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Prevalence, Temporal Trends and Characteristics of Colonic Diverticulosis: A Ten-Year Retrospective Colonoscopy Based Study

Muhammad Umar Saddique
msaddique@hamad.qa

Hamad Medical Corporation
Haidar Hussein Barjas
Hamad Medical Corporation
Mohammed Abderahim Hassan
Hamad Medical Corporation

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Abstract

Background:

Epidemiological data on colonic diverticulosis remain scarce from the Gulf region. Qatar's multiethnic population provides a unique opportunity to examine diverticulosis prevalence and patterns. We aimed to determine the prevalence, temporal trends, demographic and endoscopic characteristics of colonoscopy-confirmed diverticulosis over a 10-year period at Qatar's principal tertiary endoscopy centre.

Methods:

This retrospective study included all patients aged ≥ 14 years who underwent colonoscopy at Ambulatory Care Centre, Department of Gastroenterology and Hepatology, Hamad Medical Corporation between January 2015 and December 2024. Each patient was represented by their index colonoscopy. Records were classified as diverticulosis-positive, non-diverticulosis, or unclassified. A stratified random audit of 200 unclassified records was performed to assess documentation-related misclassification. Temporal trends were evaluated using correlation, Mann–Kendall testing, and joinpoint regression. Multivariable logistic regression identified independent predictors of diverticulosis.

Results:

Among 36,735 unique patients (47,249 procedures), diverticulosis was confirmed in 3,611 patients, yielding a primary prevalence of 9.83% (95% CI 9.53–10.14%), increasing to 11.43% after audit adjustment and 15.02% among screening colonoscopies. Prevalence increased from 9.0% in 2015 to 11.7% in 2024 ($p = 0.004$), with a sustained upward trend from 2019 onward. Age ≥ 50 years was the strongest independent predictor (aOR 4.23; 95% CI 3.86–4.63; $p < 0.001$). Non-Qatari patients had significantly higher rates of right-sided diverticulosis than Qatari patients.

Conclusions:

Approximately one in nine patients undergoing colonoscopy in Qatar had diverticulosis, with prevalence increasing over time. Distinct right- and left-sided disease patterns across nationality groups highlight the importance of complete colonoscopic evaluation in ethnically diverse populations.

Clinical Trial Registration

Clinical trial number not applicable.

1. Introduction

Colonic diverticulosis is mucosal outpouching through points of relative weakness in the colonic wall. It is a very common structural finding at colonoscopy and is increasingly recognised as a global health burden. The condition has traditionally been viewed as a disease of Western populations and is more common in societies consuming low-fibre, highly processed diets [1, 2]. However, recent studies have questioned the previously assumed protective role of dietary fibre [3, 4] and emerging data from Asia and Africa have documented rising prevalence in populations undergoing rapid dietary and lifestyle transition [5, 6]. The etiology of diverticulosis is multifactorially related to aging, genetic predisposition, gut microbiome alterations, and connective tissue changes, rather than any diet alone [7, 8, 9].

A geographical divide exists in the anatomical distribution of diverticulosis: Western populations predominantly have left-sided phenotype, whereas East Asian populations, particularly Japanese, Korean, and Chinese populations, predominantly have a right-sided phenotype [5, 10, 11]. Right-sided diverticulosis carries relatively lower risk of diverticulitis but a comparable or higher risk of diverticular bleeding [5]. These geographic differences are clinically important because they may influence risk stratification.

The Gulf Cooperation Council (GCC) countries, including Qatar, have populations from diverse ethnic and geographic backgrounds. Qatari nationals are approximately 12% of the population, while the remaining 88% comprise a multiethnic expatriate workforce mainly from South Asia, Southeast Asia, and the Arab world [12]. This demographic diversity offers a unique opportunity to study the prevalence and patterns of diverticulosis. Despite this, colonoscopy-based epidemiological data from Qatar and the GCC region remain sparse and most published studies limited to small single-centre cohorts.

Globally, colonoscopy-confirmed diverticulosis prevalence vary depending on the study design and population: from approximately 5–10% in community endoscopy databases [3] to 40–65% in prospective screening cohorts [13]. Large registry-based prevalence studies have consistently identified older age as the dominant risk factor [3, 13], with prevalence rising steeply from under 5% in those under 40 years to over 60% in those aged 80 years and above in Western populations [3]. Long-term changes in diverticulosis prevalence remain unclear, especially in populations experiencing rapid social and dietary change.

To address this gap, we conducted a ten-year retrospective study using the colonoscopy procedure registry of the Ambulatory Care Centre (ACC), Department of Gastroenterology and Hepatology, Hamad Medical Corporation (HMC), the principal tertiary public hospital in Qatar. HMC provides care to the majority of Qatar's population, and its endoscopy registry is one of the most comprehensive datasets available in the region. The objectives of this study

were to determine the prevalence of colonoscopy-confirmed colonic diverticulosis, evaluate temporal trends between 2015 and 2024, and describe the endoscopic and demographic characteristics of affected patients, including age-specific prevalence and nationality-based analysis.

2. Methods

2.1 Study Design, Setting, and Ethics:

This retrospective study was conducted at the Department of Gastroenterology and Hepatology, ACC, HMC, Doha, Qatar. All colonoscopies performed between 1 January 2015 and 31 December 2024 were included in the analysis. Ethics approval was obtained from the HMC Medical Research Centre (Protocol No. MRC-01-26-318), and the requirement for individual informed consent was waived given the retrospective registry-based design. This study is reported in accordance with the STROBE guidelines. An artificial intelligence language model (Claude, Anthropic) was used to assist with drafting and structural editing of the manuscript text. All data, analyses, clinical interpretations, and conclusions are the sole responsibility of the authors.

2.2 Study Population:

Patients aged ≥ 14 years (the institutional threshold for adult endoscopy at HMC) who underwent colonoscopy during the study period were included. Exclusion criteria were prior total colectomy and colonoscopy not advancing beyond the rectum due to inadequate bowel preparation. Data were extracted from the EndoVault® endoscopy reporting system. Each patient was represented by their index (earliest recorded) colonoscopy. Patients with two or more colonoscopies during the study period (n = 6,992; 19.0%) were identified and reported separately to evaluate diverticulosis detection on repeat procedures.

2.3 Classification of Index Colonoscopies:

Each colonoscopy record was extracted from the EndoVault® endoscopy reporting system and classified into three groups: (1) diverticulosis-positive, defined as explicit documentation of colonic diverticulosis in the structured diagnosis field, identified using a keyword search incorporating known spelling variants (e.g., "diverticulosis", "diverticulusis", "divertuclosis"). (2) non-diverticulosis, defined as a normal finding or alternative documented diagnosis; and (3) unclassified, defined as records with a blank diagnosis field or a "See Findings" entry (indicating that findings were documented in the free-text report body rather than the structured field). Unclassified records underwent manual review of the free-text colonoscopy report to confirm or exclude diverticulosis. Diverticulosis-positive cases were further categorised as detected at index colonoscopy (primary analysis) or at a subsequent procedure (secondary analysis) (Supplementary Fig. 1).

