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Is cough a predisposing factor for hemorrhoids? A prospective, analytical cross-sectional study

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Abstract

Hemorrhoidal disease has been associated with factors that increase intra-abdominal pressure, yet the clinical relationship between cough and hemorrhoid severity remains poorly defined. This prospective analytical cross-sectional study evaluated whether cough-related variables and smoking history were associated with hemorrhoid grade in 84 adults with internal hemorrhoids. Disease severity was categorized as low-grade (Goligher I-II, n = 42) or high-grade (Goligher III-IV, n = 42). Cough presence, cough duration, cough severity assessed by visual analog scale, and cough-related quality of life measured by the Leicester Cough Questionnaire (LCQ) were analyzed together with smoking exposure. The mean age of the study population was 45.8 ± 11.5 years, and the mean body mass index was 26.8 ± 4.1 kg/m². Cough was present in 22.6% of patients, whereas cough lasting ≥ 4 weeks was uncommon (4.8%). No significant differences were observed between the low-grade and high-grade groups in cough prevalence (23.8% vs 21.4%, p = 0.794), cough lasting ≥ 4 weeks (4.8% vs 4.8%, p > 0.999), cough severity, or Leicester Cough Questionnaire scores. Ever smoking was more frequent in the high-grade group, but the difference was not statistically significant (72.5% vs 58.5%, p = 0.186). In exploratory multivariable logistic regression, neither cough presence nor cough severity was associated with high-grade disease after adjustment for covariates. In this cohort, cough-related variables and smoking history were not significantly associated with hemorrhoid severity. These findings suggest that cough may not be a major determinant of hemorrhoidal severity, particularly in cohorts in which longer-duration cough is uncommon.

Keywords: Hemorrhoids, cough, smoking, quality of life, cross-sectional studies

Introduction

Hemorrhoidal disease is a common anorectal disorder characterized by symptomatic enlargement and distal displacement of the normal anal cushions [1]. Internal hemorrhoids arise above the dentate line and are typically classified according to the degree of prolapse, whereas external hemorrhoids develop below the dentate line and are covered by anoderm [1]. Despite its high prevalence and substantial impact on quality of life, the exact pathophysiology of hemorrhoidal disease remains incompletely understood, and the evidence supporting several commonly cited risk factors is variable [1,2].

One of the most widely accepted pathophysiological concepts is the sliding anal cushion theory, which proposes that fragmentation or weakening of the supporting connective tissues contributes to distal displacement of the anal cushions [1]. Repeated or sustained increases in intra-abdominal and anorectal pressure may play a role in this process. Accordingly, factors such as straining during defecation, constipation, prolonged toilet sitting, pregnancy, obesity, and age-related tissue weakening have all been implicated in the development or progression of hemorrhoids [1,2]. Nevertheless, the relative contribution of these factors remains uncertain, and some proposed associations rely more on observational evidence than on direct physiological demonstration.

Cough is a coordinated reflex and voluntary motor action involving the diaphragm as well as thoracic, abdominal, and pelvic musculature, and it may generate substantial transient increases in intra-abdominal pressure [3–7]. In healthy adults, resting intra-abdominal pressure is relatively low, whereas coughing can produce marked pressure elevations [3,5,6].

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Electromyographic and physiological studies have further shown close interaction between the abdominal wall and pelvic floor musculature during such pressure-generating maneuvers [4,7]. These observations provide a biologically plausible basis for the hypothesis that prolonged or frequent cough may contribute to the development or worsening of hemorrhoidal disease.

Despite this physiological rationale, the relationship between cough and hemorrhoidal severity has not been well characterized clinically. A retrospective cohort study from Taiwan reported a higher risk of hemorrhoids among patients with chronic obstructive pulmonary disease, suggesting a possible link between chronic respiratory disease and hemorrhoidal pathology [8]. In addition, smoking, a major contributor to chronic cough, may also influence hemorrhoidal disease through vascular and connective tissue-related mechanisms [9]. However, prospective analytical studies directly examining the association between specific cough characteristics and hemorrhoid grade remain scarce. This gap is clinically relevant because identifying prolonged cough as a potentially modifiable contributing factor may improve risk assessment and support targeted preventive strategies in susceptible individuals.

