folia medica

Folia Medica 68(5)
DOI: 10.3897/folmed.68.e191434

Research Article

Endometritis and its relationship to different clinico-pathological parameters: experience from a tertiary care center

Rawan Al-Rawas[1], Yumna Al-Hatmi[1], Mohammad Arafa[1]

1 *Department of Pathology, College of Medicine and Health Sciences, Sultan Qaboos University, and Sultan Qaboos University Hospital/University Medical City, Oman*

Corresponding author: Mohammad Arafa, Department of Pathology, College of Medicine and Health Sciences, Sultan Qaboos University, Oman; Email: marafa@squ.edu.om; Tel: (+968) 2414 1123

Received: 12 March 2026 ♦ **Accepted:** 30 March 2026 ♦ **Published:** 29 October 2026

Citation: Al-Rawas R, Al-Hatmi Y, Arafa M. Endometritis and its relationship to different clinico-pathological parameters: experience from a tertiary care center. Folia Med (Plovdiv) 2026;68(5):e191434. doi: 10.3897/folmed.68.e191434.

Abstract

Introduction: Endometritis is an inflammation of the endometrium that might be associated with, or present as, some gynecological clinical conditions. However, there is a lack of studies exploring the condition in our locality.

Aim: This study aimed to assess the cases of endometritis diagnosed over a period of six years with insight into the relation to different clinico-pathological parameters.

Material and methods: A retrospective cross-sectional study was conducted on 137 female patients diagnosed with endometritis. Data were retrieved from hospital records, including demographic, clinical, histopathological, microbiological, and laboratory findings. Statistical analyses were performed using SPSS version 25, including descriptive statistics, chi-square tests, and logistic regression.

Results: Among the 137 patients, most were aged between 30 and 50 years. Chronic endometritis constituted about 90% of cases. Abnormal uterine bleeding and lower abdominal pain were the most common symptoms. Among the positive cultures, Gram-positive bacteria were the most identified pathogens. About 3% of women presenting to the general gynecology clinic were diagnosed with endometritis, highlighting a notable prevalence within the population.

Conclusions: Endometritis predominantly affects women of reproductive age and is mainly chronic. Clinical evaluation supported by histopathological confirmation and integration of sensitive laboratory markers is essential for proper diagnosis and management.

Keywords

endometritis, chronic inflammation, plasma cells, abnormal bleeding, infertility

Introduction

Endometritis is inflammation of the endometrial lining of the uterine cavity.[1] The endometrium is normally sterile, but ascending infections from the lower genital tract can lead to inflammation.[1] Approximately 85% of endometrial infections are attributed to sexually transmitted pathogens, with *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and bacterial vaginosis being the primary causative agents.[2]

Endometritis can occur in any woman, most commonly during childbirth, manifesting as chorioamnionitis, or during the postpartum period.[3] Additionally, women who have undergone caesarean sections, those with a history of pelvic inflammatory diseases (PID), and those who have

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had an abortion are at an increased risk of developing endometritis.[3,4]

Endometritis is clinically and pathologically classified as acute or chronic. Acute endometritis is typically symptomatic, presenting with pelvic or abdominal pain, abnormal vaginal bleeding, foul-smelling or discolored discharge, malaise, and fever.[1] Histologically, it is characterized by micro-abscesses and neutrophilic infiltration, often extending into the glandular lumen.[5,6] It commonly follows childbirth, miscarriage, or cervical and uterine procedures.[7] However, a randomized controlled trial found no significant association between acute endometritis and impaired fertility.[8] In contrast, chronic endometritis is a prolonged low-intensity inflammation of the endometrium.[9,10] Histopathologically, it is diagnosed by the presence of plasma cells within the endometrial stroma, accompanied by other chronic inflammatory cells such as lymphocytes, eosinophils, and, in some cases, lymphoid follicles.[6] Other notable histopathological features include superficial endometrial edema and increased stromal density, which reflect ongoing chronic inflammation and structural changes in the endometrium.[6] Many individuals with chronic endometritis remain asymptomatic; however, most of the patients present clinically with secondary amenorrhea and infertility.[1] The incidence of chronic endometritis increases after menopause and is also associated with bacterial infections such as *Chlamydia* or gonorrhea.[11,12] Diagnosis can be challenging, as to date, there is a notable absence of standardized methods for histologically assessing plasma cell infiltration.[6,13]

