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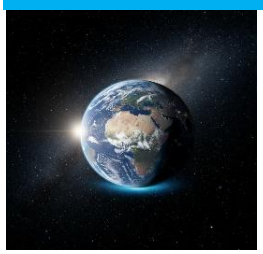

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Hemorrhoidal Disease - The Role of Dietary, Behavioral and Lifestyle Factors in Prevention and Conservative Management

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Abstract

Introduction and purpose: Hemorrhoidal disease is a common anorectal condition affecting quality of life and frequently leading to medical consultation. Its pathogenesis is multifactorial, involving vascular, connective tissue and neuromuscular alterations, as well as modifiable lifestyle factors. This review aims to summarize current evidence on dietary, behavioral and lifestyle factors in the prevention and conservative management of hemorrhoidal disease.

Materials and methods: A literature review was conducted using PubMed and Google Scholar, focusing primarily on studies published in English and prioritizing systematic reviews, meta-analyses, randomized controlled trials and observational studies.
State of knowledge: Chronic constipation, straining, prolonged toilet sitting, low fiber intake, inadequate hydration, obesity, smoking and certain dietary patterns contribute to hemorrhoidal disease. Fiber-rich diets, adequate fluids and moderate physical activity improve bowel function and reduce mechanical stress. Behavioral factors, including toilet posture and avoidance of prolonged sitting, also play a role. Emerging evidence suggests gut microbiota may influence disease development.
Conclusions: Conservative management should focus on lifestyle and behavioral modifications. Adequate hydration, fiber intake, weight management, smoking cessation, physical activity and proper bowel habits form the basis of non-invasive management. A holistic, patient-centered approach may reduce symptom severity, prevent progression and limit the need for surgical interventions.

Keywords: dietary fiber; constipation; physical actvity; obesity; smoking; risk factors

Introduction

Hemorrhoids are physiological structures of the anal canal composed of vascular and connective tissue cushions that play a crucial role in continence and stool consistency control [1]. These cushions consist of venous plexuses, connective tissue and smooth muscle fibers and their normal function enables airtight closure of the anal canal at rest and cushioning during defecation [1].

Pathological enlargement and displacement of the anal cushions lead to the development of hemorrhoids, which most commonly manifest as rectal bleeding, usually occurring during defecation. Other symptoms may include pruritus, a sensation of incomplete evacuation, discomfort and - particularly in more advanced stages - pain [2,3]. Hemorrhoids may significantly impair patients' quality of life, affecting daily functioning and causing both physical and psychological discomfort [1].

Hemorrhoidal disease develops as a result of dysfunction of the anal cushions, including abnormal dilation of blood vessels, destructive changes in the supporting connective tissue, inflammatory processes and vascular proliferation. These changes involve degeneration of collagen fibers, weakening of subepithelial muscles and increased microvascular density, leading to displacement of the cushions and the development of symptomatic hemorrhoids.

Dysregulation of vascular tone, including increased activity of nitric oxide synthase, also plays an important role in the pathophysiology of hemorrhoidal disease [2].

Risk factors for the development of hemorrhoids include chronic constipation, a low-fiber diet, overweight or obesity, a sedentary lifestyle and pregnancy. Constipation and hard stools promote excessive straining during defecation, whereas obesity and pregnancy increase pressure in the pelvic and anorectal veins, facilitating disease development. In addition, physical inactivity may impair intestinal peristalsis and promote constipation, further increasing the risk of hemorrhoids [4].

Epidemiological studies indicate that hemorrhoidal disease is common among adult populations worldwide. Systematic reviews and meta-analyses have shown that the global point prevalence of hemorrhoids is approximately 25-26%, meaning that more than one in four adults may be affected at any given time [5].

Hemorrhoidal disease is commonly classified according to the Goligher grading system, which categorizes hemorrhoids into four grades (I-IV) based on the degree of prolapse and reducibility. The characteristics of each grade are summarized in Table 1. [6].

Table 1. Goligher classification of hemorrhoids (adapted from Ravindranath et al. [6]).