2.4 Audit of Unclassified Records:

A stratified random sample of 200 patients was selected from the 4,508 unclassified records using proportional allocation across study years (2015–2024). Sample size was calculated a priori to achieve a ± 5% margin of error at 95% confidence, assuming a conservative positivity rate of 15% (minimum required n = 188 after finite population correction; 200 selected to provide an additional margin). Free-text colonoscopy reports for sampled patients were manually reviewed to confirm or exclude diverticulosis. The observed positivity proportion was extrapolated to the full unclassified cohort, with 95% confidence intervals derived using bootstrap resampling (10,000 iterations).

2.5 Study Variables:

Demographic variables included sex, age at index colonoscopy, age group (< 50 and ≥ 50 years), and nationality (Qatari or Non-Qatari). These were extracted from the Hamad Medical Corporation electronic health record and linked to EndoVault® data using the unique hospital chart number (HC#).

Procedural variables included year of procedure, indication for colonoscopy (classified into 18 predefined categories using rule-based text analysis of the indication field), and extent of examination (complete when the terminal ileum or caecum was reached, otherwise classified as incomplete). Diverticulosis-related variables included anatomical location, presence of diverticulitis (yes/no), colonoscopically confirmed diverticular bleeding (defined as active bleeding or stigmata of recent haemorrhage documented in the endoscopist's report), and segmental colitis associated with diverticulosis (SCAD). Concomitant findings included colorectal polyps and haemorrhoids.

2.6 Statistical Analysis:

All analyses were performed using Python 3.12 and independently verified using SPSS version 29.0 and Stata v18.0. Prevalence was reported with 95% Wilson score confidence intervals. Continuous variables were compared using the Mann–Whitney U test, and categorical variables using Pearson's chi-square test. Temporal trends were assessed using Pearson correlation and the Mann–Kendall test, while joinpoint segmented regression was used to identify changes in trend over time.

Univariate and multivariable binary logistic regression models were used to estimate unadjusted and adjusted odds ratios (aOR) with 95% confidence intervals. The multivariable model included age group, sex, year of procedure, and all 18 colonoscopy indications simultaneously (n = 31,480 complete cases), with model fit assessed using the Nagelkerke pseudo-R^2. Four pre-specified sensitivity analyses were performed: screening-only prevalence, joinpoint trend analysis, completion-stratified analysis, and audit-adjusted prevalence with bootstrap validation. A two-sided p-value < 0.05 was considered statistically significant.

3. Results

3.1 Study Population:

Over the ten-year study period, 47,249 colonoscopy procedures were performed yielding 36,864 unique patients after de-duplication. After exclusions (n = 129), the final analysis cohort comprised 36,735 patients. Of these, 29,743 (81.0%) underwent a single colonoscopy, while 6,992 (19.0%) had two or more procedures (mean 2.49 per repeat patient; overall mean 1.29 per patient). Among index colonoscopies, 31,481 patients (85.7%) had a classifiable diagnosis, while 4,508 (12.3%) were unclassified (blank: 61.0%; "See Findings": 39.0%) (Fig. 1). The remaining 746 patients (2.0%) comprised 711 (1.9%) in whom diverticulosis was identified only on subsequent colonoscopy (secondary cohort, analysed separately) and 35 (0.1%) who could not be linked due to registry issues.

3.2 Prevalence - Primary Outcome:

Diverticulosis was confirmed at index colonoscopy in 3,611 of 36,735 patients, yielding a primary prevalence of 9.83% (95% CI: 9.53–10.14%). As the 4,508 unclassified records were included in the denominator but contributed no cases, this represents a conservative lower bound. When restricted to classified records (n = 31,481), prevalence increased to 11.47% (95% CI: 11.12–11.83%). Including 711 patients diagnosed at subsequent colonoscopies, the cumulative prevalence was 11.77% (95% CI: 11.44–12.10%). All estimates are summarised in (Supplementary Table 1).

3.3 Baseline Characteristics:

Patients with diverticulosis were significantly older than those without (mean 57.6 ± 11.6 vs 47.4 ± 13.9 years; p < 0.001), with a higher proportion aged ≥ 50 years (78.2% vs 47.0%; p < 0.001). A modest male predominance was also observed (63.2% vs 60.9%; p = 0.007). The most common indication among diverticulosis patients was screening (28.2%), followed by bleeding per rectum (16.0%), anaemia (11.5%), and abdominal pain (10.8%). Detailed demographic and indication comparisons are provided in (Table 1), indication-stratified analyses presented in (Supplementary Table 3).

Table 1
Baseline Characteristics of Patients with and without Colonic Diverticulosis Detected at Index Colonoscopy

Variable	Diverticulosis (n = 3,611)	Non-Diverticulosis (n = 27,870)	p-value
Demographic Characteristics			
Age (years), mean ± SD	57.6 ± 11.6	47.4 ± 13.9	< 0.001
Age (years), median [IQR]	58 [51–65]	48 [37–57]	
Sex, n (%)			0.007
Male	2,283 (63.2%)	16,967 (60.9%)	
Female	1,328 (36.8%)	10,903 (39.1%)	
Age Group, n (%)			< 0.001
<50 years	787 (21.8%)	14,761 (53.0%)	
≥50 years	2,824 (78.2%)	13,108 (47.0%)	
Indication for Colonoscopy, n (%)			
Screening	1,020 (28.2%)	5,773 (20.7%)	< 0.001
Bleeding per rectum	579 (16.0%)	5,305 (19.0%)	
Anaemia / Iron-deficiency anaemia	416 (11.5%)	3,192 (11.5%)	
Abdominal pain	389 (10.8%)	4,068 (14.6%)	
History of diverticulosis	189 (5.2%)	49 (0.2%)	
Constipation	185 (5.1%)	1,884 (6.8%)	
Surveillance / Follow-up	157 (4.3%)	932 (3.3%)	
Other	676 (18.7%)	6,667 (23.9%)	
IQR, interquartile range			
Age compared using Mann–Whitney U test; sex, age group, nationality, and indication compared using Pearson's chi-squared test. p < 0.05 considered significant.			
711 patients with diverticulosis first detected at a later colonoscopy were excluded; only index-colonoscopy-positive cases are included.			
Surveillance/Follow-up: general surveillance (DIV n = 103; Non-DIV n = 607) and polyp surveillance (DIV n = 54; Non-DIV n = 325).			