Therefore, the primary aim of this study was to evaluate the association between hemorrhoid severity and the presence, duration, and severity of cough. We hypothesized that prolonged cough, through repeated increases in intra-abdominal pressure, would be associated with higher hemorrhoid grades. As a secondary aim, we investigated the relationship between hemorrhoid grade and smoking history.

Material and Methods

Study Design and Setting

This prospective analytical cross-sectional study was conducted at the General Surgery Outpatient Clinic of Muğla Training and Research Hospital between March 2025 and November 2025. The study protocol was approved by the Muğla Sıtkı Koçman University Medical Sciences Ethics Committee (approval number: 240242-35, date: 16.02.2025). Written informed consent was obtained from all participants prior to enrollment.

Participants: Inclusion and Exclusion Criteria

Adult patients aged 18 years or older who presented with anorectal symptoms, including rectal bleeding, pain, itching, or prolapse, and were diagnosed with hemorrhoidal disease on physical and rectal examination were evaluated for eligibility. Hemorrhoidal disease was graded according to the Goligher classification (grades I-IV) based on the degree of mucosal prolapse.

Inclusion criteria were age ≥ 18 years, ability to speak and understand Turkish, sufficient cognitive ability to answer the study questions, and provision of written informed consent. Exclusion criteria were refusal to participate, inability to understand the study questions, presence of proctologic disease other than hemorrhoidal disease or pelvic floor disease, previous hemorrhoidal surgery, hemorrhoidal disease secondary to portal hypertension, pregnancy or postpartum hemorrhoidal disease, and conditions that could independently increase intra-abdominal pressure, including benign prostatic hyperplasia or neurogenic bladder. In addition, patients with external hemorrhoids and records with non-interpretable Goligher grading were excluded from the final analysis.

Consecutive eligible patients presenting during the study period were included. A priori sample size calculation was performed using G*Power 3 software. Assuming a moderate effect size (Cohen's d = 0.5), 95% power, and an alpha level of 0.05, the minimum required sample size was calculated as 134 participants. However, due to the single-center design and predefined study period, all consecutive eligible patients were enrolled, and 84 patients with internal hemorrhoidal disease and classifiable Goligher grade were available for final analysis.

Data Collection and Clinical Assessments

Baseline demographic and clinical data were recorded, including age, sex, smoking exposure, height, weight, body mass index, hemorrhoid grade, and other relevant clinical characteristics. Smoking exposure was recorded as ever smoking and active smoking status, and pack-year history was documented when available.

A structured respiratory history was obtained focusing on the presence of cough and its duration. According to the study questionnaire, cough duration was categorized as < 4 weeks or ≥ 4 weeks. According to current adult cough guidelines [10,11], chronic cough is generally defined as lasting longer than 8 weeks; therefore, the ≥ 4-week category in this study was interpreted as prolonged cough rather than guideline-defined chronic cough. Cough severity was assessed using a cough visual analog scale (VAS), ranging from 0 (no cough) to 10 (worst cough imaginable).

The impact of cough on quality of life was evaluated using the Leicester Cough Questionnaire (LCQ) [12], a 19-item instrument covering physical, psychological, and social domains over the preceding two weeks, with each item scored from 1 to 7, where higher scores indicate better health status. LCQ assessment was performed in patients with available questionnaire data. Accompanying comorbidities relevant to cough were also recorded, and patients with active cough requiring further etiological evaluation were advised to attend the Pulmonology outpatient clinic for diagnosis and management in accordance with the study protocol.

Outcome Measurements

The primary outcome was the association between hemorrhoid grade (Goligher stage I-IV, categorized as low-grade [I-II] vs high-grade [III-IV]) and cough-related variables, including presence of cough, cough duration category, cough VAS score, and LCQ score where available. Secondary outcomes included the associations between hemorrhoid grade and smoking exposure.