Grade	Clinical Characteristics
Grade I	Minimal mucosal prolapse, with severe straining, hemorrhoids may become trapped by sphincter closure. Occasional venous congestion may occur, resulting in discomfort and/or bleeding.
Grade II	Increased mucosal protrusion with an obvious lump perceived by the patient, hemorrhoids reduce spontaneously and rapidly after defecation unless thrombosis is present.
Grade III	Chronic hemorrhoidal disease characterized by persistent prolapse leading to anal sphincter dilatation, hemorrhoids protrude with minimal provocation and usually require manual reduction.
Grade IV	Hemorrhoids are usually external and remain prolapsed continuously unless manually reduced.

Treatment of hemorrhoids includes conservative and surgical strategies, selected based on disease severity and symptom intensity. Conservative management includes dietary and lifestyle modifications, increased fiber intake, topical therapies and other non-invasive measures and is usually effective in patients with grade I-II hemorrhoids. This approach is characterized by a high safety profile and minimal invasiveness. Surgical treatments, such as

hemorrhoidectomy or Doppler-guided hemorrhoidal artery ligation, provide faster symptom resolution and lower recurrence rates but may be associated with procedure-specific complications, including postoperative pain, fecal incontinence or mucous discharge. In addition to conservative and surgical strategies, minimally invasive methods - such as rubber band ligation, sclerotherapy and infrared coagulation - are also used, offering rapid symptom relief with lower invasiveness than surgery. The choice of treatment should consider disease severity, patient preferences and the potential risk of complications [7,8].

Given the increasing prevalence of hemorrhoidal disease and its impact on quality of life, understanding its pathophysiology and risk factors is crucial for prevention and appropriate treatment selection. Increasing attention is being paid to modifiable lifestyle factors such as hydration, physical activity, dietary patterns and toilet behaviors, which may influence the development and course of hemorrhoidal disease. Therefore, the following sections focus on these aspects, discussing their role in maintaining anorectal health and their potential to support conservative management of hemorrhoids.

Research materials and methods

A comprehensive review was conducted using PubMed and Google Scholar, focusing primarily on studies published in English. Priority was given to systematic reviews, meta-analyses, randomized controlled trials and observational studies. Selected studies were screened for relevance and data were extracted regarding contributing factors, prevention and management strategies.

Results

Role of Hydration in Hemorrhoidal Disease

Adequate hydration is an important component of conservative management of hemorrhoidal disease, primarily through its effect on stool consistency and bowel movement frequency [4]. Constipation, hard and dry stools and excessive straining during defecation are among the most well-documented risk factors for the development and exacerbation of hemorrhoidal symptoms [4].

Insufficient fluid intake leads to increased water absorption from intestinal contents in the colon, resulting in dry, hard stools that require intense straining [9]. As a consequence of prolonged straining, venous pressure within the hemorrhoidal plexuses increases, promoting venous dilation, blood stasis and progression of disease symptoms [4].

Adequate fluid intake also supports normal intestinal peristalsis and shortens intestinal transit time, thereby reducing the risk of chronic constipation and secondary proctological complications, including hemorrhoids [9]. Population-based studies indicate that higher total water intake (from both beverages and food) is associated with a significantly lower risk of constipation [9], suggesting a protective role of adequate hydration in the prevention and alleviation of hemorrhoidal symptoms [4,9].

Current recommendations emphasize that a high-fiber diet should always be combined with adequate fluid intake, as only this combination effectively improves stool consistency and reduces mechanical trauma to the anal canal during defecation [4].

Regular bowel movements with stool types 3-4 on the Bristol Stool Form Scale (BSFS) are considered one of the key goals of conservative management of hemorrhoidal disease [4]. It is suggested that consuming approximately 2 liters of fluids per day may significantly help prevent constipation and thus indirectly reduce the risk and severity of hemorrhoidal symptoms [9].

In clinical practice, lifestyle modification - including increased fluid intake - is regarded as a fundamental and safe supportive therapy for patients with hemorrhoids, regardless of disease severity.

Dietary Patterns and Bowel Function in Hemorrhoidal Disease

Diet plays a key role in modulating bowel movement frequency and gastrointestinal symptoms, which is directly relevant to hemorrhoidal disease, as symptom severity often coexists with chronic constipation. Results from prospective studies involving nearly 96,000 adult participants indicate that adherence to a Mediterranean diet (MED) or a plant-based diet (PDI), characterized by high consumption of vegetables, nuts, legumes and healthy fats, is associated with a significantly reduced risk of chronic constipation [10]. This effect may result not only from fiber content but also from beneficial effects on the gut microbiota and the production of short-chain fatty acids (SCFAs), which regulate intestinal motility and support normal peristalsis [10,11]. Population-based studies have shown that individuals who regularly follow a Mediterranean diet have a significantly lower risk of chronic constipation, particularly among those with obesity [11].