3.4 Clinical and Endoscopic Characteristics:

Among 3,611 index-positive patients, anatomical location was documented in 1,654 (45.8%). The ascending colon was most frequently affected (27.8%), followed by the sigmoid (27.2%), descending (21.1%), multi-segment (17.3%), transverse (3.3%), and pan-colonic disease (3.3%). Diverticulitis was documented in 158 patients (4.4%), while SCAD was identified in 15 (0.4%). Colonoscopically confirmed diverticular bleeding (active bleeding or stigmata of recent haemorrhage) documented in the endoscopist's report in 60 patients (1.7%) ,of whom 24 (0.7%) required endoscopic intervention. Concomitant

colorectal polyps and haemorrhoids were present in 1,672 (46.3%) and 1,809 (50.1%) patients, respectively. Complete colonoscopy was achieved in 2,793 patients (77.3%) (Table 2).

Table 2
Endoscopic and Clinical Characteristics of Patients with Colonic Diverticulosis Confirmed at Index Colonoscopy (n = 3,611)

Characteristic	n (%)
1. Indication for Colonoscopy	
Screening	1,020 (28.2%)
Bleeding per rectum	579 (16.0%)
Anaemia / Iron-deficiency anaemia	416 (11.5%)
Abdominal pain	389 (10.8%)
Other	269 (7.4%)
History of diverticulosis	189 (5.2%)
Constipation	185 (5.1%)
Surveillance	103 (2.9%)
Mass / Malignancy workup	82 (2.3%)
Pre-operative / Comorbidity screen	71 (2.0%)
Change in bowel habit	61 (1.7%)
Polyp surveillance	54 (1.5%)
Diarrhoea	52 (1.4%)
Perianal symptoms / Piles	51 (1.4%)
Weight loss	48 (1.3%)
Inflammatory bowel disease / Colitis	21 (0.6%)
Irritable bowel syndrome	12 (0.3%)
Family history of colorectal cancer	9 (0.2%)
2. Diverticulosis Features	
Anatomical Location	
Unspecified / Not documented	1,957 (54.2%)
Ascending colon	460 (12.7%)
Sigmoid colon	450 (12.5%)
Descending colon	349 (9.7%)
Multi-segment involvement	286 (7.9%)
Transverse colon	55 (1.5%)
Pan-colonic	54 (1.5%)
Diverticular Complications	
Diverticulitis[a]	158 (4.4%)
Colonoscopically confirmed diverticular bleeding[b]	60 (1.7%)
— Active bleeding with endoscopic intervention	24 (0.7%)
— Stigmata of recent haemorrhage	36 (1.0%)
Segmental colitis associated with diverticulosis (SCAD)	15 (0.4%)

SCAD, segmental colitis associated with diverticulosis; TI, terminal ileum; IDA, iron-deficiency anaemia. Demographic characteristics reported in Table 1. *Year-wise prevalence data reported in Supplementary Table 2.*

[a] Documented in the endoscopist's report as acute diverticulitis or peridiverticular inflammation.

[b] Colonoscopically confirmed cases only (active bleeding or stigmata of recent haemorrhage).

[c] Not mutually exclusive: mucosal ulceration 128 (3.5%), colitis 100 (2.8%), mass/malignancy 61 (1.7%), angiodysplasia 38 (1.1%), lipoma 24 (0.7%), melanosis coli 20 (0.6%), fistula 16 (0.4%), stricture 15 (0.4%).

[d] Complete = TI or caecum reached. Incomplete scope extent subcategories reported in Supplementary Table 8.

Characteristic	n (%)
1. Indication for Colonoscopy	
3. Concomitant Colonoscopy Findings	
Colorectal polyps	1,672 (46.3%)
Haemorrhoids	1,809 (50.1%)
Any other significant finding[c]	358 (9.9%)
4. Extent of Examination	
Complete colonoscopy (terminal ileum or caecum reached)[d]	2,793 (77.3%)
— Terminal ileum	1,985 (55.0%)
— Caecum	808 (22.4%)
Incomplete colonoscopy	808 (22.4%)
Not documented	10 (0.3%)
SCAD, segmental colitis associated with diverticulosis; TI, terminal ileum; IDA, iron-deficiency anaemia. Demographic characteristics reported in Table 1. *Year-wise prevalence data reported in Supplementary Table 2.*	
[a] Documented in the endoscopist's report as acute diverticulitis or peridiverticular inflammation.	
[b] Colonoscopically confirmed cases only (active bleeding or stigmata of recent haemorrhage).	
[c] Not mutually exclusive: mucosal ulceration 128 (3.5%), colitis 100 (2.8%), mass/malignancy 61 (1.7%), angiodysplasia 38 (1.1%), lipoma 24 (0.7%), melanosis coli 20 (0.6%), fistula 16 (0.4%), stricture 15 (0.4%).	
[d] Complete = TI or caecum reached. Incomplete scope extent subcategories reported in Supplementary Table 8.	

3.5 Age Decade-Specific Prevalence and Temporal Trend:

Prevalence increased progressively with age, from 1.3% in the third decade to 30.9% in the ninth decade, with the steepest rise between the sixth and seventh decades (+ 6.84 percentage points) (Table 5; Fig. 3). Overall prevalence increased over time, from 9.0% in 2015 to 11.7% in 2024 (Pearson r = 0.822, p = 0.004; Mann–Kendall τ = 0.600, p = 0.017). Joinpoint analysis demonstrated an initial plateau phase (2015–2018; 8.79%) followed by a sustained rising phase from 2019 onward (+ 0.807 percentage points/year; p = 0.011). The upward trend persisted despite reduced procedural volume during the 2020 pandemic years (Fig. 2; Supplementary Tables 2 and 7).

Table 5
Age Decade-Wise Point Prevalence of Colonic Diverticulosis at Index Colonoscopy (n = 3,611 Cases)

Age Decade-Wise Point Prevalence of Colonic Diverticulosis (Index Colonoscopy) — Hamad Medical Corporation, 2015–2024							
Age Decade	**Total Patients (n)**	**Diverticulosis Cases (n)**	**Non-Diverticulosis (n)**	**Prevalence (%)**	**95% CI Lower (%)**	**95% CI Upper (%)**	**95% CI (Ra**
< 20	554	7	547	1.26%	0.61%	2.58%	0.6%–2.6%
20–29	2,575	34	2,541	1.32%	0.95%	1.84%	1.0%–1.8%
30–39	5,564	200	5,364	3.59%	3.14%	4.12%	3.1%–4.1%
40–49	6,855	546	6,309	7.96%	7.35%	8.63%	7.4%–8.6%
50–59	8,816	**1,226**	7,590	**13.91%**	13.20%	14.64%	13.2%–14.
60–69	5,216	**1,089**	4,127	**20.88%**	19.80%	22.00%	19.8%–22.
70–79	1,621	**424**	1,197	**26.16%**	24.08%	28.35%	24.1%–28.
80–89	262	**81**	181	**30.92%**	25.63%	36.75%	25.6%–36.
> 90	17	4	13	23.53%	9.55%	47.26%	9.6%–47.3
TOTAL	**31,481**	**3,611**	**27,869**	**11.47%**	**11.12%**	**11.83%**	**11.1%–11.**
CI, confidence interval; DIV, diverticulosis.							
Denominator = classified patients (diverticulosis + non-diverticulosis) per decade at index colonoscopy; unclassified patients (n = 4,508) excluded.							
One non-diverticulosis patient with no age recorded excluded from decade-wise analysis; Non-DIV TOTAL row = 27,869 (all other tables use n = 27,870).							

