

Epidemiological and Diagnostic Characteristics of Esophageal Candidiasis at the Borgou-Alibori Departmental University Hospital Center in the Republic of Benin in 2025

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Abstract

Introduction: Esophageal candidiasis is an opportunistic disease that is frequently associated with immunosuppressive conditions. Its prevalence remains substantial worldwide, particularly among immunocompromised individuals. The aim of this study was to describe the epidemiological and diagnostic characteristics of esophageal candidiasis in northern Benin in 2025.

Methods: A descriptive cross-sectional study with prospective data collection was conducted from February 3, 2025, to July 31, 2025. All patients, aged 18 and older, referred to the Borgou-Alibori Departmental University Hospital Center (CHUD-B/A) for upper gastrointestinal endoscopy were included. Those with suspected esophageal candidiasis identified during upper gastrointestinal endoscopy underwent mycological testing of samples taken from the lesions. The dependent variable was the presence of esophageal candidiasis diagnosed by upper gastrointestinal endoscopy and mycological examination.

Results: Among the 229 patients who underwent upper gastrointestinal endoscopy, esophageal candidiasis was diagnosed in 41, representing a hospital prevalence of 17.9%. The mean age of these patients was 50.9 ± 13.5 years. The male-to-female ratio was 0.78. The most frequently reported symptoms were abdominal pain (61%), dysphagia (26.8%), and retrosternal pain (21.9%). Candida species were isolated in all patients, with *Candida albicans* accounting for 48.8% of the isolates. Among the known risk factors reported in the literature,

the most frequently observed in our patients were proton pump inhibitor use, antibiotic exposure, excessive alcohol consumption, cirrhosis, diabetes mellitus, and HIV infection. **Conclusion:** Esophageal candidiasis is highly prevalent at CHUD-B/A. It predominantly affects middle-aged adults, and women represented a slight majority of cases in the present study. Further prospective analytical studies involving larger sample sizes are required to identify factors associated with esophageal candidiasis and to describe the therapeutic and prognostic aspects of this condition.

Keywords

Esophageal Candidiasis, Dysphagia, *Candida*, Parakou

1. Introduction

Candida is a yeast that naturally colonizes the epithelial surfaces of the gastrointestinal and urogenital tracts in immunocompetent individuals. Under immunosuppressive conditions, excessive proliferation of *Candida* may occur, leading to the development of candidiasis [1]. Invasive *Candida* infection is a disease associated with advances in modern medicine and is recognized as a major cause of hospital-related morbidity and mortality [1] [2]. At least fifteen distinct *Candida* species are pathogenic to humans; however, more than 90% of invasive infections are caused by the five most common species: *Candida albicans*, *Candida glabrata*, *Candida tropicalis*, *Candida parapsilosis*, and *Candida krusei* [2]. Several factors have been identified as predisposing conditions for esophageal fungal infections. These include immunosuppression related to Human Immunodeficiency Virus (HIV) infection, prolonged corticosteroid therapy, chronic excessive alcohol consumption, disruption of the normal microbial flora following antibiotic use, hypochlorhydria resulting from long-term proton pump inhibitor (PPI) therapy, and comorbidities such as diabetes mellitus [2] [3].

Globally, the prevalence of esophageal candidiasis varies considerably. In resource-limited settings, where the burden of infections such as HIV remains high, higher prevalence rates have been reported [3]. According to a meta-analysis conducted in sub-Saharan Africa, the pooled prevalence of esophageal candidiasis among people living with HIV was 12% [4]. In HIV-infected individuals, esophageal candidiasis is associated with low CD4 T-lymphocyte counts, high HIV viral loads, and the absence of highly active antiretroviral therapy [5].

The symptoms most frequently reported in patients with esophageal candidiasis include odynophagia with or without dysphagia, nausea and vomiting, abdominal pain, fever, and weight loss. Less commonly, patients may report retrosternal discomfort or upper gastrointestinal bleeding [3]. It should be noted that 20% to 40% of patients with esophageal candidiasis remain asymptomatic [3]. For the diagnosis of this condition, upper gastrointestinal endoscopy is a highly reliable investigation, with a reported sensitivity of 100% and a specificity ranging from

83% to 92% [3].

In resource-limited countries, the management of this condition is hindered by limited access to diagnostic tools, including upper gastrointestinal endoscopy and microbiological culture facilities.

In Benin, data on this condition remain scarce. The present study was therefore undertaken to describe the epidemiological and diagnostic characteristics of esophageal candidiasis in northern Benin.

2. Patients and Methods

Study setting: The study was conducted in the digestive endoscopy unit and the clinical biology laboratory of the Borgou-Alibori Departmental University Hospital Center (CHUD-B/A), located in the city of Parakou, northern Benin.

