of UC patients among the studies which reported both UC and CD was obtained by conducting a meta-analysis of proportions with inverse variance weighting using a random-effects model. Subsequently, subgroup analyses were conducted to assess the difference in proportions between the two time periods (before and after January 2015).

Subsequently, meta-analyses of proportions were performed to obtain the overall proportions of males among UC and CD patients, respectively. Separate meta-analyses were conducted to evaluate the overall proportions of UC and CD patients with a positive family history of IBD, history of smoking, and disease severity (mild, moderate and severe), with different extra-intestinal manifestations (EIMs: including joint, ocular, dermatological, bone, biliary involvement, and thromboembolism), receiving different treatments (i.e. including corticosteroids, salicylates, azathioprine, infliximab, ciclosporin, other biologics, and other immunosuppressants) were evaluated. The differences in disease locations in UC (i.e. ulcerative proctitis, left-sided UC, extensive colitis, and pan-colitis) and CD (i.e. ileal, colonic, ileocolonic, isolated upper GI, and peri-anal involvement) were evaluated. Further analyses were conducted to obtain the proportions of UC patients with colorectal cancer and CD patients with non-stricturing and non-penetrating, stricturing, and penetrating disease, and UC and CD patients requiring surgical intervention. Separate meta-analyses were conducted to estimate the average mean age at diagnosis for UC and CD, using the studies which reported mean and standard deviation of ages. Subgroup analyses were performed to assess the difference in proportions between the two time periods.

Forest plots were developed to summarise the results of the above meta-analyses. The Cochran Q test and I^2 were used to assess heterogeneity between studies. A p-value of 0.05 was considered statistically significant. Data was analysed using R programming language 4.3.3, and meta-analyses of proportions were conducted [9]. Forest plots were developed using the "meta" library [10]. Risk of bias plots and traffic light plots were obtained from the "robvis" library [11].

3. Results

3.1. Selection of articles

After the title appraisal, 78 publications were potentially relevant. After the exclusion of irrelevant studies, there were 30 eligible publications. After the quality assurance process, 21 publications (twelve from India [12–23], two from Nepal [24,25], two from Pakistan [26,27] and five from Sri Lanka [28–32]) were included in the study (Fig. 1) (Supplementary Table 2).

3.2. Assessment of methodological quality

The quality assessment of the 21 studies is presented in Supplementary Figs. 1 and 2. Most of the studies had a low risk of bias.

All the prevalence rates and proportions mentioned below are pooled estimates and proportions. The two time periods compared were up to December 2014 ("historical studies") and from January 2015 onwards ("contemporary studies").

3.3. Patient demographics

Twelve studies reported both UC and CD. From these studies, 69.6 % were UC, and 30.4 % were CD (Figs. 2, 3 and 4). There was no statistically significant difference in the proportions of UC and CD cases between the two periods (Supplementary Fig. 3).

There were 13 and 10 studies, which reported the male-to-female ratio, for UC and CD respectively. The proportion of males for UC

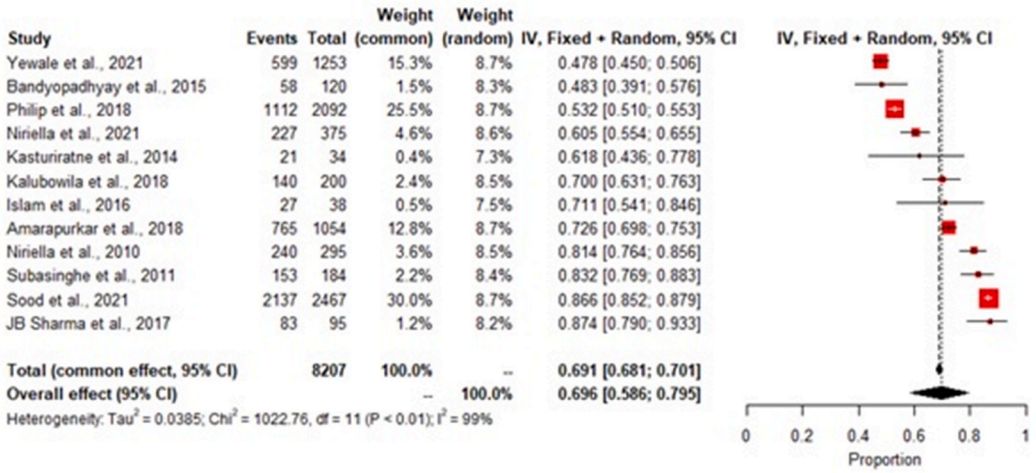

Fig. 2. Forest plot on Ulcerative colitis (UC) proportion from studies reporting both UC and Crohn's Disease (CD).