3.6 Logistic Regression:

Age ≥ 50 years was the strongest independent predictor of diverticulosis on both univariate (OR 4.04; 95% CI: 3.72–4.39; p < 0.001) and multivariable analysis (aOR 4.23; 95% CI: 3.86–4.63; p < 0.001). Calendar year remained independently associated with rising prevalence after full adjustment (aOR 1.051 per year; p < 0.001), confirming that the temporal trend is not explained by shifts in patient age or referral pattern. Male sex was significant on univariate analysis (OR 1.11; p = 0.007) but did not retain significance after adjustment (aOR 1.07; p = 0.086). Among indication categories, a prior documented history of diverticulosis showed the highest association with confirmed findings (aOR 40.02; p < 0.001), reflecting the expected relationship between a prior diagnosis as the referral indication and positive colonoscopic findings. Independently protective indications included IBD/colitis (aOR 0.359), diarrhoea (aOR 0.714), constipation (aOR 0.794), and anaemia (aOR 0.851; all p < 0.05). Full results are presented in (Tables 3 and 4).

Table 3
Univariate Logistic Regression Analysis: Factors Associated with Colonic Diverticulosis

Variable	Diverticulosis(n = 3,611)n (%)	Non-Diverticulosis(n = 27,870)n (%)	Unadjusted OR(95% CI)	p-value
Continuous Variables				
Age at procedure (per 1-year increase)	57.6 ± 11.6*	47.4 ± 13.9*	1.059 (1.056–1.062)	< 0.001
Year of procedure (per 1-year increase)	—	—	1.046 (1.033–1.059)	< 0.001
Sex (reference: Female)				
Female	1,328 (36.8%)	10,903 (39.1%)	Reference	
Male	2,283 (63.2%)	16,967 (60.9%)	1.105 (1.028–1.187)	0.007
Age Group (reference: <50 years)				
< 50 years	787 (21.8%)	14,761 (53.0%)	Reference	
≥ 50 years	2,824 (78.2%)	13,108 (47.0%)	4.041 (3.721–4.388)	< 0.001
Indication for Colonoscopy (reference: Screening)				
Screening	1,020 (28.2%)	5,773 (20.7%)	Reference	
Bleeding per rectum	579 (16.0%)	5,305 (19.0%)	0.618 (0.554–0.689)	< 0.001
Anaemia / Iron-deficiency anaemia	416 (11.5%)	3,192 (11.5%)	0.738 (0.653–0.833)	< 0.001
Abdominal pain	389 (10.8%)	4,068 (14.6%)	0.541 (0.478–0.612)	< 0.001
Other	269 (7.4%)	2,268 (8.1%)	0.671 (0.582–0.774)	< 0.001
History of diverticulosis	189 (5.2%)	49 (0.2%)	21.831 (15.834–30.099)	< 0.001
Constipation	185 (5.1%)	1,884 (6.8%)	0.556 (0.471–0.655)	< 0.001
Surveillance	103 (2.9%)	607 (2.2%)	0.960 (0.771–1.196)	0.718
Mass / Malignancy workup	82 (2.3%)	834 (3.0%)	0.556 (0.439–0.705)	< 0.001
Pre-operative / Comorbidity screen	71 (2.0%)	385 (1.4%)	1.044 (0.803–1.356)	0.749
Change in bowel habit	61 (1.7%)	487 (1.7%)	0.709 (0.539–0.933)	0.014
Polyp surveillance	54 (1.5%)	325 (1.2%)	0.940 (0.700–1.264)	0.684
Diarrhoea	52 (1.4%)	791 (2.8%)	0.372 (0.279–0.496)	< 0.001
Perianal symptoms / Piles	51 (1.4%)	496 (1.8%)	0.582 (0.433–0.782)	< 0.001
Weight loss	48 (1.3%)	420 (1.5%)	0.647 (0.476–0.878)	0.005
Inflammatory bowel disease / Colitis	21 (0.6%)	753 (2.7%)	0.158 (0.102–0.245)	< 0.001
Irritable bowel syndrome	12 (0.3%)	138 (0.5%)	0.492 (0.272–0.891)	0.019
Family history of colorectal cancer	9 (0.2%)	94 (0.3%)	0.542 (0.273–1.077)	0.081
OR, odds ratio; CI, confidence interval; SD, standard deviation; IDA, iron-deficiency anemia.				
□ Per 1-year increment in age.				
Reference categories: sex — female; age group — <50 years; indication — Screening.				
All models: binary logistic regression; p < 0.05 considered significant.				

Table 4
Multivariate Logistic Regression Analysis: Independent Predictors of Colonic Diverticulosis

Variable	Adjusted OR (95% CI)	p-value
Demographic and Temporal Predictors		
Age Group (reference: <50 years)		
<50 years	Reference	
≥50 years	4.228 (3.864–4.627)	< 0.001
Sex (reference: Female)		
Female	Reference	
Male	1.068 (0.991–1.152)	0.086
Year of procedure (per 1-year increase)	1.051 (1.038–1.065)	< 0.001
Indication for Colonoscopy (reference: Screening)		
Screening	Reference	
Bleeding per rectum	1.025 (0.915–1.149)	0.670
Anaemia / Iron-deficiency anaemia	0.851 (0.751–0.963)	0.011
Abdominal pain	0.983 (0.864–1.119)	0.800
History of diverticulosis	40.015 (28.533–56.118)	< 0.001
Constipation	0.794 (0.671–0.941)	0.008
Surveillance	1.107 (0.885–1.384)	0.375
Mass / Malignancy workup	0.685 (0.538–0.871)	0.002
Pre-operative / Comorbidity screen	0.964 (0.740–1.256)	0.787
Change in bowel habit	1.069 (0.806–1.418)	0.643
Polyp surveillance	1.055 (0.781–1.427)	0.727
Diarrhoea	0.714 (0.532–0.960)	0.026
Perianal symptoms / Piles	1.024 (0.755–1.390)	0.877
Weight loss	0.858 (0.627–1.174)	0.339
Inflammatory bowel disease / Colitis	0.359 (0.230–0.560)	< 0.001
Irritable bowel syndrome	0.939 (0.512–1.722)	0.838
Family history of colorectal cancer	0.774 (0.384–1.558)	0.473
Other	0.876 (0.756–1.014)	0.076
aOR, adjusted odds ratio; CI, confidence interval; IDA, iron-deficiency anemia.		
Reference categories: age group — <50 years; sex — female; indication — Screening.		
Model: age group, sex, year of procedure, and 18 indication categories simultaneously; n = 31,480 complete cases; Nagelkerke pseudo-R^2 = 0.093.		