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Statistical Analysis

All statistical analyses were performed using SPSS version 22.0 (IBM Corp., Armonk, NY, USA). The distribution of continuous variables was assessed using visual methods and normality tests (Kolmogorov-Smirnov and Shapiro-Wilk). Normally distributed variables were presented as mean ± standard deviation, whereas non-normally distributed variables were summarized as median and interquartile range (IQR). Categorical variables were presented as frequencies and percentages.

Comparisons between low-grade hemorrhoids (Goligher I-II) and high-grade hemorrhoids (Goligher III-IV) were performed using the chi-square test or Fisher's exact test for categorical variables, and the independent samples t-test or Mann-Whitney U test for continuous variables, as appropriate. Correlations between ordinal hemorrhoid grade and continuous cough-related variables were assessed using Spearman's correlation coefficient. Exploratory multivariable logistic regression analyses were performed to assess whether cough-related variables were associated with high-grade hemorrhoidal disease after adjustment for clinically relevant covariates. Odds ratios and 95% confidence intervals were calculated. A two-sided p value of < 0.05 was considered statistically significant.

Results

A total of 84 patients with internal hemorrhoidal disease and classifiable Goligher grade were included in the final analysis after exclusion of external hemorrhoids and records with non-interpretable grading. The mean age of the overall study population was 45.8 ± 11.5 years, and the mean body mass index was 26.8 ± 4.1 kg/m². Cough was present in 19 patients (22.6%), while cough lasting ≥ 4 weeks was identified in 4 patients (4.8%). Ever smoking was present in 53 patients (63.1%), and 16 patients (19.0%) were active smokers. Of the total cohort, 42 patients (50.0%) were classified as having low-grade hemorrhoids (Goligher grades I-II) and 42 patients (50.0%) as having high-grade hemorrhoids (Goligher grades III-IV) (Table 1). The patient inclusion and exclusion process is summarized in Figure 1.

Table 1. Baseline characteristics of the study population (n = 84)

Characteristic	Value
Age (years), mean ± SD	45.8 ± 11.5
Male sex, n (%)	68 (81.0)
Female sex, n (%)	16 (19.0)
Low-grade hemorrhoids (I – II), n (%)	42 (50.0)
High-grade hemorrhoids (III – IV), n (%)	42 (50.0)
Body mass index (kg/m²), mean ± SD	26.8 ± 4.1
Cough present, n (%)	19 (22.6)
Cough lasting ≥4 weeks, n (%)	4 (4.8)
Ever smoking, n (%)	53 (63.1)
Active smoking, n (%)	16 (19.0)