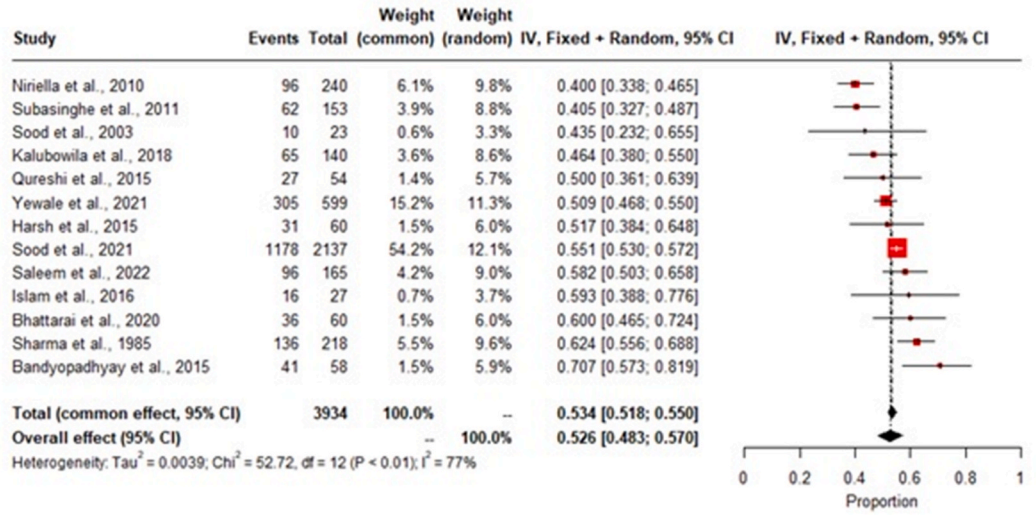

Figure 3. Forest plot on Ulcerative colitis (UC) proportion from studies reporting both UC and Crohn's Disease (CD).

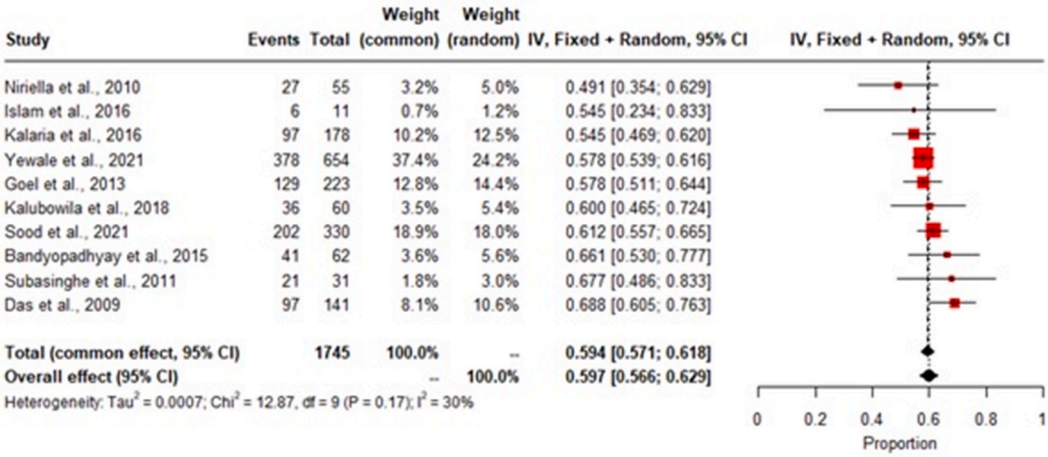

Figure 4. Forest plot on Ulcerative colitis (UC) proportion from studies reporting both UC and Crohn's Disease (CD).

and CD was 52.6 % (Supplementary Fig. 4) and 59.7 % (Supplementary Fig. 5) respectively. There were no statistically significant differences in the proportion of males-to-females for both UC and CD between the two periods (Supplementary Figs. 6 and 7).

The mean age at diagnosis of UC and CD was 37.6 years and 35.0 years respectively. There were no statistically significant differences in the mean ages at diagnosis for UC and CD between the two periods.

3.4. Risk factors

A positive family history for UC was present in 2.1 %. A positive family history for CD was present in 1.7 %. There was no statistically significant difference in a family history for either UC or CD between the two periods.

12 % of UC patients and 12.4 % of CD patients had smoked. There was no statistically significant difference in a smoking history either for UC or CD between the periods.

Montreal clinical classification of IBD was used to describe the extent and severity of UC and the location and severity of CD [33].

3.5. Disease severity

Studies reporting the severity of UC and CD were analysed. For UC, 25.6 % had mild disease, 54.9 % had moderate disease and 22.0 % had severe disease. There were no statistical significances between the proportions of severity of UC between the two periods.

For CD, 35.4 % had mild disease, 48.6 % had moderate disease and 16.9 % had severe disease. There were no statistically significant differences in the severity of CD between the two periods.

3.6. Disease extent in UC patients

28.2 % had ulcerative proctitis, 41.6 % had left-sided colitis, 34.1 % had extensive colitis and 24.3 % had pan-colitis. There was no statistically significant difference in the proportions for any of the above disease extents of UC between the two periods.

3.7. Disease location in CD patients

24.5 % had predominant ileal involvement, 34.3 % had predominant colonic involvement, and 33.0 % had ileocolonic involvement. There were no statistically significant differences in regional involvement of CD between the periods.

Patients with upper gastrointestinal CD were 6.3 %, while 11.9 % of CD patients had perianal disease. There were no statistically significant differences in the proportions of patients with CD with upper gastrointestinal and perianal disease between the periods.

3.8. CD characteristics

67.1 % had non-stricturing and non-penetrating CD. Before 2015, there were 58.7 % of patients with non-stricturing and non-penetrating CD compared to 77.7 % of patients after 2015. This difference was statistically significant ($Q = 6.77$, $DF = 1$, p-value $= 0.01$).

Patients with structuring CD was 21.8 % and penetrating CD was 10.8 %. No statistically significant differences existed between the periods among proportions of stricturing CD and penetrating CD patients.

3.9. Extraintestinal manifestations in patients with UC

21.5 % of UC patients had joint involvement. There was no statistically significant difference in the proportions of UC patients with joint involvement between the two periods.