Chronic endometritis can be diagnosed using a combination of microbial culture, imaging techniques, and hysteroscopy.[1] Microbial culture allows for the identification of pathogens, but it has limitations such as contamination and difficulty in culturing certain bacteria. RT-PCR has emerged as a faster alternative, enabling the detection of both culturable and non-culturable bacterial DNA.[6,13] Imaging methods, hysterosalpingography (HSG) and ultrasonography (USG), can help visualize endometrial irregularities, fibrosis, calcifications, and intrauterine adhesions.[6,14] Hysteroscopy is considered a valuable diagnostic tool, allowing direct visualization of endometrial abnormalities like micropolyposis, strawberry spots, and hyperemia.[6,15,16]

Chronic endometritis is primarily treated with oral antibiotics, which are selected based on culture and Gram stain results from endometrial aspiration or biopsy.[14,17] Post-treatment, repeat endometrial aspiration is typically performed. In contrast, the treatment of acute endometritis requires broad-spectrum antibiotics targeting the most likely pathogens.[1] Early initiation of therapy is essential to prevent long-term complications, and like chronic endometritis, appropriate antibiotic selection based on clinical presentation and potential pathogens is critical for effective management.[17,18]

Aim

The current study aimed to assess the cases of endometritis received at the Pathology Department of our hospital over a period of six years. The correlation with the clinicopathological features of patients and their parameters was investigated.

Materials and methods

Study design

A retrospective cross-sectional study was conducted to assess the histopathological and clinical characteristics of patients diagnosed with endometritis. A total of 137 female patients were included. These patients were served by the Department of Gynecology and Obstetrics at Sultan Qaboos University Hospital between 2018 and 2023. All patients were diagnosed with endometritis either clinically, histopathologically, or both.

Data collection

Data were extracted from the Health Information System (HIS) at our hospital. The variables collected and analyzed were aligned with the study objectives. Patients without concurrent endometrial pathology results were excluded for the study.

Statistical analysis

Statistical analysis was conducted using IBM SPSS version 25.0 and Microsoft Excel. The chi-square test was applied to assess the relationship among different variables, and a p-value less than 0.05 is considered significant. The categorized variables were also described and presented with appropriate graphs and tables to support the research findings.

Results

Demographic characteristics and prevalence

In terms of age distribution, most patients were aged between 30 and 50 years, accounting for 76.6% (n=105) of the sample. Participants younger than 30 years constituted 14.6% (n=20), while those older than 50 years comprised 8.8% (n=12). The mean age of female patients diagnosed with endometritis was 39 years. Analysis of body mass index (BMI) indicated that endometritis occurred more frequently among overweight (n=44; 32.1%) and obese patients (n=59; 43.1%).

The year 2018 reported the highest number of cases (*n*=35), accounting for 25.5% of the total cohort. On the other hand, the lowest number of cases was reported in 2020 (*n*=16).

The prevalence of endometritis in this study was 3.11%, as the total number of patients served by the Obstetrics & Gynecology Department general clinic was 4401.

Histopathological findings

Chronic endometritis was the predominant type among patients (*n*=123, *p*=89.8%). A classic morphological example is illustrated in **Fig. 1**.

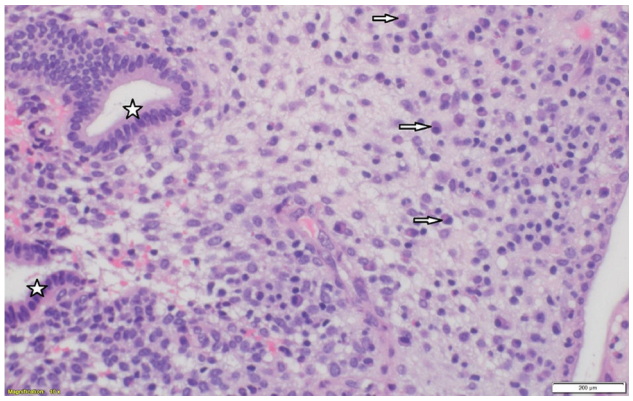

Figure 1. Microscopic appearance of chronic endometritis. The endometrial glands (stars) are set in a stroma having inflammatory cellular infiltrate comprising plasma cells (arrows). (H&E ×400).

Clinical presentation

Abnormal uterine bleeding (AUB) was the most frequently reported symptom (*n*=88, 64.2% of patients) (95% CI: 56.2–72.3), followed by lower abdominal pain (95% CI: 51.1–67.2). Classical signs of pelvic infection, such as abnormal vaginal discharge and fever, were less commonly observed. Additionally, a history of recurrent miscarriage was documented **(Table 1)**.