BMI: Body Mass Index, SD: Standard Deviation

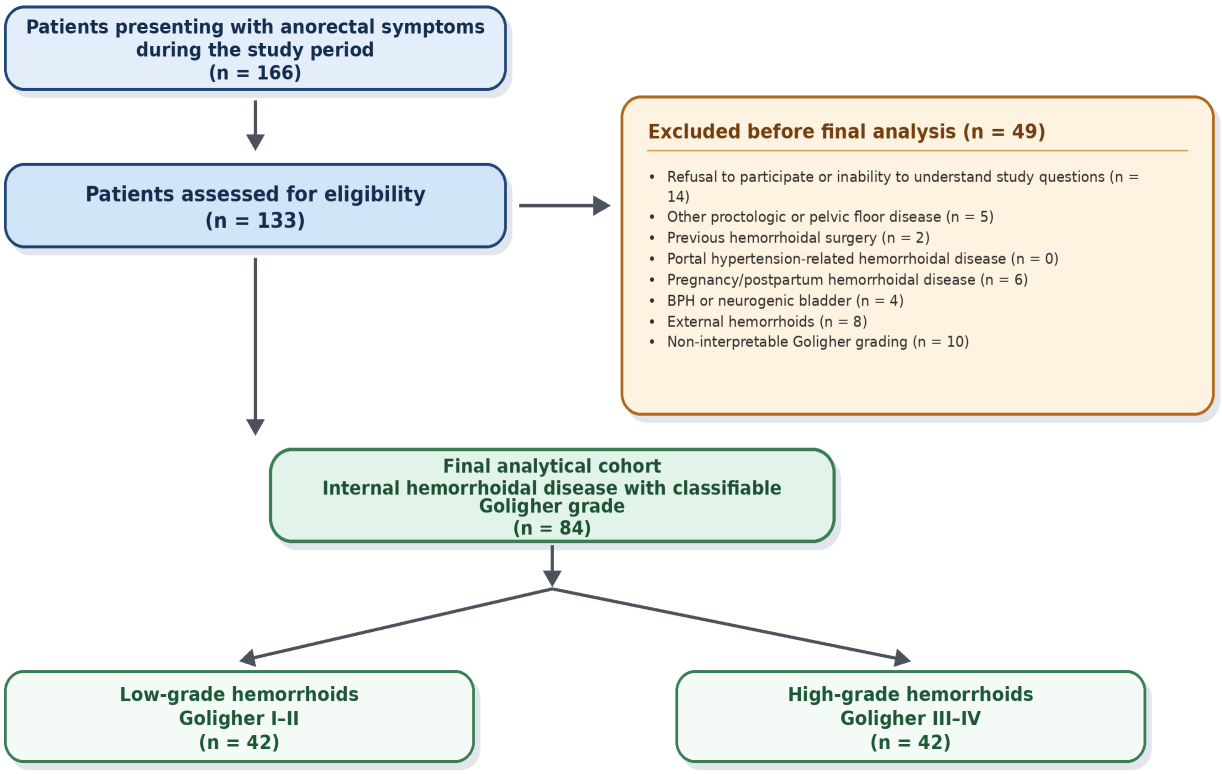

Figure 1. Patient flow diagram; BPH: benign prostatic hyperplasia

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There were no significant differences between the low-grade and high-grade groups in age, body mass index, or sex (Table 2). The prevalence of cough did not differ significantly between groups (23.8% vs 21.4%, p = 0.794), nor did cough lasting ≥ 4 weeks (4.8% vs 4.8%, p > 0.999). Ever smoking was more frequent in the high-grade group, although the difference did not reach statistical significance (p = 0.186). Active smoking was not associated with hemorrhoid grade (p = 0.871) (Table 2).

Table 2. Comparison of hemorrhoid grade groups

Parameters	Low grade (n = 42)	High grade (n = 42)	p
Age (years) (mean ± SD)	45.7 (12.0)	45.9 (11.1)	0.918+
BMI (kg/m²) (mean ± SD)	26.8 (4.8)	26.8 (3.2)	0.974+
Male sex, n (%)	33 (78.6)	35 (83.3)	0.578*
Cough present, n (%)	10 (23.8)	9 (21.4)	0.794*
Cough lasting ≥ 4 weeks, n (%)	2 (4.8)	2 (4.8)	> 0.999*
Ever smoking, n (%)	24 (58.5)	29 (72.5)	0.186*
Active smoking, n (%)	9 (30.0)	7 (28.0)	0.871*

BMI: body mass index, SD: standard deviation, +: Independent Sample T test, *: Chi Square test; Percentages for ever smoking and active smoking were calculated based on the number of patients with available smoking-status data in each group; For ever smoking, denominators were 41 in the low-grade group and 40 in the high-grade group; For active smoking, denominators were 30 and 25, respectively

Cough severity, assessed with the visual analog scale, did not differ between the low-grade and high-grade groups (median 0.0 [IQR 0.0 – 0.0] vs 0.0 [IQR 0.0 – 0.0], p = 0.985). Pack-year smoking exposure was also comparable between groups (median 5.0 [IQR 0.0 – 25.0] vs 12.0 [IQR 0.0 – 20.0], p = 0.497).

LCQ analyses were restricted to patients reporting cough symptoms (n=19). LCQ total score did not differ significantly between the two groups (p = 0.412), and no significant between-group differences were observed in any LCQ domain score (Table 3).