3.7 Subgroup and Nationality Analyses:

Patients aged < 50 years had higher rates of diverticulitis (10.4% vs 2.7%; p < 0.001) and right-sided disease (39.1% vs 24.3%; p < 0.001) but lower polyp rates (29.7% vs 50.9%; p < 0.001) than older patients. Male patients had higher diverticulitis (5.0% vs 3.3%; p = 0.022) and polyp rates (49.5% vs 40.9%; p < 0.001) than females. Among located cases, left-sided disease carried the highest diverticulitis rate (7.3%), while multi-segment and pan-colonic disease had the highest bleeding (3.5%) and polyp rates (68.5%).

Nationality data were complete in 3,610 of 3,611 patients (99.97%). Non-Qatari patients had a significantly higher proportion of right-sided diverticulosis (14.5% vs 9.0%; p < 0.001), while Qatari patients showed left-sided and multi-segment predominance. Overall bleeding rates did not differ by nationality (p = 0.747); however, all eight confirmed right-sided bleeders were Non-Qatari. (Supplementary Tables 4 and 5; Fig. 4).

3.8 Sensitivity Analyses:

Screening-only prevalence was 15.02% (95% CI: 14.19%–15.88%), exceeding the all other indication categories. Right-sided disease detection doubled with complete colonoscopy (16.0% vs 8.5%; p < 0.001). Audit of 200 unclassified records yielded an adjusted prevalence of 11.43% (bootstrap 95% CI: 10.87%–

11.98%), establishing 9.83% as a conservative lower bound with the true prevalence lying between 11% and 13% (Supplementary Tables 6, 8, and 9; Supplementary Fig. 2).

4. Discussion

To our knowledge, this is the largest colonoscopy-based diverticulosis study from the GCC and wider Middle East. Over a ten-year period involving 36,735 unique patients, the prevalence of diverticulosis was 9.83%, increasing to 11.43% after audit adjustment and 15.02% among screening colonoscopies. Older age was the strongest independent predictor, with prevalence increasing progressively with advancing age. Our findings are broadly consistent with international colonoscopy-based studies after accounting for differences in study population and referral patterns. Although the overall prevalence in our cohort was lower than that reported in Western screening cohorts such as the CORI study [3], age-specific prevalence in older patients was comparable to North American and European data [3, 13]. Similarly, the higher prevalence reported by Wlodarczyk et al. in Italy likely reflects their older study population [14], whereas the lower prevalence reported from Saudi Arabia may relate to younger and more symptom-based referrals [15]. Rates of diverticulitis in our cohort were also similar to those reported in Swedish and US studies [16, 17], supporting the generalisability of our findings. Diverticular bleeding was identified in 1.7% of patients, and 0.7% required endoscopic intervention. These findings were based on documentation of active bleeding or stigmata of recent bleeding and fall within the 0.5–2.0% range reported in studies [5, 18]. Among cases with documented location, right-sided disease was more common than left-sided disease, consistent with the known higher bleeding tendency of right-sided diverticula [5, 18].

One of the key findings of this study was the presence of two distinct diverticulosis phenotypes within the same national cohort. Non-Qatari patients had a significantly higher proportion of right-sided disease (14.5% vs 9.0%; $p < 0.001$), consistent with the recognised Asian phenotype, whereas Qatari patients were older, more often female, and showed predominantly left-sided and multi-segment disease, consistent with the Western pattern. Similar regional differences have been reported in studies from Japan and Korea [5, 10], as well as in recent reviews highlighting the higher burden of right-sided diverticular bleeding in Asian populations [18]. The coexistence of both phenotypes within a single ethnically diverse population may partly reflect genetic influences, as genome-wide and twin studies have demonstrated a substantial heritable component to diverticular disease [8, 19].

Right-sided diverticulosis was more frequently detected with complete colonoscopy (16.0% vs 8.5%; $p < 0.001$), suggesting that incomplete examination may underestimate right-sided disease, particularly in populations with Asian ancestry. More extensive disease was also associated with higher complication rates, supporting closer clinical vigilance in this subgroup [20, 21].

A significant increase in prevalence was observed over the study period, from 9.0% in 2015 to 11.7% in 2024, with a rising phase beginning in 2019. This trend may reflect changing lifestyles in Qatar, including Westernised diet, sedentary behaviour, and rising obesity rates, all of which have been linked to diverticular disease [22–24]. Similar increases over time have also been reported in other transitioning populations, including studies from Africa and the GCC region [6, 25], and are in line with trends seen in Western populations [26]. The calendar year effect remained significant after adjustment (aOR 1.051 per year; $p < 0.001$), suggesting that the increase is not explained by changes in case mix. The trend persisted during the COVID-19 period despite reduced procedure volume, supporting a true temporal rise in diverticular disease.

Several strengths of this study warrant emphasis. The registry-based design, encompassing all colonoscopies performed over a ten-year period, provided a large and broadly representative cohort while minimising selection bias. The use of endoscopically confirmed diagnoses, rather than reliance on administrative coding alone, enhanced diagnostic accuracy and reliability. Furthermore, a stratified random audit of unclassified records with bootstrap validation was undertaken to address documentation-related uncertainty, allowing prevalence estimates to be presented as a bounded range rather than a single point estimate. The near-complete availability of nationality data enabled meaningful subgroup analyses across ethnic populations, representing a unique aspect of this study.

This study has several limitations. A small number of patients (n = 35, 0.1%) could not be linked because of registry issues. Variability in endoscopist documentation resulted in 12.3% of records being unclassified. We addressed this uncertainty through stratified random audit and bootstrap resampling, generating a prevalence range (10.87%–11.98%) rather than relying on a single estimate. Anatomical location was documented in fewer than half of diverticulosis cases (45.8%), limiting the robustness of location-specific and nationality-based analyses. In addition, nationality was used as a surrogate for ethnicity, an imperfect measure in a highly heterogeneous non-Qatari population that includes individuals from South Asia, Southeast Asia, and the Arab world with potentially different genetic, cultural, and dietary backgrounds. Key lifestyle variables, including BMI, dietary habits, physical activity, and medication exposure, were unavailable in the registry, preventing adjustment for recognised diverticulosis risk factors [22, 23, 27, 28]. Finally, this was a retrospective single-centre study, so causation cannot be established and the findings should be generalised with caution.

