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Temporal evolution of hospitalizations for Crohn's disease and anorectal complications in southern and southeastern Brazil: a population-based study from 2012 to 2024

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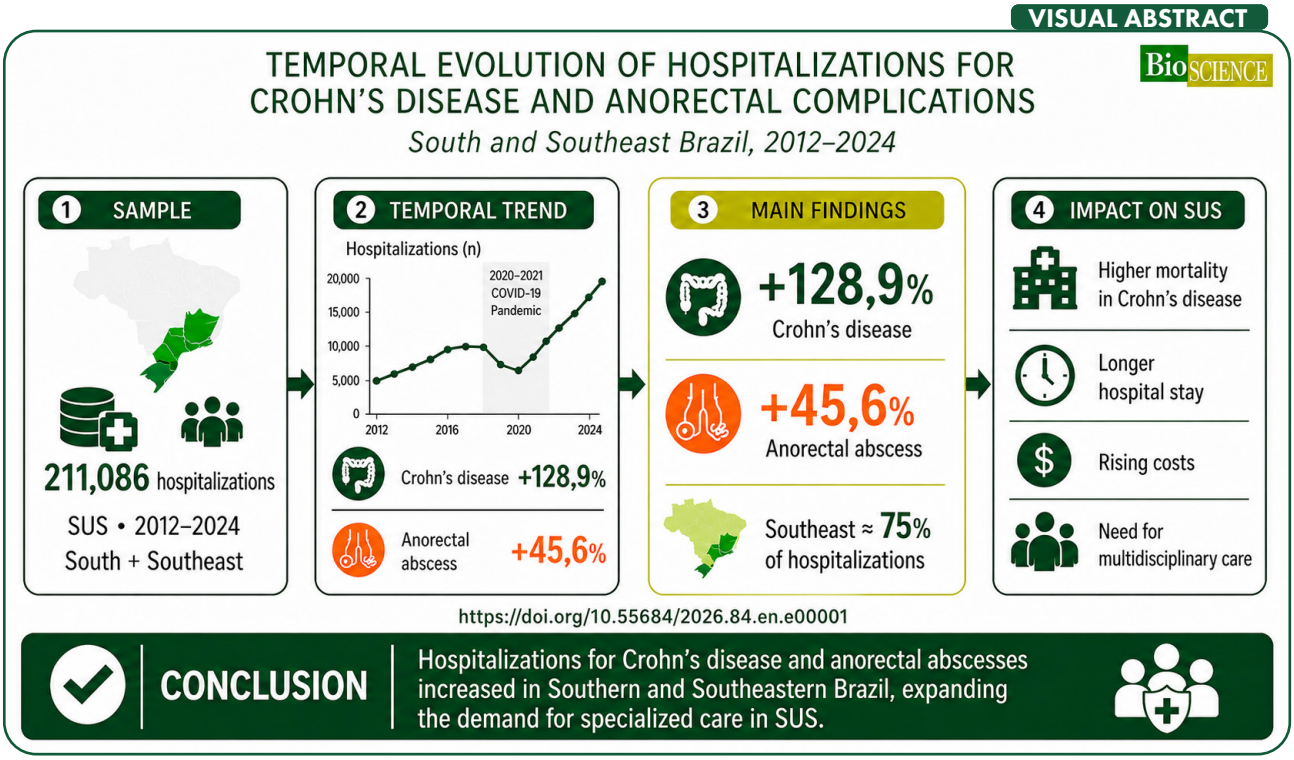
VISUAL ABSTRACT



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Central Message
Hospitalizations for Crohn's disease and its complications in the anal and perianal regions have been increasing significantly in the South and Southeast of Brazil. In just over a decade, hospitalizations for Crohn's disease have doubled and hospitalizations for perianal abscesses have increased by almost 50%. This growth generates a greater need for specialized care and greater public spending on health, highlighting the importance of early diagnosis and multidisciplinary follow-up of patients.

Perspective
The findings help clinical practice by showing that Crohn's disease is no longer a rare condition in Brazil and requires the structuring of specialized care networks. The increase in associated perianal complications reinforces the need for surgeons and gastroenterologists to act in an integrated manner, with early identification of critically ill patients and standardized management protocols. The results also signal to public managers the urgency of planning the allocation of resources for this growing demand, especially in reference centers in the most populous regions of the country.