Table 3. LCQ scores according to hemorrhoid grade

Parameters	Low grade (n = 10)	High grade (n = 9)	p*
LCQ total score (IQR)	19.6 (18.9 – 20.1)	19.9 (19.2 – 20.3)	0.412
LCQ physical domain (IQR)	6.5 (6.0 – 6.8)	6.7 (6.3 – 6.9)	0.338
LCQ psychological domain (IQR)	6.1 (5.8 – 6.6)	6.3 (6.0 – 6.9)	0.447
LCQ social domain (IQR)	6.9 (6.5 – 7.0)	7.0 (6.8 – 7.0)	0.301

LCQ: Leicester Cough Questionnaire; IQR: interquartile range. *: Mann Whitney U test.

Correlation analyses also showed no significant association between ordinal hemorrhoid grade and cough-related variables. Hemorrhoid grade was not correlated with cough VAS (rho = 0.080, p = 0.473), LCQ total score (rho = 0.189, p = 0.335), LCQ physical domain (rho = 0.111, p = 0.561), LCQ psychological domain (rho = 0.138, p = 0.429), or LCQ social domain (rho = 0.175, p = 0.324). No significant correlations were observed for age, body mass index, or pack-year smoking exposure.

In multivariable logistic regression analysis, neither cough presence nor cough severity was associated with high-grade hemorrhoids after adjustment for covariates. In the model including cough presence, age, body mass index, ever smoking, and sex, cough presence was not a significant predictor of high-grade disease (OR 0.83, 95% CI 0.29 – 2.37, p = 0.724) (Table 4). In the alternative model including cough VAS instead of cough presence, cough VAS likewise showed no significant association (OR 0.99, 95% CI 0.81 – 1.21, p = 0.918). None of the covariates entered into either model reached statistical significance.

Table 4. Multivariable logistic regression for high-grade hemorrhoids

Parameters	OR	95% CI	p
Age	1.00	0.96 – 1.04	0.967
BMI	1.00	0.89 – 1.12	0.998
Cough present	0.83	0.29 – 2.37	0.724
Ever smoking	1.74	0.65 – 4.65	0.269
Male sex	1.31	0.39 – 4.43	0.664

BMI: body mass index, OR: odds ratio, CI: confidence interval

Discussion

In this prospective analytical cross-sectional study, we found no significant association between hemorrhoid grade and cough-related variables, including cough presence, cough lasting ≥ 4 weeks, cough severity assessed by VAS, and LCQ scores. Similarly, smoking-related variables, including ever smoking, active smoking, and pack-year exposure, were not significantly associated with high-grade hemorrhoidal disease. Multivariable

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logistic regression analyses also did not demonstrate an adjusted association between cough-related variables and severe hemorrhoidal disease.

These findings are noteworthy because the study hypothesis was biologically plausible. Cough is known to generate transient but substantial increases in intra-abdominal pressure, and repeated pressure loading has been proposed as a possible contributor to distal displacement of the anal cushions [3–7]. Based on this mechanism, one could reasonably hypothesize that frequent or longer-duration cough might predispose to more advanced hemorrhoidal disease. However, our clinical data did not support this assumption. The absence of a detectable association suggests that cough-related pressure spikes alone may not be sufficient to influence hemorrhoid severity, or that their clinical effect may be much smaller than expected when compared with other contributing factors such as defecatory habits, constipation, connective tissue support, and individual susceptibility.

A key consideration in interpreting the present findings is the distinction between shorter-duration and longer-duration cough. Although cough can generate marked transient increases in intra-abdominal pressure, the structural changes implicated in advanced hemorrhoidal disease are more likely to arise from prolonged and repetitive mechanical stress rather than brief pressure surges. In our cohort, cough lasting ≥ 4 weeks was uncommon and identified in only four patients, indicating that the study population consisted predominantly of non-coughers or patients with shorter-duration cough. This distribution may help explain why a physiologically plausible association was not demonstrable in the present dataset. Brief cough episodes are less likely to produce the sustained biomechanical loading required for connective tissue weakening and progressive distal displacement of the anal cushions.