4.4 % of UC patients had ocular involvement. Comparing the two time periods, 8.6 % of UC patients before 2015 and 0.7 % of UC patients after 2015 had involvement of the eyes. This difference between the two periods was statistically significant ($Q = 22.88$, $DF = 1$, p-value=<0.01).

4.1 % of UC patients had dermatological involvement. Comparing the two periods, 8.5 % of UC patients before 2015 and 1.4 % of UC patients after 2015 had skin involvement. This difference between the two periods was statistically significant ($Q = 18.16$, $DF = 1$, p-value=<0.01).

We analysed the biliary involvement in patients with UC, mainly for the presence of primary sclerosing cholangitis (PSC). 1.0 % of UC patients had PSC.

One study before 2015 reported 44.8 % bone involvement (osteopenia ± osteoporosis) among UC patients. Two studies, both in the contemporary period, reported 0.5 % thromboembolism as an extraintestinal manifestation of UC.

3.10. Extraintestinal manifestations in patients with CD

The proportions of joint involvement and ocular involvement among CD patients were 26.6 % and 5.7 % respectively. No statistically significant difference existed between the two periods for joint or ocular involvement in CD.

2.6 % of CD patients had dermatological involvement. Subgroup analysis comparing the two periods showed that 3.5 % CD patients before 2015 and 0.7 % CD patients after 2015 had skin involvement. This difference between the two periods was statistically

significant (Q = 10.77, DF = 1, p-value=<0.01).

We analysed the presence of PSC among CD patients. A proportion of 0.9 % was obtained. There was no statistically significant difference between the two time periods among the proportion of CD patients with PSC.

One study in the historical period reported bony involvement in CD, which reported 54.8 % to have osteopenia ± osteoporosis.

3.11. Treatment modalities of UC

73.7 % of patients with UC were treated with corticosteroids. We combined the studies reporting the use of salicylate (including mesalamine, aminosalicylate and 5-ASA) for treating UC. The proportions of patients treated with salicylates and azathioprine were 98.2 % and 24.2 % respectively. There were no statistically significant differences in the proportions of patients treated with corticosteroids, salicylates or azathioprine between the two periods.

No studies have reported using biologics and other immunosuppressants to treat UC before 2015. The proportion of UC patients treated with infliximab and ciclosporin was 1.8 % and 1.1 % respectively. One study showed that 0.2 % had been on other immunosuppressants for UC.

3.12. Treatment modalities of CD

85.8 % of CD patients were treated with salicylate. There was no statistically significant difference in the proportions of CD patients treated with salicylates between the two periods.

59.3 % of CD patients were treated with azathioprine. Studies before 2015 reported that 49.8 % of patients used azathioprine for the treatment of CD, while 67.0 % of CD patients used azathioprine after 2015. This difference was statistically significant (Q = 3.87, DF = 1, p-value=<0.05).

55.1 % of CD patients were treated with corticosteroids. Historical studies report 43.1 % using steroids for the treatment of CD, while 73.6 % have used steroids in recent studies. This difference was statistically significant (Q = 34.58, DF = 1, p-value=<0.01).

No studies reported using biologics and other immunosuppressants for CD before 2015. Studies done after 2015 reported using infliximab, other biologics and immunosuppressants for treating CD. 11.5 % of CD patients were treated with infliximab. A single study reported that 8.7 % had used other biologics to treat CD. 1.2 % have used other immunosuppressants to treat CD.

3.13. Complications in IBD patients

We looked at the development of cancer and the need for surgical treatment as complications of UC and CD. 0.8 % of UC patients developed colorectal cancer as a complication. The difference in the proportion of UC patients developing colorectal cancer between the two periods was not statistically significant.

2.6 % of UC patients and 22.8 % of CD patients needed surgical treatment. The proportions of patients requiring surgical intervention between the two periods were not statistically significant for UC or CD.

Table 1 summarizes pooled proportions or means for various parameters in Ulcerative Colitis (UC) and Crohn's Disease (CD) patients and also indicates if there was a statistically significant difference between the historical (before 2015) and recent (after 2015) periods for that parameter.

Table 2 compares the findings of the present study, the IBD-ENC study [6] and the ACCESS study [34].

Table 1
– Table summarizing pooled proportions or means for various parameters in ulcerative colitis and Crohn's disease patients. The last column indicates if there was a statistically significant difference between the historical (before 2015) and recent (after 2015) periods for that parameter.

Parameter	Ulcerative Colitis	Crohn's Disease	Difference between periods
Proportion of patients	69.56 %	30.44 %	None
Male proportion	52.64 %	59.75 %	None
Mean age at diagnosis	37.62 years	35.04 years	None
Family history	2.16 %	1.74 %	None
Smoking history	12 %	12.37 %	None
Mild disease	25.55 %	35.38 %	None
Moderate disease	54.88 %	48.56 %	None
Severe disease	21.96 %	16.87 %	None
Proctitis	28.21 %	–	None
Left-sided	41.60 %	–	None
Extensive	34.12 %	–	None
Pancolitis	24.30 %	–	None
Ileal involvement	–	24.46 %	None
Colonic involvement	–	34.26 %	None
Ileocolonic involvement	–	33.02 %	None
Upper GI involvement	–	6.29 %	None
Perianal disease	–	11.85 %	None
Non-stricturing non-penetrating	–	67.13 %	**Increased in the recent period** (p-value = 0.01)

(*continued on next page*)

Table 1 (*continued*)