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ABSTRACT

Introduction: Among the most debilitating complications of Chron's disease are perianal manifestations, including anorectal abscesses and fistulas throughout the course and are associated with significant morbidity, impaired quality of life, and surgical interventions.

Objective: To describe the epidemiology and temporal trends of hospitalizations for anorectal abscesses, anal fistulas and fissures, and Crohn's disease in the Unified Health System of the South and Southeast regions of Brazil between 2012 and 2024.

Method: Retrospective ecological time series study using administrative data on public hospital admissions in the South and Southeast regions between 2012 and 2024. Hospitalizations were identified by the codes of the International Classification of Diseases, tenth revision, corresponding to Crohn's disease, anorectal abscesses, and anal fistulas. The volume of hospitalizations, hospital mortality, length of stay, and costs were analyzed. Temporal trends were evaluated by linear regression and mean annual percentage change.

Results: A total of 211,086 hospitalizations were analyzed. Those due to Crohn's disease increased by 128.9%, while anorectal abscesses grew by 45.6%. In-hospital mortality was higher in Crohn's disease, followed by abscesses and fistulas, with a longer average length of hospital stay, and average cost. Abscesses and fistulas showed a strong male predominance. The Southeast region concentrated approximately 75% of hospitalizations.

Conclusion: Hospitalizations for Crohn's disease and anorectal abscesses have increased substantially in the more developed regions of Brazil, representing an increasing burden on the public health system. The findings reinforce the need for better allocation of resources, early diagnosis, and multidisciplinary management strategies for complex perianal disease.

KEYWORDS: Inflammatory bowel diseases. Perianal disease. Hospitalization. Time series studies. Ecological studies. Unified Health System.

INTRODUCTION

Crohn's disease (CD) is a chronic and relapsing inflammatory bowel disease (IBD) characterized by transmural inflammation that can affect any segment of the gastrointestinal tract. Among its most debilitating complications are perianal manifestations, including anorectal abscesses and fistulas, which occur in approximately 20–40% of patients over the course of the disease and are associated with significant morbidity, impaired quality of life, and recurrent surgical interventions.[1-3]

Anorectal abscesses (ICD-10: K61) represent acute suppurative infections of the perianal and anorectal spaces, while anal fistulas and fissures (ICD-10: K60) comprise chronic pathological communications between the anal canal and the perianal skin or adjacent structures. Although these conditions may occur in isolation, their coexistence with CD reflects the underlying pathophysiology of transmural intestinal inflammation and constitutes a hallmark of complex perianal Crohn's disease.[4,5]

In Brazil, the Unified Health System (SUS) provides universal public health coverage and is responsible for approximately 75% of all health care in the country. The SUS Hospital Information System (SIH/SUS) is one of the largest administrative databases of hospital admissions in the world, registering millions of admissions annually and providing a valuable resource for population-based epidemiological analyses.[6,7]

The South and Southeast regions of Brazil concentrate approximately 56% of the national population and have the highest density of tertiary health services and surgical specialists. This concentration of infrastructure, together with possible differences in the incidence of IBD associated with the degree of urbanization and industrialization, makes these regions particularly relevant for the study of the burden of hospitalizations due to anorectal complications in the context of CD.[8-10]

Despite the growing global recognition of the epidemiological burden of IBD, particularly in newly industrialized countries, population data on hospitalization patterns for anorectal complications associated with CD remain limited, especially in Latin American contexts.[11,12] Understanding the temporal trends, demographic distributions, and geographic heterogeneity of these hospitalizations is essential to support public health policies, optimize resource allocation, and identify gaps in the management of complex perianal disease.

The objective of this study was to describe the epidemiology and temporal trends of hospitalizations for anorectal abscesses, anal fistulas and fissures, and CD in the SUS in the South and Southeast regions of Brazil between 2012 and 2024, evaluating the volume of hospitalizations, hospital mortality, length of stay, costs, and demographic and geographic patterns.