Patients' characteristics

In terms of obstetric history, 48.2% of patients had low parity (1–4 births), while 27.0% had high parity (≥5), and 24.8% were nulliparous. More than half (56.9%) had delivered more than four years ago, while 25.5% had not given birth. Fertility-wise, 68.6% were fertile, while 21.9% had primary infertility and 9.5% had secondary infertility. A history of spontaneous vaginal delivery (SVD) was present in 61.3% of cases and lower segment cesarean section (LSCS) in 33.6%. Surgical history revealed that 26.3% had previously used an intrauterine device (IUD), 21.9% had undergone cervical cerclage, and 70.1% had a history of dilatation and curettage (D&C) **(Table 2)**.

Laboratory findings

Laboratory investigations revealed notable alterations in inflammatory and hematological markers among patients assessed for endometritis. Leukocytosis was observed in 36 patients (26.3%), while neutrophilia was present in 46 (33.6%). Lymphocyte counts were mostly normal (86.9%), but 14 patients (10.2%) showed lymphopenia. A significant proportion revealed monocytosis (34.3%), and 40 patients (29.2%) had elevated platelet counts. Hemoglobin levels were decreased in nearly half of the patients (46.7%), suggesting concurrent anemia, while none demonstrated increased values. Among acute-phase reactants, fibrinogen was raised in 47 cases (34.3%). Additionally, 41 patients (30.4%) showed an increased neutrophil-to-lymphocyte ratio (NLR), a recognized marker of systemic inflammation **(Table 3)**.

Microbiological findings

A genital swab revealed that organisms associated with endometritis were not found in the majority of cases (*n*=77, 61.1%). Among the positive cultures, Gram-positive bacteria were the most identified pathogens (*n*=32, 23.4%), followed by fungal organisms (*n*=26, 19.0%) and Gram-negative bacteria (*n*=7, 5.1%) **(Fig. 2)**. As per the individual organism, the distribution was as follows: *Candida* spp. (*n*=16), *Streptococcus agalactiae* (*n*=13), *Escherichia coli* (*n*=5), *Enterococcus faecalis* (*n*=3), *Gardnerella vaginalis* (*n*=2), and *Staphylococcus species, aureus* and *lugdunensis* (*n*=2). Less frequently observed organisms, those were isolated in only one case for each, included *Lactobacillus spp., Chlamydia trachomatis*, *Finegoldia magna,* and *Corynebacterium jeikeium*.

Table 1. Clinical presentations of patients with endometritis (*n*=137)

Symptom/Sign	Count	Prevalence (%)	Lower 95% CI	Upper 95% CI
Abnormal uterine bleeding	88	64.2	56.2	72.3
Lower abdominal pain	81	59.1	51.1	67.2
Abnormal vaginal discharge	40	29.2	21.9	37.2
Fever	24	17.5	11.7	24.1
Recurrent miscarriage	22	16.1	10.2	22.6

CI: confidence interval

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Table 2. Patients' characteristics by obstetric, gynecological surgical procedures

Variable	Categories	Number	Percentage	L95% CI	U95% CI
Parity group	Null (0)	34	24.8	17.6	32.0
	Low (1-4)	66	48.2	39.8	56.6
	High (≥5)	37	27.0	19.6	34.4
Last childbirth period group	<4	24	17.5	11.1	23.9
	>4	78	56.9	48.6	65.2
	NA	35	25.5	18.2	32.8
Fertility status	Fertile	94	68.6	60.8	76.4
	Primary infertility	30	21.9	15.0	28.8
	Secondary infertility	13	9.5	4.6	14.4
Number of previous SVD	0	53	38.7	30.5	46.9
	1-4	56	40.9	32.7	49.1
	>4	28	20.4	13.7	27.1
Number of previous LSCS	0	91	66.4	58.5	74.3
	1-4	43	31.4	23.6	39.2
	>4	3	2.2	−0.3	4.7
History of IUD use	-	36	26.3	18.9	33.7
Cervical cerclage	-	30	21.9	15.0	28.8
D and C	-	96	70.1	62.4	77.8

L95% CI: the lower bound of a 95% confidence interval; U95% CI: the upper bound of a 95% confidence interval; SVD: spontaneous vaginal delivery; LSCS: lower segment cesarean section; IUD: intrauterine device; D and C: dilatation and curettage