Parameter	Ulcerative Colitis	Crohn's Disease	Difference between periods
Stricturing	–	21.80 %	None
Penetrating	–	10.76 %	None
Joint involvement	21.53 %	26.60 %	None
Ocular involvement	4.38 %	5.74 %	**Decreased in recent period for UC** (p-value<0.01)
Dermatological involvement	4.07 %	2.62 %	**Decreased in recent period for both UC** (p-value<0.01) **and CD** (p-value<0.01)
Bone involvement	44.83 %	54.84 %	–
Biliary involvement	1.00 %	0.85 %	None
Thromboembolism	0.45 %	–	–
Corticosteroid use	73.68 %	55.06 %	**Increased in recent period for CD** (p-value<0.01)
Salicylate use	98.23 %	85.78 %	None
Azathioprine use	24.20 %	59.30 %	**Increased in recent period for CD** (p-value<0.05)
Infliximab use	1.77 %	11.52 %	–
Ciclosporin use	1.05 %	–	–
Other biologics	–	8.72 %	–
Other immunosuppressant use	0.17 %	1.22 %	–
Colorectal cancer	0.82 %	–	None
Surgery	2.56 %	22.84 %	None

CD – Crohn's disease, UC – ulcerative colitis.

Table 2
– Table comparing the findings of the present study, IBD-ENC study [6] and ACCESS study [34].

Parameter	Present study		IBD-ENC		ACCESS - Asia cohort		ACCESS – Australia cohort	
	UC	CD	UC	CD	UC	CD	UC	CD
Proportion of patients (UC: CD)	69.56:30.44		1.9:1		2		0.5	
Male proportion	52.64 %	59.75 %	1.3:1	1.4:1	57.90 %	61.40 %	45.50 %	47.60 %
Mean age at diagnosis	37.62 years	35.04 years						
Family history	2.16 %	1.74 %	4 %	7 %	3 %		17 %	
Smoking history	12 %	12.37 %	11 %		6 %	11 %	8 %	10 %
Mild disease	25.55 %	35.38 %						
Moderate disease	54.88 %	48.56 %						
Severe disease	21.96 %	16.87 %						
Proctitis	28.21 %	–	27 %		37 %	–	32 %	–
Left-sided	41.60 %	–	40 %		32 %	–	27 %	–
Extensive	34.12 %	–	33 %		31 %	–	41 %	–
Pancolitis	24.30 %	–				–		–
Ileal involvement	–	24.46 %	–	27 %	–	31 %	–	31 %
Colonic involvement	–	34.26 %	–	27 %	–	24 %	–	24 %
Ileocolonic involvement	–	33.02 %	–	43 %	–	45 %	–	45 %
Upper GI involvement	–	6.29 %	–	5 %	–	5 %	–	5 %
Perianal disease	–	11.85 %	–	8 %	–	18 %	–	12 %
Non-stricturing non-penetrating/inflammatory	–	67.13 %	–	64 %	–	66 %	–	88 %
Stricturing	–	21.80 %	–	23 %	–	17 %	–	10 %
Penetrating	–	10.76 %	–	11 %	–	19 %	–	2 %
Joint involvement	21.53 %	26.60 %	18 %		15 %			
Ocular involvement	4.38 %	5.74 %	3 %		2 %			
Dermatological involvement	4.07 %	2.62 %	5.40 %		4 %			
Bone involvement	44.83 %	54.84 %						
Biliary involvement	1.00 %	0.85 %	0.50 %		1 %			
Thromboembolism	0.45 %	–						
Corticosteroid use	73.68 %	55.06 %	54 %	51 %	21 %	42 %	50 %	67 %
Salicylate use	98.23 %	85.78 %	94 %	61 %	68 %	49 %	86 %	71 %
Azathioprine use	24.20 %	59.30 %	31 %	56 %	8 %	35 %	0 %	14 %
Ciclosporin use	1.05 %	–						
Other immunosuppressant use	0.17 %	1.22 %						
Infliximab use	1.77 %	11.52 %	4 %	13 %	1 %	5 %	0 %	0 %
Other biologics	–	8.72 %						
Colorectal cancer	0.82 %	–						
Surgery	2.56 %	22.84 %	1 %	18 %				

ACCESS - Asia-Pacific Crohn's and Colitis Epidemiology Study, CD – Crohn's disease, IBD-ENC – inflammatory bowel disease-emerging nations cohort, UC – ulcerative colitis.

Supplementary Table 3 gives an overview of the key demographics, disease characteristics, extraintestinal manifestations, treatment modalities, and complications for both UC and CD patients.

Supplementary Table 4 summarizes the pooled proportions or means of some parameters in UC and CD patients before 2015 and after 2015 and whether their differences are statistically significant.

4. Discussion

Our systematic review and meta-analysis, spanning studies published from January 1981 to June 2023, provides an overview of the epidemiology of adult UC and CD in South Asia. With data from more than 9000 patients across South Asia, this review offers valuable insights into the trends, patient characteristics, risk factors, disease manifestations, and treatment patterns of IBD in this region. This is the first systematic review to discuss the epidemiology of IBD in South Asia. With its large population, the rise in IBD cases in the South Asian region is poised to contribute significantly to the global burden of IBD.

Studying the epidemiology of IBD as it emerges in the South Asian region carries substantial implications. Firstly, it allows for characterizing the clinical manifestations and identifying the unique obstacles to diagnosis and treatment in this part of the world, enabling the development of tailored management strategies [35]. Secondly, quantifying the disease burden is crucial for informing healthcare policies and resource allocation. This increased attention can raise awareness about IBD among the general public, healthcare providers, and government agencies, which is particularly important, as many South Asian nations currently do not recognize IBD as a significant public health concern. Moreover, tracking the evolution of these chronic diseases over time presents an opportunity to investigate potential environmental factors that may contribute to their emergence and progression in the region [36,37].