Study design and period: A descriptive cross-sectional study with prospective data collection was conducted from February 3, 2025, to July 31, 2025.

Study population: All patients undergoing upper gastrointestinal endoscopy during the study period were eligible for inclusion. Adult patients (≥ 18 years) with endoscopic findings suggestive of esophageal candidiasis who subsequently underwent mycological examination of lesion specimens were included. Patients who did not provide informed consent to participate in the study were excluded.

Outcome assessment: Upper gastrointestinal endoscopy was performed by two consultant hepatogastroenterologists. Esophageal candidiasis was endoscopically suspected based on the presence of whitish plaques on the esophageal mucosa. Lesions were classified according to the Kodsi classification system [6]. Specimens were collected from the lesions and immediately placed into sterile containers containing physiological saline before being transported to the laboratory. The diagnosis was confirmed by mycological examination (both direct microscopic examination and a positive culture) demonstrating budding yeast cells and pseudohyphae on direct microscopic examination after Gram and methylene blue staining. Fungal culture was subsequently performed on Sabouraud agar and incubated at 37°C for 48 - 72 hours. *Candida albicans* was identified using the germ tube test. All mycological analyses were performed by the same specialist in bacteriology and mycology. Comorbidities were identified based on patient reports and by reviewing their medical records. Blood glucose levels, HIV testing, and complete blood counts were performed on patients with suspected esophageal candidiasis identified during upper gastrointestinal endoscopy, when a recent result was not available in their medical records.

Sampling method: An exhaustive recruitment strategy was adopted, including all patients meeting the eligibility criteria during the study period.

Variables: The dependent variable was the presence of esophageal candidiasis diagnosed by both upper gastrointestinal endoscopy and mycological examination. Independent variables included patients' sociodemographic, clinical, endoscopic and laboratory characteristics.

Data collection: Data were collected through patient interviews and review of

medical records.

Statistical analysis: Quantitative variables were expressed as mean $\pm$ standard deviation, whereas qualitative variables were presented as frequencies and percentages.

Ethical considerations: Prior to data collection, the study protocol received approval from the Local Ethics Committee for Biomedical Research of the University of Parakou (Approval No. 952/2024/CLERB-UP/SP/R/SA).

3. Results

3.1. Hospital Prevalence of Esophageal Candidiasis

During the study period, 229 patients underwent upper gastrointestinal endoscopy. Esophageal candidiasis was diagnosed (direct microscopic examination and positive culture) in 41 patients, corresponding to a hospital prevalence of 17.9% (41/229).

3.2. Sociodemographic Characteristics of Patients with Esophageal Candidiasis

The mean age of patients diagnosed with esophageal candidiasis was 50.9 ± 13.5 years. Twenty-three patients were female, representing a male-to-female ratio of 0.78. Among the 41 patients, 26 (63.4%) resided in urban areas, while 14 (34.1%) had no formal education. Regarding marital status, 30 patients (73.2%) were married. **Table 1** summarizes the distribution of patients according to their sociodemographic characteristics.

Table 1. Distribution of patients with esophageal candidiasis according to sociodemographic characteristics, CHUD-B/A, 2025 (n = 41).

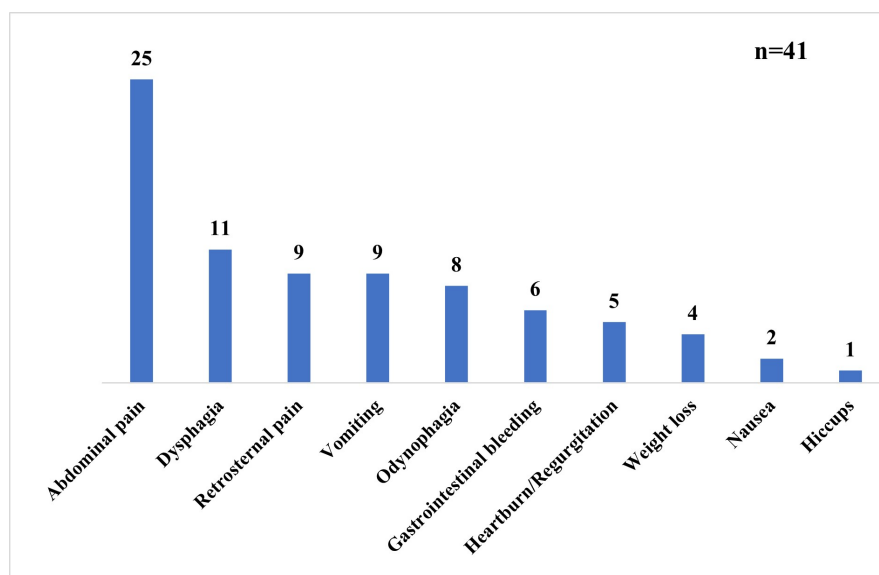
	N	%
Age group (years)		
<30	2	4.9
30 - 39	6	14.6
40 - 49	10	24.4
50 - 59	13	31.7
60 - 69	6	14.6
≥ 70	4	9.8
Sex		
Female	23	56.1
Male	18	43.9
Place of residence		
Urban	26	63.4
Rural	15	36.6

