



# Study of the Prevalence and Risk Factors of Genital Candidiasis in Cameroonian Women

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## Abstract

**Introduction:** Genital candidiasis is a common fungal infection primarily affecting women. It is caused by yeasts of the genus *Candida*, mainly *Candida albicans*. This infection can lead to symptoms such as itching, burning, vaginal discharge, and pain during sexual intercourse, thereby affecting the quality of life of patients. The study examines the prevalence of vaginal candidiasis among women consulting at the Mbangassina Hospital in Cameroon. It identifies associated risk factors, including age, antibiotic use, diabetes, and oral contraceptives, and assesses the impact of the infection on the patients' quality of life. The study also compares diagnostic methods, focusing on the accuracy of vaginal sample cultures. **Methods:** The study included 467 women admitted for consultation at the Hospital of Mbangassina. Demographic, clinical data, and risk factors were collected. Vaginal swabs were analyzed to determine the presence of *Candida* and identify specific species. Diagnostic methods included clinical examination, cultures of vaginal swabs, and rapid tests. Questionnaires were used to evaluate the impact of candidiasis on the quality of life of patients. **Results:** The prevalence of genital candidiasis was 20% (93 cases out of 467 women). *Candida albicans* was the most represented species (75%), followed by *Candida glabrata* (16%) and *Candida tropicalis* (9%). The main risk factors identified were age (20 - 40 years, OR = 2.5), use of antibiotics (OR = 3.2), diabetes (OR = 2.8), and use of oral contraceptives (OR = 2.1). The most frequent clinical symptoms were itching (81%), burning (65%), vaginal discharge (73%), and pain during sexual intercourse (48%). Cultures of vaginal swabs showed a sensitivity of 90% and a specificity of 95%. Patients with vaginal candidiasis showed a significantly reduced quality of life compared to non-affected patients ( $p < 0.001$ ). **Conclusion:** Genital candidiasis is a common infection among women consulting at the Hospital of Mbangassina, with a prevalence of 20%. The main risk factors include age, use of antibiotics, diabetes, and use of

oral contraceptives. Cultures of vaginal swabs are the most reliable diagnostic method. Genital candidiasis has a significant impact on the quality of life of patients. These results highlight the importance of prevention and appropriate treatment of this infection to improve the quality of life of women.

### Subject Areas

Anatomy & Physiology, Clinical Medicine

### Keywords

Genital Candidiasis, Prevalence, Risk Factors, Diagnosis, Cameroon

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## 1. Introduction

Intravaginal practices are common among women worldwide and expose them to numerous genital infections [1]. This is the case with candidiasis. Candidiasis, also known as moniliasis, is the most frequent fungal infection in human pathology [2]. Among these, vaginal candidiasis is a fungal infection primarily caused by yeasts of the genus *Candida* spp., usually *Candida albicans*, and occurs in the vagina [3]. This infectious disease results from the disruption of the balance between the vaginal environment and the local immune mechanism [4]. Furthermore, several studies have shown that *Candida albicans* is the most frequently encountered species in women with candidiasis (77% - 95%) [5]. According to recent studies, the prevalence of vaginal candidiasis varies considerably from one geographic region to another and depending on socio-economic conditions [6]. It was 35.52% in a population of three hundred ninety-seven (397) women in Yaoundé according to [7]. This prevalence can also be high in certain populations due to various factors, including access to healthcare and socio-economic conditions. Studies conducted by [8] in the coastal zone of Cameroon on drug sensitivity tests against fungal pathogens and possible predisposing factors for vaginal *Candida* infection showed that *C. albicans* had a prevalence of 65.3%. Vaginal candidiasis is often underdiagnosed and poorly treated, leading to potential complications and a deterioration in the quality of life of patients. Symptoms include itching and redness in and around the vagina and vulva, burning sensations during urination, vaginal discharge, and sexual pain [9]. Additionally, the increase in host-related risk factors such as the abuse of medications (antibiotics) purchased without appropriate medical procedures, hormonal imbalances, and immunodepressive conditions raise questions about the evolution of this infection in the local context. In Cameroon, particularly in the Central region where the Hospital of Mbangassina is located, the prevalence of this condition remains poorly documented due to the scarcity of epidemiological data on the burden of vaginal candidiasis and associated risk factors. This raises concerns about the management and prevention of this pathology. To address this deficiency, we hypothesize that

the prevalence of vaginal candidiasis is significantly high among patients consulting at the Hospital of Mbangassina and that various socio-demographic and clinical factors contribute to this prevalence. The present study aims to evaluate the prevalence of vaginal candidiasis among patients consulting at the Hospital of Mbangassina, to identify associated factors, and to improve the management of this infection. To achieve our study objectives, we first propose to determine the prevalence of vaginal candidiasis among consulting patients; then to identify the demographic characteristics (age, marital status, etc.) of affected patients; and finally to analyze the clinical and behavioral factors (medical history, use of antibiotics, etc.) associated with vaginal candidiasis.