One of the key findings is the higher prevalence of UC compared to CD (2:1) among South Asian patients. This pattern aligns with observations from other regions where IBD is an emerging disease. The IBD-ENC described a UC-to-CD ratio of 1.9:1 [6]. Similarly, the Asian cohort in the Asia-Pacific Crohn's and Colitis Epidemiology Study (ACCESS) showed a similar ratio (2:1). Conversely, the Australian cohort in the ACCESS showed CD was as twice as common as UC [34].

The present study also revealed a male predominance for both UC and CD, which contrasts with the slight female bias observed in Western cohorts [4]. The findings of our study are in line with IBD-ENC data (1.3:1 male-to-female UC ratio and 1.4:1 male-to-female CD ratio) and the Asian cohort in ACCESS data (57.9 % male UC patients and 61.4 % male CD patients) [6,34]. The Australian cohort in the ACCESS study had a female predominance both for UC (54.5 % females) and CD (52.4 % Females) [34]. The mean age at diagnosis for UC was around 38 years and for CD it was around 35 years, without a significant change over time.

Familial aggregation, a known risk factor in Western populations, appears to play a relatively modest role in South Asian IBD cases, affecting only a small percentage of patients. The present study revealed a family history of IBD was only around 2 % for both UC and CD. In the IBD-ENC cohort, a positive family history was 4 % for UC and 7 % for CD [6]. Furthermore, the Asian population in the ACCESS study had only 3 % with a positive family history, which is similar to our findings [34]. This finding is consistent with studies suggesting that common IBD susceptibility genes such as NOD2 may not contribute significantly to disease risk in Asian populations [38,39]. On the other hand, the Australian cohort of the ACCESS group had a very significant family history of 17 % among IBD patients.

According to our study, smoking prevalence was similar among UC and CD patients (around 12 %) again showing no major shifts with time. In comparison, 11 % of IBD patients had a smoking history in the IBD-ENC cohort [6]. A similar proportion of CD patients in both Asian and Australian cohorts (11 % and 10 % respectively) in the ACCESS had a smoking history, however, smoking among UC patients was quite low in both these groups (6 % and 8 % respectively) [34]. These findings reiterate the complex interplay of genetic and environmental factors in IBD pathogenesis.

The study provides insights into the disease phenotypes. The majority of the patients had moderately severe disease in both UC and CD. Left-sided colitis (41.6 %) was the most common manifestation of UC followed by extensive colitis (34.1 %) then by ulcerative proctitis (28.2 %). These findings were consistent with the findings of the IBD-ENC results (40 %, 33 % and 27 % respectively) [6]. However, ulcerative proctitis (37 %) was the most common in the ACCESS Asian cohort and extensive colitis (41 %) was the most prominent in the ACCESS Australian cohort [34].

In the present study, colonic involvement predominated among CD patients (34.3 %) followed by ileocolonic (33.0 %) and then by ileal involvement (24.5 %). However, in both the IBD-ENC cohort and the two ACCESS cohorts, ileocolonic involvement predominated. 11.9 % of CD patients in the present study had perianal involvement which was similar to IBD-ENC (8 %) and ACCESS Asian cohort (12 %) [6,34]. However, perianal involvement was more predominant among the ACCESS Australian cohort (18 %) [34].

Non-stricturing and non-penetrating phenotype was the commonest (67.1 %) and there was an increase in proportion over time possibly due to advances in diagnostic methodologies and treatment modalities. This was followed by stricturing CD (21.8 %) and Penetrating CD (10.8 %). Similar results were seen in the IBD-ENC cohort [6]. Though the inflammatory phenotype was the dominant form among Asians (66 %) and Australians (88 %) in the ACCESS study, the penetrating form (19 %) was more common than the stricturing phenotype (17 %) among Asians [34]. The penetrating disease was significantly lower among the Australian group (2 %) possibly due to early use of aggressive therapy involving biologics.

Joint involvement was the most common extraintestinal manifestation both for UC and CD. Both IBD-ENC and ACCESS cohorts showed joint involvement to be the most common EIM. According to the present study, though the proportions of eye involvement (4.4 %) and skin involvement (4.1 %) in UC were almost equal, eye involvement (5.7 %) was twice as common as dermatological involvement (2.6 %) in CD. Skin involvement showed a decreasing trend for both UC and CD, but the reduction in ocular involvement with time was seen only among UC patients. This decline might be possibly due to more effective control of intestinal inflammation

with more advanced and aggressive treatment. However, both the IBD-ENC and Asian cohorts of the ACCESS study showed skin involvement to be more prominent than ocular involvement among IBD patients which is contrary to our finding [6,34].

According to the present study, almost all patients with UC have received treatment with salicylates (98.2 %). Though this is similar to the IBD-ENC cohort (94 %) and ACCESS Australian group (86 %), ACCESS Asian reports only 68 % being treated with salicylates [6, 34]. Closer to three-fourths (73.7 %) of the South Asian UC population had treatment with corticosteroids which was higher than the IBD-ENC population (54 %) and ACCESS population (Asia – 21 %, Australia – 50 %). About 25 % of UC patients in South Asia had received azathioprine. While a similar use of immunosuppressants is seen in the IBD-ENC cohort (31 %), both the Asian subgroup and Australian subgroup of the ACCESS study showed far less use of immunosuppressants for UC (8 % and 0 % respectively) [6,34]. Our study showed that around 2 % of South Asian UC patients require Infliximab. While the IBD-ENC cohort has used biologics twice more frequently (4 %), only 1 % in the ACCESS Asian subgroup used biologics for the treatment of UC [32]. The very low percentage of Infliximab use in UC in this study compared percentage of severe and extensive disease in the same study may be due to the availability or price of the drugs as well as physicians' trend/choice/knowledge.