METHOD

This study was conducted with secondary, public and unidentified data, and therefore exempted from consideration by the Research Ethics Committee in accordance with Resolution No. 510/2016 of the National Health Council (Brazil).

This is a retrospective ecological time series research based on administrative records of hospital admissions from the SUS Hospital Information System (SIH/SUS, DATASUS). The SIH/SUS records all hospitalizations funded by the public sector in Brazil and contains standardized information on demographics, diagnoses, procedures, outcomes, costs, and length of stay. The data were extracted from the reduced Hospital Admission Authorization (RD-AIH) files for the period from January 2012 to

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December 2024, restricted to the federative units of the South (Paraná, Santa Catarina, and Rio Grande do Sul) and Southeast (São Paulo, Minas Gerais, Rio de Janeiro, and Espírito Santo) regions.

Hospitalizations were identified and classified based on the main diagnostic code (DIAG_PRINC) according to the International Classification of Diseases, 10th Revision (ICD-10). Three diagnostic groups were defined: Crohn's disease (K50); anorectal abscess (K61); and fistula and anal fissure (K60). These groups were analyzed independently, since the administrative data do not allow individual linkage between concurrent diagnoses or sequential diagnoses between admissions.

The following variables were analyzed: year of admission (2012–2024); federative unit (seven states in the South and Southeast regions); sex (male, female); age group (< 20, 20–39, 40–59, 60–79, ≥ 80 years); number of hospitalizations; hospital deaths; hospital mortality (proportion of admissions resulting in death); average and median length of stay (in days); total cost of hospitalization; and average cost per hospitalization (in reais, R$).

Statistical analysis

Descriptive statistics were calculated for all variables, including totals, proportions, means, and medians. Temporal trends in the number of hospitalizations, mortality, length of stay, and costs were evaluated by linear regression of ordinary least squares (OOM) with the year as an independent variable. The mean annual percentage change (AAPC) was estimated by adjusting linear regression to the natural logarithm of the annual hospitalization counts, with the AAPC calculated as $[\exp(\beta)-1]\times100$, where β is the regression coefficient. 95% confidence intervals (95% CI) were derived from the standard error of the coefficient. Spearman's correlation coefficients (ρ) were calculated to evaluate monotonic temporal trends. The pre-COVID (2012–2019) and post-COVID (2020–2024) periods were compared by independent sample t-tests. Subgroup analyses were stratified by sex, age group, and state. All analyses were performed in Python 3.[12] with NumPy, SciPy and pandas. A two-tailed $p < 0.05$ was considered statistically significant.

RESULTS

During the 13-year period of the study (2012–2024), a total of 211,086 hospitalizations were recorded in the three diagnostic groups in the South and Southeast regions of Brazil. Fistulas and anal fissures (K60) accounted for the highest proportion of admissions (112,088; 53.1%), followed by anorectal abscesses (K61; 79,018; 37.4%) and CD (K50; 19,980; 9.5%). The total combined cost of these hospitalizations exceeded R$ 98.[4] million over the period included.

Hospital mortality was higher for CD (1.76%), approximately twice that observed for anorectal abscesses (0.86%) and about 20 times higher than for anal fistulas/fissures (0.09%). The mean length of stay was longest for CD (7.0 days), followed by anorectal abscesses (3.9 days) and fistulas/fissures (1.8 days). The mean cost per hospitalization was higher for CD (R$ 1,098.39), compared to R$ 450.56 for abscesses and R$ 364.28 for fistulas/fissures (Table 1).

TABLE 1 — General descriptive statistics of hospitalizations by diagnostic group, South and Southeast Brazil (2012–2024)

Variable	Crohn's disease (K50)	Anorectal Abscess (K61)	Fistula/Anal Fissure (K60)	Total
Total hospitalizations, n	19.980	79.018	112.088	211.086
Proportion of total, %	9,5	37,4	53,1	100,0
Hospital deaths, n	351	678	96	1.125
Hospital mortality, %	1,76	0,86	0,09	0,53
Average MPR, days	7,0	3,9	1,8	—
Average cost/intern., R$	1.098,39	450,56	364,28	—
Total cost, million R$	21,95	35,60	40,83	98,38
Weighted average age, years	40,4	44,7	43,4	—
M:F Ratio	0,93	2,26	1,77	—
Change 2012–2024, %	128,9	45,6	35,6	—
AAPC, % (95% CI)	6,53 (5,03–8,06)	3,02 (2,23–3,82)	1,00 (-2,19–4,30)	—

MPR, average length of stay; AAPC, mean annual percentage change; CI, confidence interval; M:F, male:female.