Conclusion

This ten-year registry study of 36,735 patients shows a diverticulosis prevalence of 9.83% at index colonoscopy, increasing to 11.43% after audit adjustment and 15.02% in screening colonoscopies. There is a sustained rise since 2019 independent of age or indication. Right-sided predominance in Non-Qatari patients and left-sided predominance in Qatari nationals highlight the importance of complete colonoscopy in ethnically diverse populations, as incomplete examination may miss right-sided disease. Overall, to our knowledge, these findings provide the first colonoscopy-based epidemiological benchmark for diverticular disease in Qatar and support its consideration in national health planning.

Abbreviations

ACC
Ambulatory Care Centre

aOR
Adjusted Odds Ratio
CI
Confidence Interval
GCC
Gulf Cooperation Council
HMC
Hamad Medical Corporation
IBD
Inflammatory Bowel Disease
MOPH
Ministry of Public Health
SCAD
Segmental Colitis Associated with Diverticulosis
STROBE
Strengthening the Reporting of Observational Studies in Epidemiology.

Declarations

Ethics Approval:

This study was conducted in accordance with the principles of the Declaration of Helsinki. Approval was granted by the Hamad Medical Corporation Medical Research Centre (Protocol No. MRC-01-26-318). Individual patient consent was waived in accordance with the exempt review classification under Ministry of Public Health (MOPH) guidelines given the retrospective nature of the study.

Consent to Participate:

Individual patient consent was waived by the HMC Medical Research Centre given the retrospective nature of the study and use of de-identified registry data.

Consent for Publication:

Not applicable.

Competing Interests:

The authors declare that they have no competing interests.

Funding:

No external funding was received for this study.

Author Contribution

M.U.S. conceived the study, performed data collection, conducted statistical analysis, and wrote the main manuscript text. H.H.B. contributed to data collection, data interpretation, and manuscript review. M.A.H. contributed to data analysis, literature search, and manuscript review. All authors reviewed and approved the final manuscript.

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Data Availability

The data supporting the findings of this study are derived from the EndoVault® colonoscopy registry at Hamad Medical Corporation, Doha, Qatar. De-identified data are available upon reasonable request to the corresponding author (M.U.S.) subject to HMC data governance policies and institutional approval.

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Figures

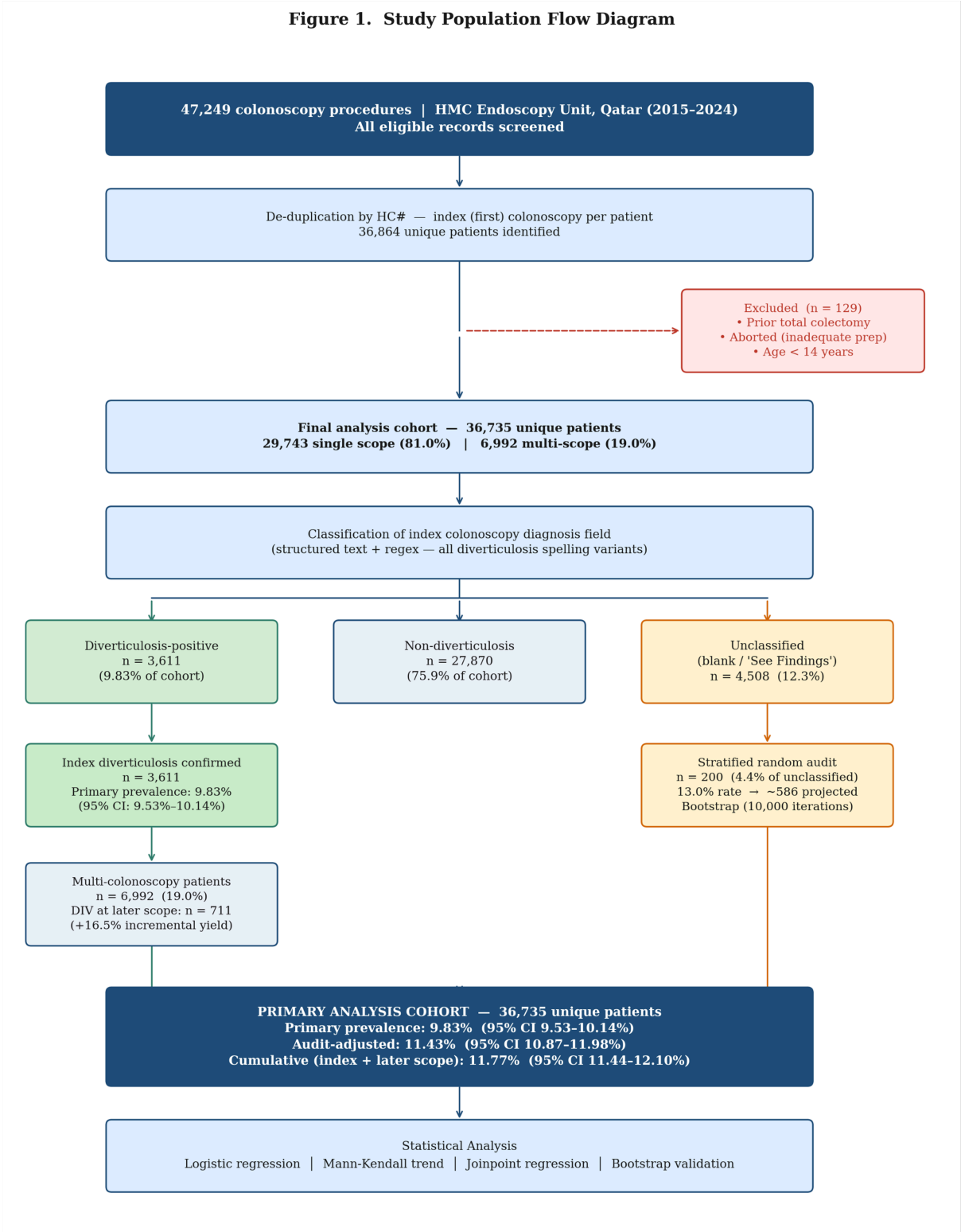


Figure 1

Study population flow diagram, HMC Endoscopy Unit, Qatar (2015–2024). Of 36,735 patients in the final analysis cohort, 31,481 (85.7%) had a classifiable index colonoscopy, 4,508 (12.3%) were unclassified (blank diagnosis: 61.0%; 'See Findings': 39.0%), 711 (1.9%) had diverticulosis identified only at a subsequent colonoscopy (secondary cohort), and 35 (0.1%) could not be classified due to registry linkage failure. Audit of 200 unclassified records yielded a diverticulosis rate of 13.0% (95% CI: 9.0–18.4%) and an audit-adjusted prevalence of 11.43% (bootstrap 95% CI: 10.87–11.98%). CI, confidence interval; HC#, hospital chart number.