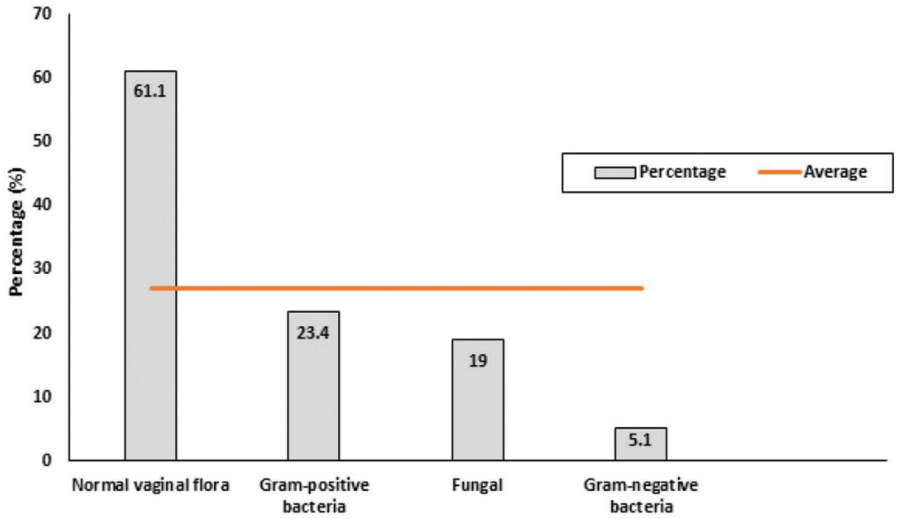

Figure 2. Microbial findings in patients with endometritis. Normal flora represented most of the cases, followed by Gram-positive bacteria, then fungi, and lastly Gram-negative bacteria.

Discussion

The histopathological diagnosis of endometritis has implications for the management of patients with gynecological complaints. Owing to the importance of this condition, the current study was conducted on patients diagnosed with endometritis in our referral hospital with the aim to deepen the understanding of the nature of the disease and to enhance the awareness of health care providers about this condition.

Chronic endometritis (CE) was the predominant histological subtype identified, present in 89.8% of cases. This high proportion is in agreement with the growing recognition of CE as a frequently underdiagnosed entity in women undergoing evaluation for AUB or infertility.[16] In this study, most patients (76.6%) were aged between 30 and 50

Table 3. Profile of hematological and inflammatory laboratory parameters

Parameter	Count	%
Leukocytes		
Normal	99	72.3
Low	-	-
High	36	26.3
Neutrophils		
Normal	87	63.5
Low	2	1.5
High	46	33.6
Lymphocytes		
Normal	119	86.9
Low	14	10.2
High	2	1.5
Monocytes		
Normal	86	62.8
Low	2	1.5
High	47	34.3
Hemoglobin		
Normal	71	51.8
Low	64	46.7
Thrombocytes		
Normal	93	67.9
Low	2	1.5
High	40	29.2
Fibrinogen		
Normal	87	63.5
High	47	34.3
NLR		
Normal	94	69.6
High	41	30.4

NLR: neutrophil-to-lymphocyte ratio

years, aligning with previous literature suggesting that endometritis predominantly affects women of reproductive age.[5,9] This age group is often associated with active reproductive health challenges, including fertility issues, miscarriage, and postpartum complications, conditions frequently linked to chronic endometritis.[6,11] The temporal distribution of cases showed a peak in 2018 and a marked decline during 2020, followed by a subsequent rise. This pattern likely reflects the impact of the COVID-19 pandemic on healthcare utilization, as reported in global studies that noted a reduction in outpatient visits and elective gynecological procedures during the pandemic period.[19]

The prevalence of endometritis in this study (3.11%) aligns closely with that reported by Kimura and colleagues among women attending a gynecological clinic in Japan. This consistency suggests a relatively stable prevalence across different geographic and clinical settings. Minor differences may reflect variations in population demographics, diagnostic criteria, or healthcare practices.[7,20]

In our cohort, AUB was the most common symptom (64.2%), followed by lower abdominal pain (59.1%). These findings are consistent with previous reports identifying AUB as a hallmark of chronic endometritis due to persistent inflammation and endometrial disruption.[1,9] In the current study, AUB prevalence appears higher than in some others, possibly due to variations in diagnostic methods and patient selection. Lower abdominal pain, though non-specific, remains a frequent complaint in both acute and chronic pelvic infections.[2]