Temporal trends in hospitalizations

Hospitalizations due to CD showed a more pronounced temporal increase, from 1,036 admissions in 2012 to 2,371 in 2024, corresponding to an increase of 128.9% and AAPC of 6.53% (95% CI: 5.03–8.06%; $p < 0.001$; Spearman $\rho = 0.923$; $p < 0.001$). Hospitalizations for anorectal abscess also showed a significant upward trend, increasing from 5,113 in 2012 to 7,447 in 2024 (increase of 45.6%; AAPC: 3.02%; 95% CI: 2.23–3.82%; $p < 0.001$). In contrast, hospitalizations for anal fistulas/fissures did not show a statistically significant linear trend (AAPC: 1.00%; 95% CI: -2.19–4.30%; $p = 0.555$), although they remained the numerically largest group throughout the period (Figure 1).

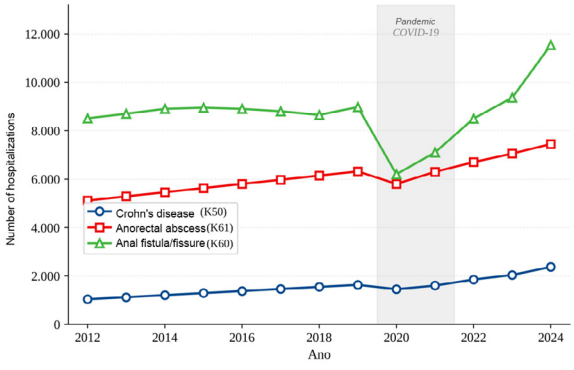

FIGURE 1 — Annual trend of hospitalizations by diagnostic group in the South and Southeast regions of Brazil (2012–2024); horizontal axis: year of admission; vertical axis: number of hospitalizations. The gray band indicates the period of the COVID-19 pandemic

Notable reduction in hospitalizations was observed during 2020–2021, coinciding with the COVID-19 pandemic, particularly for anal fistulas/fissures. The post-pandemic recovery was rapid for all groups, with

2023–2024 values surpassing pre-pandemic levels. Comparison of pre-COVID (2012–2019) and post-COVID (2020–2024) annual means showed significant increases for CD (1,334 vs. 1,862; p = 0.016) and anorectal abscesses (5,715 vs. 6,660; p = 0.025), but not for fistulas/fissures (p = 0.899, Table 2).

TABLE 2 — Comparison of the annual means of hospitalizations in the pre-COVID (2012–2019) and post-COVID (2020–2024) periods, South and Southeast of Brazil

Diagnostic group	Pre-COVID Average (2012–2019)	Post-COVID average (2020–2024)	p-value
Crohn's disease	1,334	1,862	0,016
Anorectal abscess	5,715	6,660	0,025
Fistula/anal fissure	8,673	8,541	0,899

Independent sample t-test comparing annual means of hospitalizations

Hospital mortality trends

Hospital mortality in CD fluctuated between 1.1% and 3.3% over the period, with no statistically significant temporal trend. Mortality of anorectal abscesses ranged from 0.5% to 2.0%, and that of fistulas/fissures remained consistently below 0.4%, The age gradient was striking: in-hospital mortality increased progressively with advancing age in all groups, reaching 12.84% in patients with CD ≥ 80 years of age (Table 3).