The present study showed about 85 % of CD patients use salicylates for treatment in South Asia, which was higher than the IBD-ENC cohort (61 %), ACCESS-Asian subgroup (49 %) and ACCESS-Australian subgroup (71 %) [6,34]. Half of the South Asian CD patients (55 %) received corticosteroid treatment which showed an increasing trend with time. This was similar to the IBD-ENC cohort (51 %). Only 42 % of the ACCESS-Asian subgroup used corticosteroids. However, the ACCESS-Australian cohort shows that 67 % of CD patients require corticosteroid treatment. 59 % of CD patients in our study were treated with azathioprine and it showed a rising temporal trend [34]. A similar number (56 %) in the IBD-ENC subgroup was treated with immunosuppressants [6]. However, the use of immunosuppressants among CD patients was less frequent in both ACCESS Asia and Australia subgroups (35 % and 14 % respectively) [34]. The present study showed that around 12 % of South Asian CD patients required treatment with Infliximab, which was similar to the IBD-ENC group (13 %) which required biologics for the treatment of CD [6]. However, only around 5 % of the Asian ACCESS cohort has received biologics and 0 % in the Australian ACCESS cohort received biologics in the first 3 months [34]. The relatively lower percentage use of Infliximab in UC in this study compared percentage of severe and complicated disease in the same study may be again due to the availability or price of the drugs as well as physicians' trend/choice/knowledge.

Surgical intervention was more common in CD patients compared to UC patients, although the overall rates were lower than those reported in Western cohorts [4]. The need for surgical intervention is 10 times more common among CD patients (22.8 %) than UC patients (2.6 %), which was similar to the findings of the IBD-ENC group (18 % and 1 % respectively) [6]. Only one study describes colorectal cancer among UC patients affecting about one in 100 patients.

There was no statistically significant difference between the historical (before 2015) and recent (after 2015) periods for most parameters in both UC and CD patients (Table 1). However, a few notable differences emerged: for CD, the proportion with non-stricturing and non-penetrating phenotypes increased in the recent period, potentially due to advances in early diagnostic methods and treatments. Ocular involvement decreased in the recent period specifically for UC patients. Dermatological involvement decreased in the recent period for both UC and CD patients. The use of corticosteroids increased in the recent period for CD patients. The use of azathioprine increased in the recent period for CD patients. No other significant temporal differences were observed for parameters such as disease distribution, smoking/family history, other extraintestinal manifestations, use of salicylates or biologics, rates of colorectal cancer or surgery requirements (Table 1).

This study has limitations including the potential selection bias due to data collection from secondary and tertiary care centres, as well as the cross-sectional nature of the data, which may not capture the cumulative probabilities of certain outcomes over time. The findings of this study may have been shaped by the resource constraints prevalent in many South Asian nations. Diagnostic capabilities, encompassing colonoscopy and gastrointestinal pathology services, are often inadequate in a region where awareness of IBD remains limited, and dedicated IBD centres are scarce. In the absence of robust epidemiological studies describing the incidence and the prevalence of IBD from the South Asian region, we could not determine if there was a demographic transition of epidemiological stages for IBD within the region, from the historical period to the recent period. We also limited the present study to adult populations, excluding paediatric IBD from the region, in this systematic review. The un-availability data on the particular type of dermatological, rheumatological and ocular EIMs is a further limitation of this study.

Despite the above limitations, this study provides a comprehensive overview of IBD in South Asia, where epidemiological data on IBD are limited. It represents a step towards future research in understanding the environmental factors in countries where the diseases are emerging.

5. Conclusion

In summary, this study presents a comprehensive overview of the epidemiology of IBD in South Asia, revealing a higher prevalence of UC than CD, a male predominance and modest familial aggregation. Left-sided colitis was the most common type of UC. Non-stricturing, non-penetrating behaviour was the dominant phenotype and colonic involvement was more common than small bowel involvement in CD. Extraintestinal manifestations were commonly reported, with joint manifestations being the most prevalent for UC and CD. Salicylates and corticosteroids were widely used for UC and CD in South Asia. Immunomodulators, such as azathioprine, were used particularly for CD. However, the use of biological agents, like infliximab, was relatively low, likely due to factors such as cost and availability. The need for surgical intervention was more common in CD patients, although the overall rates were lower than those reported in Western cohorts.

While acknowledging the limitations of the study, these findings offer a foundation for future research and inform the development of region-specific management strategies for IBD in South Asia.

CRediT authorship contribution statement

Madunil Anuk Niriella: Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Conceptualization. **Charith Kanishka Martinus:** Writing – review & editing, Writing – original draft, Investigation, Data curation. **Madhuri Yasodha Withanage:** Writing – review & editing, Investigation, Data curation. **Selani Darshika:** Writing – review & editing, Investigation, Data curation. **Maljini Illangasinghe:** Writing – review & editing, Investigation, Data curation. **Hayashini Ruvindri Perera:** Writing – review & editing, Investigation, Data curation. **Dileepa Senajith Ediriweera:** Writing – review & editing, Writing – original draft, Formal analysis. **Hithanadura Janaka de Silva:** Writing – review & editing, Supervision, Project administration, Methodology.

Consent statement

Not applicable.