Continued

Marital status		
Married	30	73.2
Widowed	7	17.0
Single	2	4.9
Divorced	1	2.4
Cohabiting	1	2.4
Educational Level		
No formal education	14	34.1
Literate (non-formal education)	3	7.3
Primary education	5	12.2
Secondary education	13	31.7
Higher education	6	14.6

3.3. Clinical Characteristics of Patients with Esophageal Candidiasis

The most frequently reported symptoms were abdominal pain, observed in 25 patients (61%), and dysphagia, reported by 11 patients (26.8%). **Figure 1** illustrates the distribution of patients according to presenting symptoms. Among the 41 patients, 11 (26.8%) were overweight and 6 (14.6%) were obese.



A patient could present with more than one symptom simultaneously.

Figure 1. Distribution of patients with esophageal candidiasis according to presenting symptoms, CHUD-B/A, 2025 (n = 41).

3.4. Laboratory and Endoscopic Findings

Laboratory investigations revealed anemia in 13 patients (31.7%), lymphopenia in

4 (9.8%), thrombocytopenia in 4 (9.8%), and neutropenic leukopenia in 1 patient (2.4%).

Upper gastrointestinal endoscopy showed that esophageal candidiasis lesions were localized to the lower third of the esophagus in 20 patients (48.9%), whereas involvement of the entire esophagus was observed in 17 patients (41.5%). According to the Kodsi classification, 25 patients (61%) presented with grade I lesions. The endoscopic findings are summarized in **Table 2**.

Table 2. Distribution of patients with esophageal candidiasis according to upper gastrointestinal endoscopic findings, CHUD-B/A, 2025 (n = 41).

	n	%
Lesion location*		
Upper esophagus	3	7.31
Middle esophagus	13	31.7
Lower esophagus	20	48.9
Entire esophagus	17	41.5
Kodsi Classification		
Grade I	25	60.9
Grade II	11	26.8
Grade III	4	9.8
Grade IV	1	2.4

*Multiple lesion locations could be observed simultaneously in the same patient.

Of the 54 patients with endoscopic findings suggestive of esophageal candidiasis, direct microscopic examination and culture were positive in 41 (75.9%). Following the germ tube test, *Candida albicans* was identified in 20 patients (48.8%), whereas the remaining isolates were classified as *Candida* spp.

3.5. Predisposing Factors for Esophageal Candidiasis

Known risk factors for esophageal candidiasis reported in the literature and assessed among the 41 patients are summarized in **Table 3**. Chronic excessive alcohol consumption was identified in 9 patients (22%), diabetes mellitus in 4 patients (9.8%), and HIV infection in 4 patients (9.8%). With regard to medication use, the most frequently reported drugs were proton pump inhibitors (65.9%), penicillins (29.3%), fluoroquinolones (19.5%), macrolides (14.6%), and cephalosporins (7.3%).

4. Discussion

The present study described the epidemiological and diagnostic characteristics of esophageal candidiasis in northern Benin, a region of sub-Saharan Africa.

In this study, the hospital prevalence of esophageal candidiasis was high, affecting approximately one-fifth of patients undergoing upper gastrointestinal

Table 3. Distribution of known risk factors for esophageal candidiasis among patients at CHUD-B/A in 2025 (n = 41).

	n	%
Lifestyle factors		
Alcohol consumption*	9	22.0
Tobacco use	1	2.4
Comorbidities		
Cirrhosis	5	12.2
HIV infection	4	9.8
Diabetes mellitus	4	9.8
Proton pump inhibitor use	27	65.9
Antibiotic use		
Penicillins	12	29.3
Ciprofloxacin	8	19.5
Azithromycin/Clarithromycin	6	14.6
Ceftriaxone/Cefixime	3	7.3

*Excessive and chronic alcohol consumption; HIV: Human Immunodeficiency Virus; PPI: Proton Pump Inhibitor.

endoscopy. This hospital prevalence was higher than those reported by Kpossou *et al.* [7] in Cotonou, southern Benin, in 2023 (13.3%), Zoungrana *et al.* [8] in Burkina Faso in 2018 (9.1%), Ouattara *et al.* [9] in Ivory Coast in 2018 (4.1%), Reddah *et al.* [10] in Togo in 2001 (2.7%), and Sumantri *et al.* [11] in Indonesia in 2011 (2.6%). The observed differences may be explained by variations in sampling techniques, study methodologies, and, most importantly, by the use or absence of mycological confirmation for diagnosis.