In contrast, a high-fat diet - especially one rich in saturated fats - promotes delayed intestinal transit, increasing the risk of constipation [12]. Population studies have shown that such dietary patterns are associated with reduced bowel movement frequency, with the problem being particularly pronounced among women, older adults, African Americans and patients with diabetes [12]. High intake of saturated fats may activate the “ileal brake” mechanism, slowing intestinal emptying, and may damage enteric neurons, impairing gastrointestinal motility. Reduced stool transit increases pressure and tension within the anorectal venous plexuses, thereby promoting the development or exacerbation of hemorrhoidal symptoms [12].

Alcohol consumption and diets rich in spicy foods are recognized as important triggers of hemorrhoidal disease exacerbations, particularly in younger patients. Therefore, limitation or avoidance of alcohol and spicy foods is recommended in both prevention and conservative management, especially during periods of symptom exacerbation [13].

Furthermore, studies in individuals with constipation suggest that supplementation with probiotics and prebiotic formulations supports beneficial gut bacteria, potentially improving bowel regularity and stool consistency [14-16]. Although they represent only a small component of dietary strategies, probiotics and prebiotics may serve as adjunctive measures in constipation-relieving diets that support hemorrhoid management [14-16].

In summary, dietary patterns rich in vegetables, fruits, whole grains, legumes, nuts and healthy fats - such as the Mediterranean diet - may reduce the risk of chronic constipation and indirectly

alleviate hemorrhoidal symptoms. In contrast, high-fat and pro-inflammatory diets increase the risk of impaired bowel transit and may exacerbate hemorrhoidal complaints. Probiotics and prebiotics may further support a beneficial gut microbiota and normal peristalsis, serving as potential components of dietary strategies for hemorrhoid management.

Role of Dietary Fiber in Hemorrhoidal Disease

Dietary fiber plays an important role in the prevention and alleviation of hemorrhoidal symptoms by improving stool consistency, regulating intestinal motility and reducing constipation. Increased stool bulk and appropriate consistency reduce the need for forceful straining during defecation, thereby limiting pressure on the venous plexuses of the anal canal and reducing the risk of irritation [17]. Studies have shown that fiber supplementation reduces the risk of persistent hemorrhoidal symptoms by 47% and the risk of bleeding by 50% [17].

Different types of fiber exert distinct effects in the colon. Insoluble fiber, such as wheat bran, acts mechanically by stimulating the intestinal mucosa to secrete water and mucus, facilitating stool passage [4]. Soluble fiber, such as psyllium, binds water to form a gel-like structure that helps maintain optimal stool consistency while increasing stool volume, thereby promoting regular bowel movements. This mechanism contributes to a reduction in bleeding and pain associated with hemorrhoids [4,17].

In addition, dietary fiber influences the gut microbiota by supporting the growth of beneficial bacteria, such as Bifidobacterium spp. and Lactobacillus spp. and by improving intestinal motility [18]. This effect helps prevent constipation, which is one of the main risk factors for hemorrhoidal disease. Thus, fiber acts through multiple mechanisms: mechanically facilitating stool passage, maintaining appropriate stool consistency and volume and supporting normal intestinal function via microbiota modulation [4]. Adults are recommended to consume approximately 25-38 g of dietary fiber per day [19].

For both prevention and conservative treatment of hemorrhoids, fiber intake should be combined with adequate hydration, moderate physical activity and lifestyle modification. A comprehensive approach addressing these factors may significantly improve patients' quality of life, reduce recurrence rates and limit the need for surgical intervention [4,17].

Gut Microbiota and Hemorrhoidal Disease

Growing evidence suggests that the composition of the gut microbiota may influence the development and course of intestinal disorders, including hemorrhoids. Genetic studies allow investigation of potential causal relationships between specific bacterial taxa and disease risk, which may help identify new preventive and therapeutic strategies.