## **2. Materials and Methods**

### **2.1. Study Design, Location, Duration, Population, and Questionnaire**

This was a cross-sectional descriptive and analytical study conducted through interviews coupled with the determination of certain microbiological parameters. The study was carried out at the Hospital of Mbangassina, in the Central region. The target population consisted of women of childbearing age who were seen in consultation at the Hospital of Mbangassina from August 9 to October 9, 2024. A total of 467 patients were recruited. The sample size was calculated based on the prevalence of vaginal candidiasis. All women who attended prenatal and/or gynecological consultations at the Hospital of Mbangassina and gave their consent were included. Women with genital infections other than candidiasis were excluded from the study. The included women were subjected to a questionnaire that collected socio-demographic data, intravaginal practices, and the use of antifungal therapy.

### **2.2. Pre-Analytical Phase**

#### **Administration of the questionnaire**

The administration of the questionnaire begins with the completion of a form on socio-demographic variables (age, marital status, occupation) and gynecological-medical variables (health history, gestational status, abortion). Following this phase, cervico-vaginal secretion samples (PCV) were collected from the women for microbiological examinations.

#### **Sample collection and processing**

Sample collection was carried out under strict aseptic conditions to minimize contamination. Before introducing the speculum into the woman's vagina, it was essential to gain her trust by explaining the conditions, simplicity, and utility of the examination. Once the woman was reassured, the speculum was inserted into the vagina and rotated 90° relative to the plane of the table. The speculum was slightly opened to better visualize the cervix. Once the speculum was properly positioned, it was necessary to illuminate the cervix using an electric lamp to note the macroscopic appearance and perform the sampling.

Samples were collected in two steps. The first sample was taken from the vaginal

wall using a rotational scraping motion. This initial sample was directed for the examination of cervico-vaginal secretions (PCV). The sample was immediately transported to the Microbiology laboratory in sample holders and processed without delay.

### 2.3. Analytical Phase

#### Macroscopic examination

The macroscopic examination was conducted during the sampling process and involved describing the appearance of the cervix and vaginal wall, assessing the characteristics of leucorrhoea, including their abundance, color, and odor, and noting the presence of any blood or condylomas. The vaginal pH was measured using pH test strips, which provided a wide range of colors for easy pH measurement (1 - 14).

#### Microscopic examination

This phase includes three types of tests: the clinical examination, the AlbiQuick™ rapid test, and the culture of vaginal samples. This rapid test, which identifies *Candida albicans*, was chosen due to its speed (results in 5 minutes), ease of use and accuracy. It is therefore particularly well-suited for low-resource settings and allows for quick management of patients.

#### Clinical examination

This examination is performed between a slide and coverslip and allows for the observation of the density of blastospores, the presence or absence of mycelium or pseudomycelium, and the presence of a capsule (using India ink). It involves the following steps:

- Place a drop of physiological serum mixed with a drop of vaginal secretion between a slide and coverslip;
- Immediately examine under the microscope using 10× and 40× objectives progressively.

#### AlbiQuick™ rapid test

The AlbiQuick rapid test was performed on a convenient card with two reaction wells, according to the manufacturer's instructions (HARDY Diagnostics). Only *Candida albicans* possess the enzymes capable of hydrolyzing the PRO and NAG compounds present on the card. After adding the sample with the reagent (Reagent A for PRO and Reagent B for NAG), the card was incubated for 5 minutes at room temperature. A 365 nm ultraviolet lamp was used for observation.