The mean age of patients with esophageal candidiasis was 50.9 ± 13.5 years in the present study conducted in northern Benin. This finding is consistent with that reported in southern Benin (48.2 ± 18.0 years) [7]. Nationally, the mean age observed in our study is also comparable to the global average reported in the literature (55.5 years) [1]. Although sex has not been identified as a risk factor for esophageal candidiasis [12], a female predominance was observed in the present study (male-to-female ratio = 0.78). Excessive alcohol consumption was reported in 22.0% of patients with esophageal candidiasis. Excessive and chronic consumption of alcoholic beverages may contribute to the development of esophageal candidiasis because it causes local injury through irritation and inflammation of the esophageal lining, thereby facilitating colonization by *Candida* species [1].

HIV infection remains a major predisposing factor for the development of esophageal candidiasis, particularly among individuals with suboptimal virological control [1] [3]. A meta-analysis conducted in sub-Saharan Africa reported a prevalence ranging from 1% to 52% among HIV-infected patients [4]. In Ivory

Coast, the prevalence of oro-esophageal candidiasis among people living with HIV was reported to be 75.6% in 2011 [13]. To our knowledge, the prevalence of esophageal candidiasis among HIV-infected individuals in Parakou, northern Benin, has not yet been documented. In the present study, HIV infection was documented in 9.8% of patients with esophageal candidiasis. In contrast, in Cotonou, southern Benin, nearly three out of ten patients with esophageal candidiasis were HIV-positive [7]. In our study, diabetes mellitus was present in 9.8% of patients with esophageal candidiasis, a finding comparable to that reported in Cotonou in 2023 [7]. Diabetes mellitus is widely recognized as a major risk factor for fungal infections, particularly those caused by *Candida* species [14]. Chronic hyperglycemia promotes the proliferation and persistence of *Candida* organisms.

Broad-spectrum antibiotics increase the risk of esophageal candidiasis through disruption of the normal microbial flora. The antibiotic classes most commonly implicated include penicillins (amoxicillin and amoxicillin-clavulanic acid), fluoroquinolones, and tetracyclines [1] [3]. These data are consistent with our findings, which showed that penicillin use (29.3%) and fluoroquinolone use (19.5%) were frequently reported. Proton pump inhibitor use was reported in 65.9% of patients with esophageal candidiasis. Proton pump inhibitor therapy is a well-established risk factor for this condition [1] [3]. By reducing gastric acidity through an increase in gastric pH, inhibiting lymphocyte cytotoxic activity, and decreasing salivary secretion, proton pump inhibitors may facilitate *Candida* overgrowth within the oral cavity and esophagus [3]. These findings underscore the importance of raising public awareness regarding the risks associated with self-medication and promoting rational prescribing practices among healthcare professionals, particularly concerning antibiotics and proton pump inhibitors.

Upper gastrointestinal endoscopy raised suspicion of esophageal candidiasis in 54 patients, whereas mycological examination confirmed the diagnosis in 41 patients (75.9%). This result is comparable to that reported by Reddah *et al.* [10] in Togo, where esophageal candidiasis was confirmed in 23 of 26 endoscopically suspected cases (88.4%). These findings suggest that although upper gastrointestinal endoscopy is a highly reliable diagnostic tool, mycological sampling remains essential for establishing a definitive diagnosis. Following germ tube testing, *Candida albicans* was identified in approximately half of the patients. Higher proportions of this species have been reported elsewhere. Indeed, Kpossou *et al.* [7] in southern Benin, Maïga *et al.* [15] in Mali, Reddah *et al.* [10] in Togo, and Ouattara *et al.* [13] in Ivory Coast identified *Candida albicans* in all of their patients. Our findings indicate that more than half of the isolates were not identified as *Candida albicans* by the germ tube test. Further species-level identification studies are needed to characterize these isolates. Their precise identification is essential to ensure optimal patient management and guide antifungal therapy.

This study has limitations: its single-center design, the small number of confirmed cases of esophageal candidiasis, and the failure to identify species other than *albicans*.

5. Conclusion

This study conducted in northern Benin, sub-Saharan Africa, highlights the high prevalence of esophageal candidiasis in this setting. The disease predominantly affects middle-aged adults, and women represented a slight majority of cases in the present study. The most frequently reported symptoms were abdominal pain, dysphagia, and retrosternal pain. Upper gastrointestinal endoscopy combined with mycological examination provides reliable diagnostic confirmation. *Candida* species were isolated in all cases, and more than half of the isolates were not identified as *Candida albicans* by the germ tube test. Further studies are warranted to identify *Candida* isolates at the species level and to evaluate their antifungal susceptibility profiles, particularly with regard to fluconazole, which remains the first-line treatment for esophageal candidiasis in our setting.

Author Contributions

All authors contributed to data collection and to reviewing and revising the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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