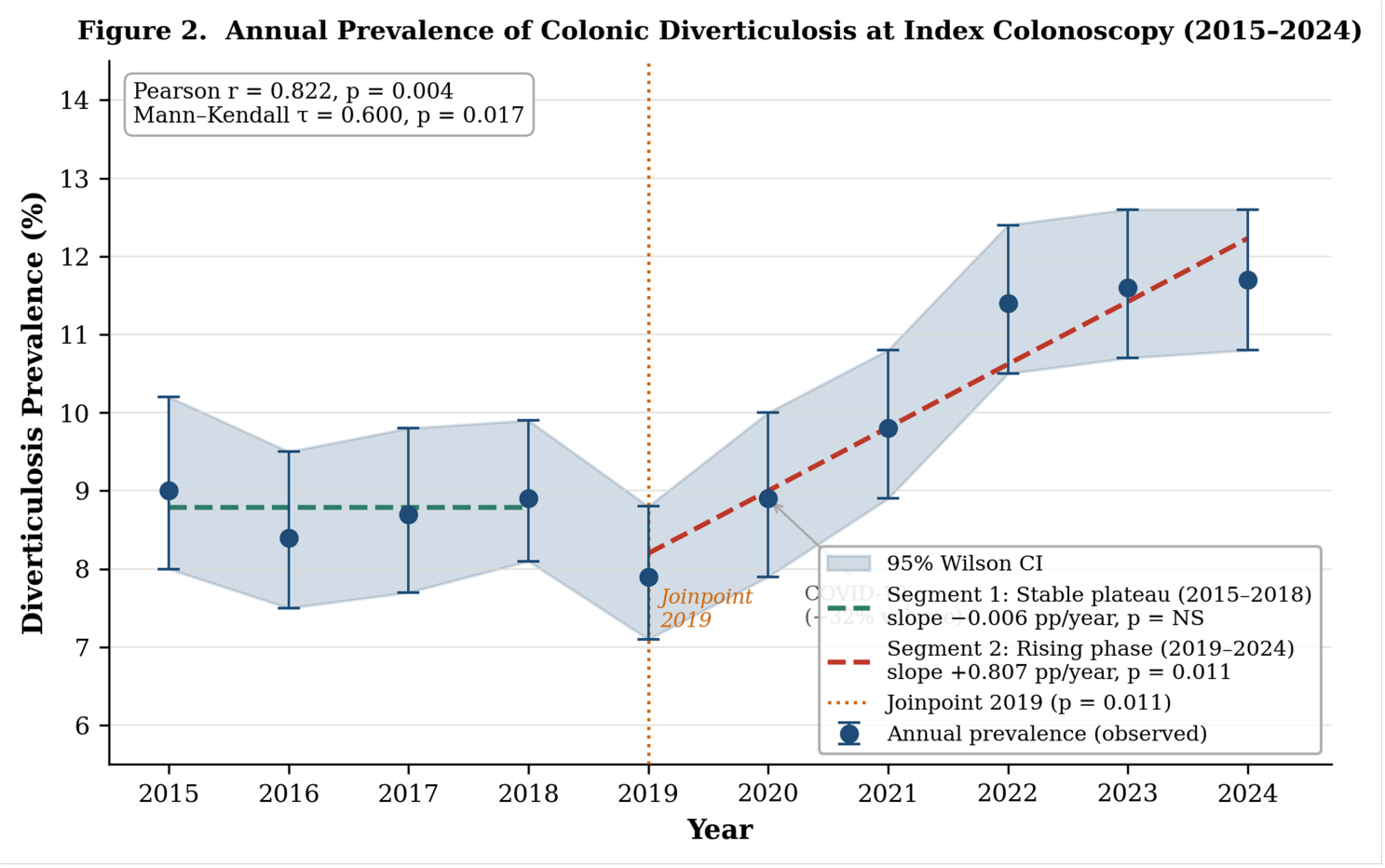


Figure 2

Annual prevalence of colonoscopy-confirmed diverticulosis at index colonoscopy, HMC Endoscopy Unit, Qatar (2015–2024). Error bars represent 95% Wilson score confidence intervals. Joinpoint regression identified a single breakpoint at 2019 (p = 0.011), separating a plateau phase (2015–2018) from a rising phase (2019–2024; +0.807 percentage points/year). Overall Pearson r = 0.822, p = 0.004; Mann–Kendall τ = 0.600, p = 0.017. CI, confidence interval.