Our results also help refine the interpretation of previous indirect evidence. Lin et al. reported an increased risk of hemorrhoids among patients with chronic obstructive pulmonary disease [8], which raised the possibility that chronic respiratory disease and cough may contribute to hemorrhoidal pathology. However, chronic obstructive pulmonary disease is a complex systemic condition associated not only with chronic cough but also with smoking exposure, altered connective tissue biology, chronic inflammation, reduced physical capacity, and multiple comorbidities. Therefore, the increased hemorrhoid risk observed in such populations may not be attributable to cough alone. Our findings suggest that the relationship between respiratory disease and hemorrhoids may be more complex than a simple cough-pressure mechanism.

Likewise, smoking did not show a statistically significant association with hemorrhoid grade in our cohort. Although smoking has been proposed to contribute to hemorrhoidal disease through more than one pathway, including cough-related pressure loading and smoking-related vascular or connective tissue alterations [9], our data did not demonstrate a clear relationship with disease severity. Nevertheless, the frequency of ever smoking was numerically higher in the high-grade group than in the low-grade group (72.5% vs 58.5%). This pattern may still be of interest and may reflect a modest effect that the present sample size was not large enough to detect with adequate precision. It is also possible that the vascular and connective tissue-related effects of smoking require larger cohorts and more detailed control of constipation- and lifestyle-related confounders to be distinguished from other dominant factors.

Several explanations may account for the lack of statistically significant associations. First, cough was relatively uncommon in our cohort, and cough lasting ≥ 4 weeks was particularly rare, which substantially limited statistical power for detecting differences according to cough duration. Second, LCQ scores were available only in the subgroup of patients reporting cough symptoms (n = 19), which further limited the ability to detect subtle associations. Third, hemorrhoidal disease is multifactorial, and cough may represent only a minor or context-dependent contributor rather than a dominant determinant of disease grade. Finally, grading based on the Goligher classification reflects prolapse severity at presentation and may not fully capture the cumulative effects of intermittent exposures over time.

This study has several strengths. To our knowledge, it is among the few prospective clinical studies directly examining the association between hemorrhoid grade and detailed cough-related variables. In addition to cough presence, we evaluated cough duration, symptom severity, and cough-related quality-of-life measures, and we assessed these relationships using both group comparisons and adjusted exploratory regression analyses. This approach provided a more direct evaluation of the study hypothesis than prior studies relying on indirect disease proxies.

The study has several limitations. First, the overall sample size was modest, and only four patients had cough lasting ≥ 4 weeks, which limited statistical power and raises the possibility of type II error. Second, several clinically relevant confounders, including constipation severity, bowel habits, prolonged toilet sitting, occupational straining, physical activity, and dietary fiber intake, were not included in the analytical models. Third, the single-center design may limit generalizability. Finally, the cross-sectional design precludes causal inference; although data were collected prospectively, the study cannot determine whether cough preceded hemorrhoid progression.

Conclusion

In conclusion, this prospective analytical cross-sectional study did not demonstrate a significant association between cough characteristics and hemorrhoid severity. Smoking-related measures were also not significantly associated with high-grade disease. These findings suggest that cough, despite its plausible physiological effect on intra-abdominal pressure, may not be a major determinant of hemorrhoidal severity in routine clinical populations, particularly when cough lasting ≥ 4 weeks is uncommon. Larger multicenter studies enriched for patients with longer-duration cough and incorporating broader constipation- and

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lifestyle-related covariates are needed to clarify whether cough has a modest or subgroup-specific role in hemorrhoidal disease.

Ethical Approval
The study protocol was approved by the Muğla Sıtkı Koçman University Medical Sciences Ethics Committee (approval number: 240242-35, date: 16.02.2025).

Patient Consent
Written informed consent was obtained from all participants prior to enrollment.

Conflict of Interest
The authors confirm the absence of any conflicts associated with this work.

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