Classical signs of pelvic infection, abnormal vaginal discharge (29.2%), and fever (17.5%) were less prevalent, consistent with the fact that most cases in this study were chronic endometritis, which typically presents with subtle or absent systemic signs.[6,10] Such mild presentations may delay recognition, particularly when overlapping with other gynecological conditions. A history of recurrent miscarriage was reported in 16.1% of cases, supporting literature that links chronic endometrial inflammation to poor reproductive outcomes, likely due to disrupted embryo-endometrial interaction and impaired implantation from immune dysregulation.[7,8,11]

These findings emphasize the need for a high index of suspicion when evaluating women with persistent but non-specific symptoms such as AUB or pelvic discomfort, particularly in those with a history of infertility or miscarriage. Incorporating histopathological evaluation or molecular diagnostic tools in such cases may improve detection and management of this under-recognized condition.[6,8,10]

This study explored the anthropometric, obstetric, and surgical characteristics of women with endometritis, focusing on BMI, parity, fertility status, previous deliveries, and prior interventions like IUD use, cervical cerclage, and D&C. Obesity and overweight were prevalent among patients, a pattern linked to immune dysregulation and impaired endometrial receptivity, potentially contributing to inflammation and chronic endometritis.[13]

In terms of obstetric history, nearly half of the women (48.2%) had low parity, while 27% had high parity (≥5), and 24.8% were nulliparous. Although high parity has been proposed as a potential risk factor for endometrial inflammation due to mechanisms such as cervical incompetence or retained products of conception[3,4], most of our cohort had low or null parity. This suggests that other factors, such as a history of uterine interventions, may have played a more prominent role in the development of endometritis in our population. Indeed, 70.1% had undergone dilatation and curettage (D&C), a well-established risk factor for endometrial damage and chronic inflammation.[8]

Fertility issues were common, with 31.4% of patients experiencing infertility (21.9% primary and 9.5% secondary infertility), supporting evidence linking chronic endometritis with recurrent implantation failure and poor reproductive outcomes.[12] The association between endometritis and impaired fertility may be mediated through chronic inflammation disrupting the endometrial environment essential for embryo implantation and development.[7]

Spontaneous vaginal delivery was reported in 61.3%, whereas a history of lower-segment cesarean section was found in 33.6% of patients with endometritis. This could be attributed to ascending infections and surgical trauma.[2] Compared to SVD, the lower incidence of endometritis patients performing LSCS in the cohort reflects the strict aseptic procedures followed in the operating theater in our hospital. Furthermore, other instrumentation history revealed that 26.3% of patients used IUDs and 21.9% underwent cervical cerclage, both altering the uterine environment and predisposing to infection.[1,10]

Laboratory findings reflected the systemic inflammatory response often seen in chronic endometritis. Leukocytosis (26.3% of cases) and neutrophilia (33.6% of cases) suggest persistent inflammation.[9,11] Although chronic endometritis typically lacks the pronounced leukocytosis seen in acute pelvic infections, subtle hematological shifts are increasingly recognized as part of its clinical profile.[10] Monocytosis (34.3% of cases) may indicate monocyte-driven tissue remodeling. Anemia, identified in nearly half of the patients (46.7%), is likely multifactorial, potentially arising from chronic inflammatory states, menstrual irregularities such as AUB, or nutritional deficiencies.[7] Elevated platelet counts, seen in 29.2% of cases, further support the association with chronic inflammation, as thrombocytosis is a known acute-phase reactant response. The rise in fibrinogen levels in 34.3% of patients is particularly notable, given that fibrinogen is a sensitive acute-phase reactant produced in response to inflammatory cytokines such as IL-6, which have been implicated in endometrial immune dysfunction.[9] Additionally, an elevated neutrophil-to-lymphocyte ratio (NLR), detected in 30.4% of cases, supports the presence of systemic inflammatory activity in a subset of patients. Although NLR is a simple and cost-effective marker of systemic inflammation, it is not specific to endometritis, and its sensitivity is limited, as most patients in this cohort did not demonstrate elevated values.[10] NLR remains a useful adjunctive marker but cannot replace definitive diagnostic methods. Collectively, these laboratory abnormalities reflect the systemic manifestations of localized endometrial inflammation and highlight the potential utility of basic hematological and inflammatory markers in raising clinical suspicion for chronic endometritis. However, given the nonspecific nature of these changes, they should be interpreted in conjunction with histopathological and microbiological findings to ensure accurate diagnosis and management.[7,9,10]