Yang et al. conducted a Mendelian randomization study to examine whether gut microbiota composition influences hemorrhoidal disease. Genetic data on gut microbiota from over 18,000 individuals were combined with data from a genome-wide association study (GWAS) meta-analysis including more than 218,000 patients with hemorrhoidal disease and 725,000 controls. The analysis included various gut bacterial taxa and associated genetic variants [20]. The results indicated that certain bacteria, such as Cyanobacteria and Phascolarctobacterium, may have protective effects, whereas others - including Oscillospira, Peptostreptococcaceae, and Alcaligenaceae - may increase the risk of hemorrhoidal disease. Notably, Oscillospira appeared

to be both a risk factor and a consequence of the disease, highlighting the complexity of microbiota-hemorrhoid interactions [20].

These findings suggest that gut microbiota composition may influence intestinal motility and anorectal smooth muscle function, which could be relevant in the prevention and management of hemorrhoids.

Role of Physical Activity in Hemorrhoidal Disease

Physical activity is an important lifestyle factor that may influence the development and course of hemorrhoidal disease. Although a sedentary lifestyle is commonly regarded as a risk factor, available scientific evidence is inconsistent and suggests that not only the presence of physical activity but also its type, intensity and biomechanical mechanisms are relevant [4,21,22].

Moderate physical activity is often recommended for patients with hemorrhoidal disease due to its beneficial effects on intestinal peristalsis, venous circulation and constipation reduction - one of the most well-established risk factors for hemorrhoids [4]. Accordingly, regular moderate physical activity lasting approximately 20-60 minutes, 3-5 times per week is recommended as part of conservative management [23].

However, population-based studies do not unequivocally confirm a protective role of physical activity. In a cross-sectional study by Perry et al. involving more than 2,800 individuals and based on colonoscopy findings, no significant association was observed between physical activity and hemorrhoid prevalence. Paradoxically, longer sitting time was associated with a lower risk of hemorrhoids [22]. The literature emphasizes that these findings should be interpreted with caution, as certain forms of physical activity may exacerbate hemorrhoidal symptoms and influence epidemiological associations [4]. Clinical relevance appears to depend not only on activity level but primarily on activity type and intensity [4].

Activities associated with increased intra-abdominal pressure, such as bodybuilding and horse riding, have been more frequently associated with hemorrhoidal disease [21]. Short-term increases in intra-abdominal pressure during intense exertion may lead to venous congestion within the hemorrhoidal plexuses and weakening of pelvic floor structures, promoting venous dilation [4,21]. Therefore, patients with hemorrhoidal disease are advised to avoid activities requiring straining or the Valsalva maneuver while maintaining overall regular physical activity [4,21]. In contrast, moderate-intensity activities such as trekking or cross-country skiing may exert protective effects [21].

In summary, moderate physical activity may have beneficial effects on hemorrhoidal disease, whereas intense strength training and sports that increase intra-abdominal pressure may elevate the risk of disease development or symptom exacerbation. Further well-designed studies accounting for activity type, intensity and duration are needed [4,21,22].

Impact of Body Fat and Central Obesity on Hemorrhoidal Disease

An increasing body of evidence indicates a significant role of adiposity - excess body fat - as a risk factor for hemorrhoidal disease. Observational studies have shown that increased body weight is associated with a higher risk of hemorrhoids [24,25]. In a cross-sectional study conducted in Ethiopia among 403 adult surgical outpatients, individuals with a BMI ≥ 25 kg/m² had a significantly higher likelihood of hemorrhoids compared with those of normal weight

(AOR = 2.6; 95% CI: 1.08-6.23) [24]. Similarly, a prospective population-based study involving 976 participants in an Austrian colorectal cancer screening program found that BMI was an independent factor associated with hemorrhoids, with each 1-unit increase in BMI corresponding to an approximately 3.5% increase in disease risk, independent of other factors [25].

To determine whether a causal relationship exists between obesity and hemorrhoids, Huang et al. conducted a Mendelian randomization study [26]. The analysis demonstrated a significant positive association between genetically determined obesity and hemorrhoidal risk. Each 1-standard deviation increase in BMI was associated with a small but statistically significant increase in hemorrhoid risk of approximately 0.5% (OR = 1.005; 95% CI: 1.003-1.008). Similarly, higher body fat percentage, greater waist circumference and a higher waist-to-hip ratio (WHR) - markers of total and central adiposity - were associated with increased hemorrhoidal risk [26].