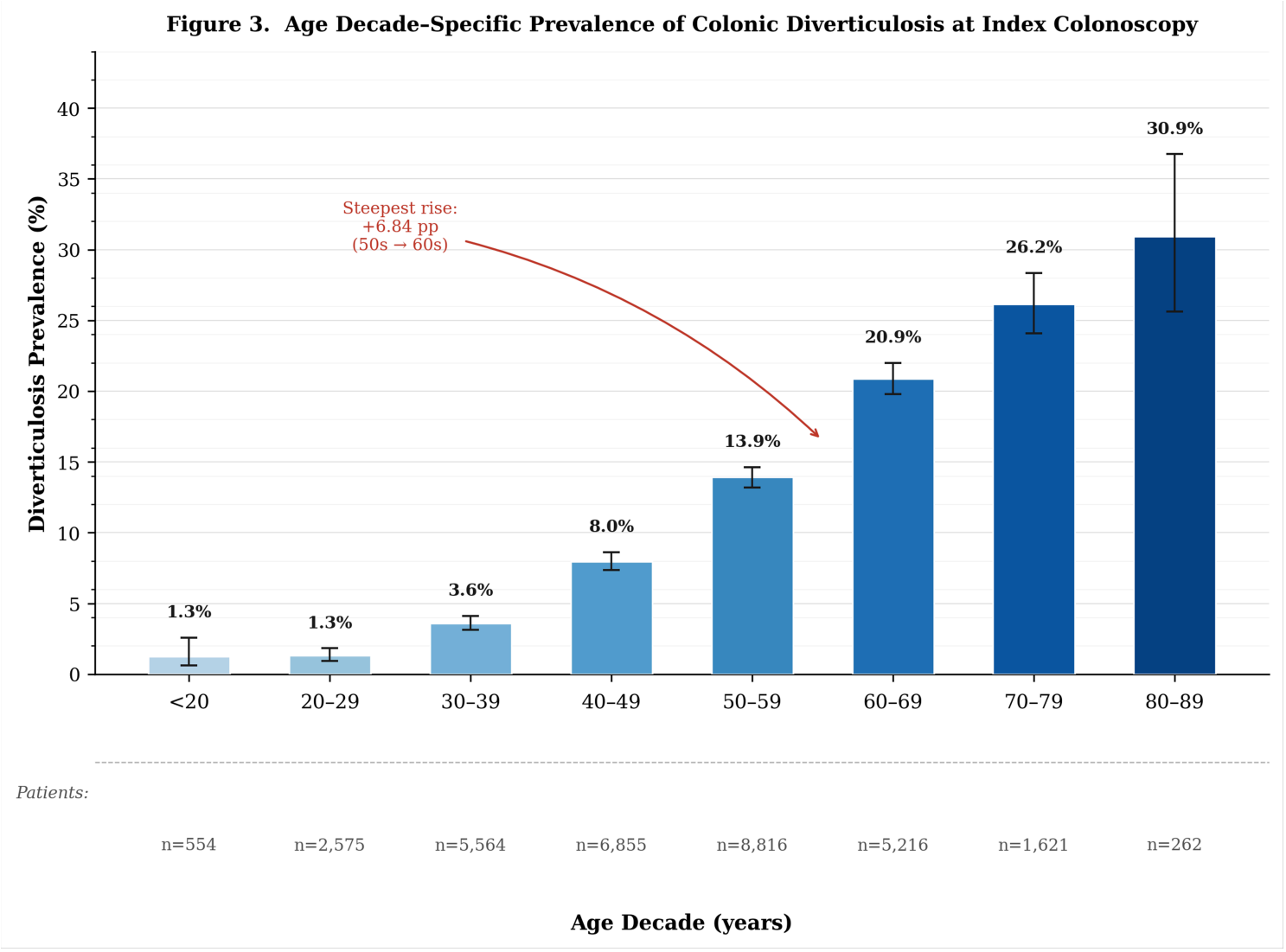


Figure 3

Age decade–specific prevalence of colonoscopy-confirmed diverticulosis at index colonoscopy (classified records only). Prevalence increased progressively from 1.3% in the third decade (20–29 years) to 30.9% in the ninth decade (80–89 years), with the steepest rise between the sixth and seventh decades (+6.84 percentage points). Patient numbers per decade are shown below the x-axis. Patients aged ≥90 years (n = 17) are omitted due to small sample size. Error bars represent 95% Wilson score confidence intervals. CI, confidence interval; pp, percentage points.

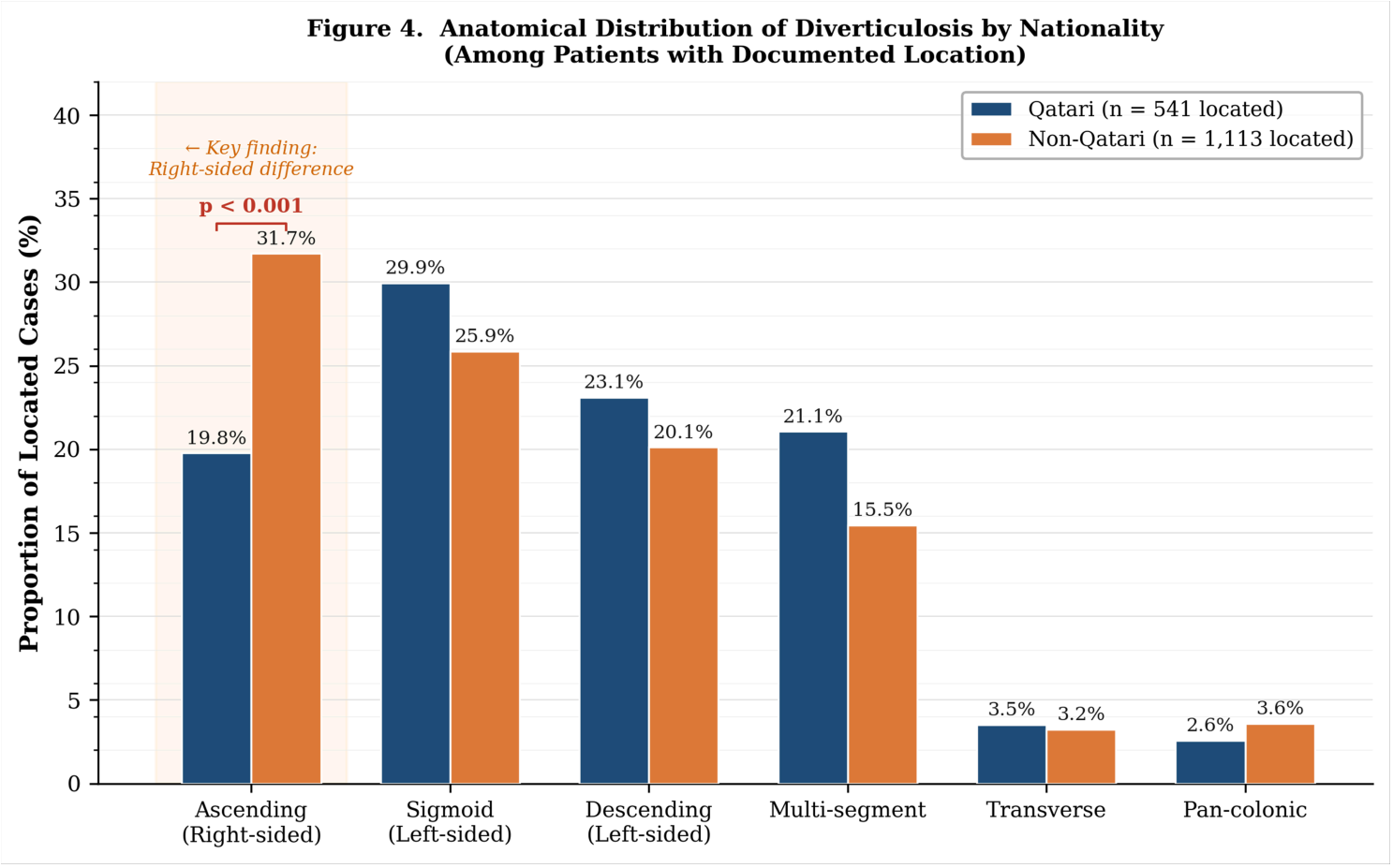


Figure 4

Anatomical distribution of diverticulosis by nationality among index-positive patients with documented location (Qatari n = 541; Non-Qatari n = 1,113; patients with unspecified location excluded). Non-Qatari patients had a significantly higher proportion of right-sided diverticulosis than Qatari patients (31.7% vs 19.8%; p < 0.001 by Pearson chi-squared test). Left-sided = sigmoid and/or descending colon; multi-segment = two or more anatomical segments involved.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryTables.docx
- STROBEChecklistDiverticulosis.docx
- SupplFigure1AnalysisWorkflow.tiff
- SupplFigure2PrevalenceEstimates.tiff