Ethics approval

Ethics approval was not required for this systematic review as we used secondary data.

Availability of data and materials

Data that support the findings of this study are available from the corresponding author upon request.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2025.e41840.

References

[1] B. Xia, C. Jba, M. Sgm, P. As, Inflammatory bowel disease: definition, epidemiology, etiologic aspects, and immunogenetic studies, World J. Gastroenterol. 4 (5) (1998) 446, https://doi.org/10.3748/wjg.v4.i5.446.
[2] S.C. Ng, H.Y. Shi, N. Hamidi, et al., Worldwide incidence and prevalence of inflammatory bowel disease in the 21st century: a systematic review of population-based studies, Lancet 390 (10114) (2017) 2769–2778, https://doi.org/10.1016/S0140-6736(17)32448-0.
[3] G.G. Kaplan, The global burden of IBD: from 2015 to 2025, Nat. Rev. Gastroenterol. Hepatol. 12 (12) (2015) 720–727, https://doi.org/10.1038/nrgastro.2015.150.
[4] S. Alatab, S.G. Sepanlou, K. Ikuta, et al., The global, regional, and national burden of inflammatory bowel disease in 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017, Lancet Gastroenterol Hepatol 5 (1) (2020) 17–30, https://doi.org/10.1016/S2468-1253(19)30333-4.
[5] S.C. Ng, F.K. Chan, Infections and inflammatory bowel disease: challenges in Asia, J Dig Dis 14 (11) (2013) 567–573, https://doi.org/10.1111/1751-2980.12091.
[6] R. Banerjee, P. Pal, I. Hilmi, et al., Emerging inflammatory bowel disease demographics, phenotype, and treatment in South Asia, South-East Asia, and Middle East: preliminary findings from the inflammatory bowel disease-emerging nations' Consortium, J. Gastroenterol. Hepatol. 37 (6) (2022) 1004–1015, https://doi.org/10.1111/jgh.15801.
[7] N.A. Molodecky, I.S. Soon, D.M. Rabi, et al., Increasing incidence and prevalence of the inflammatory bowel diseases with time, based on systematic review, Gastroenterology 142 (1) (2012) 46–54.e42, https://doi.org/10.1053/j.gastro.2011.10.001.
[8] Z. Munn, S. Moola, K. Lisy, D. Riitano, C. Tufanaru, in: E. Aromataris, Z. Munn (Eds.), Chapter 5: Systematic Reviews of Prevalence and Incidence, JBI Manual for Evidence Synthesis. JBI, 2020.
[9] R Core Team, R: A Language and Environment for Statistical Computing, R Foundation for Statistical Computing, Vienna, Austria, 2024. https://www.R-project.org/.
[10] Sara Balduzzi, Gerta Rücker, Guido Schwarzer, How to perform a meta-analysis with R: a practical tutorial, Evid. Base Ment. Health (22) (2019) 153–160.
[11] McGuinness LA, Higgins JPT. Risk-of-bias VISualization (robvis): an R package and Shiny web app for visualizing risk-of-bias assessments. Res. Synth. Methods. n/a(n/a). doi:10.1002/jrsm.1411.
[12] M.P. Sharma, S.K. Sarin, Ulcerative colitis in a North Indian hospital: current trends, J R Coll Physicians Lond 19 (2) (1985) 99–102. http://www.ncbi.nlm.nih.gov/pubmed/3999055.
[13] A. Sood, V. Midha, N. Sood, A.S. Bhatia, G. Avasthi, Incidence and prevalence of ulcerative colitis in Punjab, North India, Gut 52 (11) (2003) 1587–1590, https://doi.org/10.1136/gut.52.11.1587.