The mechanisms underlying this relationship are likely multifactorial. Excess adipose tissue, particularly central fat accumulation, increases intra-abdominal pressure, impairing venous outflow from the rectal region and promoting hemorrhoid formation. In addition, obesity is associated with chronic inflammation and oxidative stress [26].

Recent Mendelian randomization analyses further confirm that central obesity, measured by WHR adjusted for BMI, is a significant risk factor for hemorrhoidal disease [27]. Higher WHR increases the likelihood of hemorrhoids independently of overall body weight, suggesting that visceral fat distribution plays a key role in disease pathogenesis. Central obesity may also weaken pelvic floor muscles and promote pelvic organ prolapse, indirectly increasing hemorrhoidal risk [28]. These findings highlight the importance of not only overall body weight but also visceral fat distribution as a potential risk factor for hemorrhoidal disease.

Role of Smoking in Hemorrhoidal Disease

The impact of environmental factors such as cigarette smoking on hemorrhoidal disease is increasingly well documented. Hemorrhoids exhibit vulnerability to injury similar to other venous and arterial systems in the body and studies suggest that smoking may significantly increase the risk of hemorrhoidal damage [29-31].

In a retrospective study involving 242 patients undergoing screening colonoscopy, the risk of hemorrhoids among smokers was 2.4 times higher than among non-smokers ($p < 0.05$) [32]. Moreover, no significant differences were observed between current and former smokers or between men and women within the smoking group, suggesting that vascular changes may be persistent and sex-independent.

Pathophysiological mechanisms linking smoking to hemorrhoidal disease include endothelial damage, oxidative stress and chronic inflammation induced by nicotine and carbon monoxide [29]. Smoking contributes to hypoxia and venous hypertension, leading to vascular weakening and dilation - processes similar to those observed in lower limb varicose veins [30]. Furthermore, endothelial activation and increased pro-inflammatory cytokine production may exacerbate local inflammatory responses and promote the development of symptomatic hemorrhoids [31].

Impact of Toilet Behavior on Hemorrhoidal Disease

Regular Bowel Movements and Straining

Disturbances in bowel regularity and excessive straining during defecation are strongly associated with symptomatic hemorrhoids. Systematic reviews have shown that patients with hemorrhoids have a higher prevalence of functional constipation and dyssynergic defecation - a condition characterized by inappropriate coordination of pelvic floor muscles and anal sphincters during defecation - compared with healthy controls [33]. Elevated resting anal pressures and impaired sphincter relaxation may contribute to damage of the anal cushions and their pathological displacement, increasing the risk of symptomatic hemorrhoids. Importantly, all patients with hemorrhoids reported excessive straining during defecation prior to symptom onset [33]. These findings suggest that treatment of functional constipation and correction of dyssynergic defecation patterns, for example through pelvic floor physiotherapy, may reduce symptom severity and recurrence risk [33].

Avoiding Prolonged Toilet Sitting

Prolonged toilet sitting is associated with weakening and dilation of the anal cushions, potentially leading to disease progression. In a study by Giuliani et al., a linear relationship was observed between time spent on the toilet and hemorrhoid grade: patients with grade III and IV hemorrhoids spent an average of 12.7 and 14.2 minutes on the toilet, respectively, compared with approximately 7 minutes among healthy individuals [34]. Similar findings were reported in a cross-sectional study by Yazkan et al., in which 8.1% of patients with anorectal diseases - including hemorrhoids - spent more than 20 minutes on the toilet, compared with only 0.5% in healthy controls [19]. Additionally, more frequent constipation (≥ once per week) was associated with longer defecation times and higher hemorrhoid risk [19,34]. Improper hygiene practices, such as wiping from back to front, may further irritate the anal area and promote inflammation [19].