Length of stay and costs

The mean length of stay (MPR) for CD showed a decreasing trend over the period (coefficient: -0.148 days/year; R^2 = 0.702; p < 0.001), MPT of anorectal abscesses showed a modest and non-significant increase, and that of fistulas/fissures remained stable at approximately 1.8 days, The mean cost per hospitalization increased significantly for all three groups (all p < 0.001), The average cost of DC went from R$ 846 in 2012 to R$ 1.263 in 2024 (coefficient: +R$ 19.22/year; R^2 = 0.620), The total annual cost increased substantially in all groups, reflecting both the increase in the volume of hospitalizations and the increase in unit costs,

Demographic and geographic distribution

Hospitalizations for CD showed a slight predominance of females (male: 48.2%; female: 51.8%; M:F ratio: 0.93). consistent with the known epidemiology of CD in population studies. In contrast. anorectal abscesses and fistulas/fissures showed marked male predominance. with M:F ratios of 2.26 and 1.77. respectively. Regarding age distribution. the highest proportion of hospitalizations due to CD occurred in the 20–39 age group (36.9%). followed by 40–59 years (31.2%) and < 20 years (17.8%). For anorectal abscesses and fistulas/fissures. the peak age was in the 40–59 age group (40.6% and 48.1%. respectively). Hospital mortality increased sharply with advancing age in all groups (Table 3).

The Southeast region concentrated the highest burden of hospitalizations in all diagnostic groups. accounting for approximately 75% of the total in each group (Southeast: CD 75.7%. abscess 75.9%. fistula 74.2%; South: CD 24.3%. abscess 24.1%. fistula 25.8%). The state of São Paulo alone was responsible for the largest share of hospitalizations in the three groups. followed by Minas Gerais. In the South region. Paraná led for anorectal abscesses and fistulas/fissures. while Santa Catarina had the highest volume of hospitalizations for CD among the southern states.

TABLE 3 — Distribution of hospitalizations by age group and diagnosis group. with in-hospital mortality. South and Southeast Brazil (2012–2024)

Age group	DC n (%)	Abscess n (%)	Fistula n (%)	DC mort. %	Abs. mort. %
<20	3.560 (17.8)	5.734 (7.3)	4.149 (3.7)	0.48	0.19
20–39	7.371 (36.9)	27.971 (35.4)	38.768 (34.6)	0.91	0.23
40–59	6.235 (31.2)	32.103 (40.6)	53.932 (48.1)	1.92	0.69
60–79	2.596 (13.0)	12.218 (15.5)	14.743 (13.2)	4.58	2.53
≥80	218 (1.1)	992 (1.3)	496 (0.4)	12.84	7.16

CO=Crohn's disease; Abs = anorectal abscess; death=hospital mortality

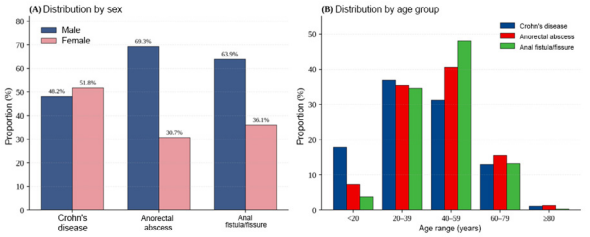

FIGURE 2 — Demographic distribution of hospitalizations by sex (panel A) and by age group (panel B), South and Southeast of Brazil (2012–2024), Horizontal axis panel A: diagnostic group; horizontal axis panel B: age group; vertical axis: proportion of hospitalizations

DISCUSSION

This ecological study analyzed 211,086 hospitalizations related to CD, anorectal abscesses, and anal fistulas/fissures in the South and Southeast regions of Brazil over 13 years, providing a comprehensive picture of the burden of hospitalizations imposed by these conditions in the most developed regions with the largest health infrastructure in the country. The findings reveal significant temporal increases in hospitalizations for CD and anorectal abscesses, associated substantial costs, and notable demographic and geographic disparities.