[14] A. Sood, K. Kaur, A. Singh, et al., Trends of inflammatory bowel disease at a tertiary care center in northern India, Int. Res. 19 (3) (2021) 282–290, https://doi.org/10.5217/ir.2020.00010.
[15] A. Goel, A.K. Dutta, A.B. Pulimood, A. Eapen, A. Chacko, Clinical profile and predictors of disease behavior and surgery in Indian patients with Crohn's disease, Indian J. Gastroenterol. 32 (3) (2013) 184–189, https://doi.org/10.1007/s12664-012-0293-y.
[16] K. Das, U.C. Ghoshal, G.K. Dhali, J. Benjamin, V. Ahuja, G.K. Makharia, Crohn's disease in India: a multicenter study from a country where tuberculosis is endemic, Dig. Dis. Sci. 54 (5) (2009) 1099–1107, https://doi.org/10.1007/s10620-008-0469-6.
[17] R. Kalaria, D. Desai, P. Abraham, A. Joshi, T. Gupta, S. Shah, Temporal change in phenotypic behaviour in patients with Crohn's disease: do Indian patients behave differently from western and other Asian patients? J Crohns Colitis 10 (3) (2016) 255–261, https://doi.org/10.1093/ecco-jcc/jjv202.
[18] D. Bandyopadhyay, S. Bandyopadhyay, P. Ghosh, et al., Extraintestinal manifestations in inflammatory bowel disease: prevalence and predictors in Indian patients, Indian J. Gastroenterol. 34 (5) (2015) 387–394, https://doi.org/10.1007/s12664-015-0598-8.
[19] J.B. Sharma, The profile of inflammatory bowel disease in natives of Western Himalayas, Trop. Gastroenterol. 38 (2) (2017), https://doi.org/10.7869/tg.408.
[20] S. Islam, M. Agarwal, A.J. Talukdar, S. Dutta, P.P. Kalita, A study on clinical profile of patients with inflammatory bowel disease, Natl. J. Med. Res. 6 (3) (2016) 233–236.
[21] M. Philip, P. Augustine, V. Thomas, et al., Multi-center prospective survey of inflammatory bowel diseases in Kerala: more than 2000 cases, Indian J. Gastroenterol. 36 (6) (2017) 459–467, https://doi.org/10.1007/s12664-017-0809-6.
[22] A.D. Amarapurkar, D.N. Amarapurkar, P. Rathi, et al., Risk factors for inflammatory bowel disease: a prospective multi-center study, Indian J. Gastroenterol. 37 (3) (2018) 189–195, https://doi.org/10.1007/s12664-018-0850-0.
[23] R.V. Yewale, K. Natarajan, J. Ubal Dhus, et al., Inflammatory bowel diseases in Tamil Nadu: a survey of demographics, clinical profile, and practices, JGH Open 5 (11) (2021) 1306–1313, https://doi.org/10.1002/jgh3.12673.
[24] S. Harsh, A. Adhikari, R. Pathak, P.K. Khadga, S. Sharma, Clinical characteristics of ulcerative colitis in NEPALESE population: experience from a tertiary care center tuth, kathmandu, Nepal, Journal of Nobel Medical College 4 (1) (2015) 1–6.
[25] S. Bhattarai, R.R. Acharya, Clinical profile and colonoscopic findings in patients with ulcerative colitis at a tertiary care hospital in Nepal: a cross sectional study, J. Adv. Intern. Med. 9 (2) (2020) 73–77.
[26] M. Qureshi, Z. Abbas, Clinical presentation of ulcerative colitis in Pakistani adults, Euroasian J. Hepato-Gastroenterol. 5 (2) (2015) 127–130, https://doi.org/10.5005/jp-journals-10018-1151.
[27] A. Saleem, M. Zeeshan, F. Hazoor, G. Mustafa, Sigmoidoscopic extent of ulcerative colitis and associated factors in Pakistani population, Pak J Med Sci 38 (1) (2021) 276–280, https://doi.org/10.12669/pjms.38.1.4648.
[28] M.A. Niriella, A.P. De Silva, A.H. Dayaratne, et al., Prevalence of inflammatory bowel disease in two districts of Sri Lanka: a hospital based survey, BMC Gastroenterol. 10 (1) (2010) 32, https://doi.org/10.1186/1471-230X-10-32.
[29] D. Subasinghe, N.M.M. Nawarathna, D.N. Samarasekera, Disease characteristics of inflammatory bowel disease (IBD), J. Gastrointest. Surg. 15 (9) (2011) 1562–1567, https://doi.org/10.1007/s11605-011-1588-5.
[30] A. Kasturiratne, M.N.F. Mufeena, K.C.D. Mettananda, et al., Incidence of inflammatory bowel disease in Gampaha district: details of the Sri Lankan component of the Asia-Pacific Crohn's and colitis epidemiology study, Ceylon Medical Journal 59 (1) (2014).
[31] U. Kalubowila, T. Liyanaarachchi, K.B. Galketiya, et al., Epidemiology and clinical course of inflammatory bowel disease in the Central Province of Sri Lanka: a hospital-based study, JGH Open 2 (4) (2018) 129–133, https://doi.org/10.1002/jgh3.12058.
[32] M.A. Niriella, I.K. Liyanage, S.K. Kodisinghe, et al., Changing phenotype, early clinical course and clinical predictors of inflammatory bowel disease in Sri Lanka: a retrospective, tertiary care-based, multi-centre study, BMC Gastroenterol. 21 (1) (2021) 71, https://doi.org/10.1186/s12876-021-01644-5.
[33] M.S. Silverberg, J. Satsangi, T. Ahmad, et al., Toward an integrated clinical, molecular and serological classification of inflammatory bowel disease: report of a Working Party of the 2005 Montreal World Congress of Gastroenterology, Can. J. Gastroenterol. 19 (suppl A) (2005) 5–36.
[34] S.C. Ng, W. Tang, J.Y. Ching, et al., Incidence and phenotype of inflammatory bowel disease based on results from the Asia-Pacific Crohn's and colitis epidemiology study, Gastroenterology 145 (1) (2013) 158–165.e2, https://doi.org/10.1053/j.gastro.2013.04.007.
[35] P.J. Hu, Inflammatory bowel disease in Asia: the challenges and opportunities, Int. Res. 13 (3) (2015) 188, https://doi.org/10.5217/ir.2015.13.3.188.
[36] A.N. Ananthakrishnan, Environmental risk factors for inflammatory bowel disease, Gastroenterol. Hepatol. 9 (6) (2013) 367–374.
[37] S.C. Ng, W. Tang, R.W. Leong, et al., Environmental risk factors in inflammatory bowel disease: a population-based case-control study in Asia-Pacific, Gut 64 (7) (2015) 1063–1071, https://doi.org/10.1136/gutjnl-2014-307410.
[38] S. Mahurkar, R. Banerjee, V.S. Rani, et al., Common variants in NOD2 and IL23R are not associated with inflammatory bowel disease in Indians, J. Gastroenterol. Hepatol. 26 (4) (2011) 694–699, https://doi.org/10.1111/j.1440-1746.2010.06533.x.
[39] J.Z. Liu, S. van Sommeren, H. Huang, et al., Association analyses identify 38 susceptibility loci for inflammatory bowel disease and highlight shared genetic risk across populations, Nat. Genet. 47 (9) (2015) 979–986, https://doi.org/10.1038/ng.3359.