Smartphone use during defecation has attracted research interest as a behavior potentially associated with prolonged defecation time and indirectly with hemorrhoidal disease. In a cross-sectional study by Ramprasad et al., individuals using smartphones during defecation were significantly more likely to remain on the toilet for longer than 5 minutes compared with non-users (37.3% vs. 7.1%). Smartphone use was associated with a 46% increase in the risk of hemorrhoids, independent of age, sex, BMI, straining, physical activity and fiber intake [35]. The authors suggest that passive smartphone use promotes prolonged sitting, increasing pressure within the anal cushions and leading to congestion and pathological enlargement, even without excessive straining. These findings highlight the importance of limiting smartphone use during defecation as a simple, modifiable preventive measure.

Body Position During Defecation

Body position during defecation significantly influences defecation mechanics, primarily by altering the anorectal angle and the amount of straining required. Manometric studies have shown that a squatting position - characterized by marked hip and knee flexion with the buttocks close to the heels - increases the anorectal angle and reduces abdominal pressure, facilitating easier and less forceful rectal emptying [36]. A study by Sikirov demonstrated that defecation

in this position was associated with a shorter time to achieve a sensation of complete evacuation and lower subjective straining compared with various seated positions [37]. Both studies emphasize that increasing the anorectal angle in the squatting position reduces the need for excessive straining, which may be relevant in preventing defecation-related disorders, including hemorrhoidal disease [36,37].

Patient education on limiting time spent on the toilet, avoiding excessive straining, adopting proper body position and using appropriate wiping techniques may represent an important component of hemorrhoid prevention and management [19,34].

Behavioral and Lifestyle Recommendations for Hemorrhoid Prevention

In response to growing evidence supporting the role of toilet behaviors in hemorrhoidal disease pathogenesis, increasing emphasis has been placed on simple behavioral recommendations. One practical approach is the TONE concept, which organizes key principles of proper defecation and hemorrhoid prevention. The components of TONE are presented in Table 2 [19,34,38].

Table 2. TONE mnemonic components for hemorrhoid prevention and proper bowel habits (compiled and adapted from multiple sources [19,34,38]).

Letter	Meaning	Description	Clinical Relevance
T	**Three minutes**	Maximum time on the toilet should be approximately 3-5 minutes to avoid excessive pressure on the hemorrhoidal cushions and prevent venous stasis in hemorrhoidal vessels. Long sitting, especially for more than 20 minutes, is associated with higher prevalence and severity of hemorrhoids.	Shortening toilet time may reduce risk of hemorrhoid development and symptom exacerbation.
O	**Once daily**	**A**ttempt defecation once daily, ideally at a regular time, for example, in the morning after a meal. Regular bowel habits help maintain soft stools, reduce constipation and dyssynergic defecation.	Promotes regular bowel movements and reduces straining, lowering risk of hemorrhoidal disease.
N	**No straining**	Excessive straining increases intra-abdominal and rectal pressure, overloading hemorrhoidal cushions and contributing to hemorrhoid formation or progression. Encouraged to respond naturally to urge and use measures to facilitate defecation, for example, adequate hydration and fiber.	Minimizes pressure on hemorrhoidal tissue and prevents complications related to excessive straining.
E	**Enough fiber**	Intake of 25-38 g of fiber daily helps soften stool, shorten defecation time and reduce the need for straining. Supports proper bowel function, decreasing constipation, dyssynergic defecation and excessive pressure on hemorrhoidal vessels.	Dietary fiber improves stool consistency and defecation efficiency, supporting hemorrhoid prevention.

TONE represents a simple and practical model for hemorrhoid prevention that integrates control of toilet time, regular bowel habits, avoidance of straining and appropriate diet. Available data suggest that adherence to these principles may be associated with a lower risk of hemorrhoid development and a milder symptom course in affected patients [19,34,38].

Summary

Hemorrhoidal disease is a common condition whose symptoms - including bleeding, pain, pruritus and discomfort - may significantly impair quality of life. Its development is multifactorial, involving both local disturbances within the hemorrhoidal plexuses and systemic factors such as obesity, chronic constipation, smoking and improper defecation habits.

Prevention and conservative management of hemorrhoidal disease rely primarily on lifestyle modifications, including a fiber-rich diet, adequate hydration, physical activity and education on proper toilet behaviors. A holistic approach incorporating lifestyle modification may help alleviate symptoms and improve patient comfort and quality of life.

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Author's Contribution
The author conceived the study, performed the literature review, analyzed the data and wrote the manuscript. The author has read and approved the final version of the manuscript.

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