Genital swab testing revealed only normal flora in 61.1% of cases, highlighting the diagnostic challenge of chronic endometritis. This aligns with prior studies indicating that chronic endometritis is often culture-negative, either due to low bacterial loads, intracellular pathogens, or organisms embedded within biofilms that evade standard detection methods.[9,10] These limitations highlight the need for more sensitive molecular techniques in routine diagnostics. Among culture-positive cases, Gram-positive bacteria (23.4%) were the predominant organisms, which is consistent with prior findings implicating *Streptococcus* species and other Gram-positive flora in endometrial infections.[2,12] The relatively high detection of fungal organisms (19.0%) in our cohort raises important clinical considerations, particularly given that immunosuppressive conditions, recent antibiotic use, and the presence of IUDs are well-established risk factors for fungal colonization and infection.[12,21] Gram-negative bacteria were less common (5.1%), reflecting a predominance of chronic over acute infection profiles.[3,4] Detailed microbial profiling revealed that *Candida* spp. was the most commonly isolated organism (16 cases). This underlies the importance of considering fungal infections, especially in patients with diabetes, antibiotic use, or IUDs.[9,21] *Streptococcus agalactiae* (Group B *Streptococcus*), found in 13 cases, was the most common bacterial isolate. Its association with both obstetric complications and gynecological infections has been well established, and its presence supports its role as a potential pathogen in endometrial inflammation.[2,22] Similarly, *Escherichia coli* (5 cases) and *Enterococcus faecalis* (3 cases) are typical urogenital and gastrointestinal tract flora, reflecting possible ascending infections, particularly relevant in postpartum or post-procedural settings.[3,4,23] Biofilm-forming organisms like *Staphylococcus aureus*, *S. lugdunensis*, and *Gardnerella vaginalis* were also detected. Less frequently, *Lactobacillus* spp. and *Chlamydia trachomatis* were isolated, the latter known for causing subclinical endometrial inflammation in younger sexually active populations.[8] These findings highlight that negative cultures do not exclude endometritis and reinforce the need for integrating histopathology and symptomatology. Expanding diagnostic strategies to include PCR and immunohistochemical techniques could improve pathogen detection.[8,11]

Conclusion

Although this retrospective cross-sectional study offers valuable insights, it has some limitations. Its design precludes causal inference, and the relatively small sample size may limit generalizability. The predominance of chronic cases may introduce diagnostic bias and restrict comparison with acute presentations. Reliance on retrospective records resulted in incomplete data for variables such as inflammatory markers and occasional gaps in microbiological or clinical documentation. Conventional cultures may have underdetected fastidious or biofilm-forming organisms. Laboratory markers showed limited diagnostic accuracy, underscoring the need for multi-modal approaches. On the other hand, the study highlighted the central role of routine histopathology in achieving an accurate diagnosis of endometritis. Future research should adopt prospective designs, standardize clinical and laboratory data collection, incorporate molecular diagnostics, and involve larger multicenter cohorts across the country or the region.

Acknowledgements

We would like to express our immense gratitude to Prof. Yahya al-Farsi for his assistance with the statistical analysis.

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Additional information

Ethical statement

- The authors declared that no clinical trials were used in the present study.
- The authors declared that no experiments on humans or human tissues were performed for the present study.
- The Ethics Committee of the College of Medicine and Health Sciences, Sultan Qaboos University, granted a waiver of written informed consent, citing the retrospective nature of the study and the utilization of anonymized data.
- Ethical approval for the study was obtained from the Medical Research Ethics Committee (MREC), College of Medicine and Health Sciences, Sultan Qaboos University (Approval No. MREC#3285, dated May 12, 2024). The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki (1964) and its subsequent revisions.
- The authors declared that no experiments on animals were performed for the present study.
- The authors declared that no commercially available immortalized human and animal cell lines were used in the present study.

Conflict of interest

The authors have declared that no competing interests exist.

Artificial Intelligence (AI) use

The authors accept full responsibility for the content of the manuscript, including the disclosure of any use of AI. No AI tools were used in the preparation of this manuscript.

Funding

No funding was reported.

Author contributions

All authors have actively contributed to generate the work and have agreed to the contents of the manuscript in its submitted form. The work is submitted with the full knowledge and approval of our institution. The manuscript text has been revised by an expert in English language. All procedures performed in the current study were approved by the ethics committee of Sultan Qaboos University in accordance with the 1964 Helsinki declaration and its later amendments.

Data availability

All of the data that support the findings of this study are available in the main text.