The most striking finding was the 128,9% increase in hospitalizations for CD between 2012 and 2024, with AAPC of 6,53%. This growth is consistent with global epidemiological trends that demonstrate increasing incidence of IBD in newly industrialized countries.[8-10] The accelerated upward trend may reflect a real increase in the incidence of the disease, improvement in diagnostic capacity and awareness, greater access to specialized care within the SUS, or a combination of these factors. Similar patterns have been reported in other Latin American countries and in population records from Asia and the Middle East.[11,12]

Anorectal abscesses also showed a significant upward trend (AAPC: 3,02%), with an increase of 45,6% in the period. Considering that they are a frequent complication of CD, the parallel increase in hospitalizations for K50 and K61 suggests a possible

shared epidemiological factor. However, it is essential to emphasize that the SIH/SUS does not allow individual linkage between these diagnostic codes, and a substantial proportion of hospitalizations for K61 probably represent anorectal abscesses unrelated to CD in the general population.[13,14] Therefore, these findings should be interpreted as complementary indicators of population burden, and not as direct evidence of a causal relationship at the individual level,

The absence of a significant trend towards hospitalizations for anal fistulas/fissures (AAPC: 1,00%; p = 0,555) is remarkable and may reflect the more stable epidemiology of these conditions in the general population, as well as a possible transition to outpatient management of less complex fistulas and fissures. The sharp drop during 2020, which was more pronounced for fistulas/clefts than for the other groups, reinforces this interpretation, as elective surgical procedures were disproportionately affected by pandemic-related restrictions.[15]

Hospital mortality was higher for CD (1,76%), consistent with the greater systemic severity and the complication profile of the disease when compared to isolated anorectal conditions. The steep gradient of mortality with advancing age, reaching 12,84% in patients with CD ≥ 80 years, highlights the vulnerability of elderly patients and the need for age-appropriate management strategies.[16]

The patterns of distribution by sex observed are consistent with the literature, CD showed an almost equal distribution between the sexes (M:F = 0,93), with a slight predominance of females, reflecting typical findings of population studies of CD.[17] The strong male predominance of anorectal abscesses (M:F = 2,26) and fistulas/fissures (M:F = 1.77) is well established and probably reflects anatomical, hormonal, and lifestyle-related risk factors.[18]

The geographic concentration in the Southeast, with São Paulo accounting alone for about 40% of all hospitalizations, reflects both the demographic weight of this region and the higher density of hospital services and referral centers. The South region, although representing approximately 25% of hospitalizations, has a proportionally relevant volume considering its population, which may indicate better diagnostic and therapeutic access in this region.[19,20]

The economic analysis revealed a progressively increasing financial burden, with average hospitalization costs increasing significantly for all three groups. CD, despite representing only 9.5% of total hospitalizations, generated disproportionately high costs per admission (R$ 1,098.39), reflecting the higher MPR and clinical complexity associated with hospitalizations for CD. The total combined cost exceeded R$ 97 million in 13 years, representing a substantial burden on the SUS budget.[21]

Limitations

This study has important limitations. First, the SIH/SUS is an administrative system developed for billing and reimbursement, not for epidemiological research. The accuracy of diagnostic coding depends on the practices of each facility, and coding errors, underreporting, and overcoding may occur. Second, the exclusive use of the primary diagnosis (DIAG_PRINC) does not capture comorbidities or secondary diagnoses; thus, hospitalization coded as K61 occurring in a patient with CD would not be identifiable as such. Third, the absence of individual identifiers makes longitudinal follow-up impossible; readmissions of the same individual are counted as separate hospitalizations. Fourth, the data reflect only hospitalizations financed by the SUS, not including the private sector. Fifth, ecological design limits causal inference. Sixth, the costs are expressed in nominal reais ($) without inflationary adjustment. Finally, the restriction to the South and Southeast regions, although it allows for a more homogeneous analysis from the point of view of health infrastructure, limits the generalization of the results to the rest of the country.

CONCLUSION

Hospitalizations for CD and anorectal abscesses increased substantially in the South and Southeast regions of Brazil between 2012 and 2024, with CD demonstrating the most pronounced growth rate. In-hospital mortality remains considerably higher than that of isolated anorectal conditions, with a steep gradient dependent on age. The economic burden is substantial and growing. Marked demographic and geographic disparities highlight inequalities in the burden of disease and access to health care even within the most developed regions of the country. These findings reinforce the need for better allocation of resources, improvement of screening and diagnostic capacity, multidisciplinary management of perianal disease in the SUS, and future epidemiological studies with linkage at the individual level to better characterize the relationship between CD and its anorectal complications.

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