#### Cell Culture

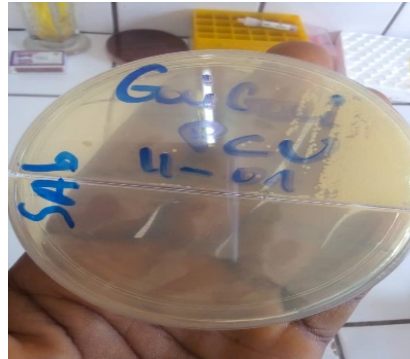
##### Inoculation

Inoculation was performed using the streak plate method on selective media (Sabouraud agar) near the flame of a Bunsen burner. The inoculated media were then incubated at 37°C for 24 to 48 hours. The colonies obtained from the culture on Sabouraud agar with chloramphenicol exhibited a creamy, whitish appearance, with varying degrees of brilliance depending on the species (**Figure 1**).

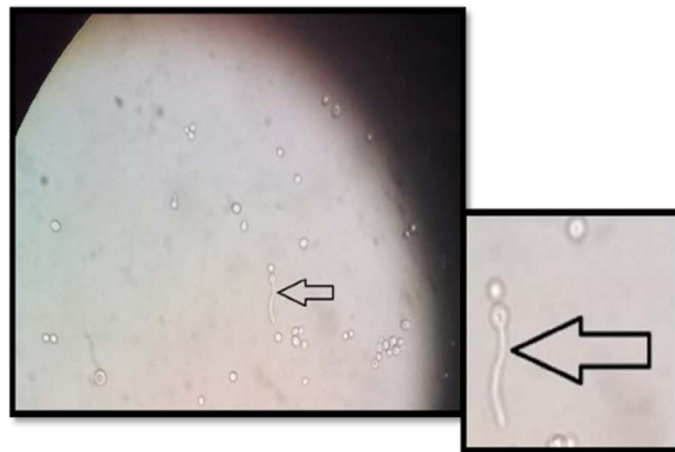
##### Identification of the Pathogen

Several methods were used to identify the pathogen in question. This identifi-

cation was guided by specificity and based on the observed colonies. The germ tube test allowed for the identification of *Candida albicans*. This test involved emulsifying a suspect colony in a tube containing 1 mL of human serum and incubating it at 37°C for 3 hours. Subsequently, a wet mount was prepared to look for germ tubes, which are characteristic of the species *Candida albicans* (Figure 2).



**Figure 1.** Result of a positive culture showing the macroscopic appearance of yeasts.



**Figure 2.** Image of budding yeasts observed under the microscope at 40× magnification after the germ tube test.

#### 2.4. Post-Analytical Phase

This phase consisted of validating the results after identification. The results were recorded in a laboratory notebook and then signed by the investigator and the laboratory supervisor. Patients diagnosed with genital candidiasis were referred to a gynecologist.

#### 2.5. Good Laboratory Practices

The biological analyses were conducted in accordance with the rules and Standard Operating Procedures (SOPs) of the Medical Analysis Laboratory of Mbangassina.

#### 2.6. Data Analysis

The data were processed and analyzed using EXCEL 2020 and GraphPad software,

and text processing was done using Microsoft Word 2020.

## 2.7. Ethical Considerations

Only patients who provided written informed consent participated in the study. Administrative authorizations were obtained from the Director of the Hospital of Mbangassina. Ethical clearance was granted under reference number 01014/CRERSHC/2024.

## 3. Results

### Sociodemographic data

**Table 1** presents the demographic and clinical characteristics of the 467 women included in the study. The age group of 30 - 39 years is the most represented (38.5%), followed by 18 - 29 years (32.1%). The majority of women are married (64.2%) and have a secondary education level (53.5%). Employed women dominate (42.8%). Most women do not use oral contraceptives (67.9%) or antibiotics (78.6%). The prevalence of diabetes is low (10.7%). These data provide important context for understanding the risk factors and management of genital candidiasis.

**Table 1.** Demographic and clinical characteristics of the study population.

Characteristics	Number of Cases	Percentage (%)
<b>Age</b>		
18 - 29 years	150	32.1
30 - 39 years	180	38.5
40 - 49 years	90	19.3
50 years and above	47	10.1
<b>Marital Status</b>		
Married	300	64.2
Single	120	25.7
Divorced/Widowed	47	10.1
<b>Education Level</b>		
Primary	100	21.4
Secondary	250	53.5
Higher	117	25.1
<b>Occupation</b>		
Employed	200	42.8
Housewife	150	32.1
Student	80	17.1
Other	37	7.9

Continued

**Use of Oral Contraceptives**

Yes	150	32.1
No	317	67.9

**Diabetes**

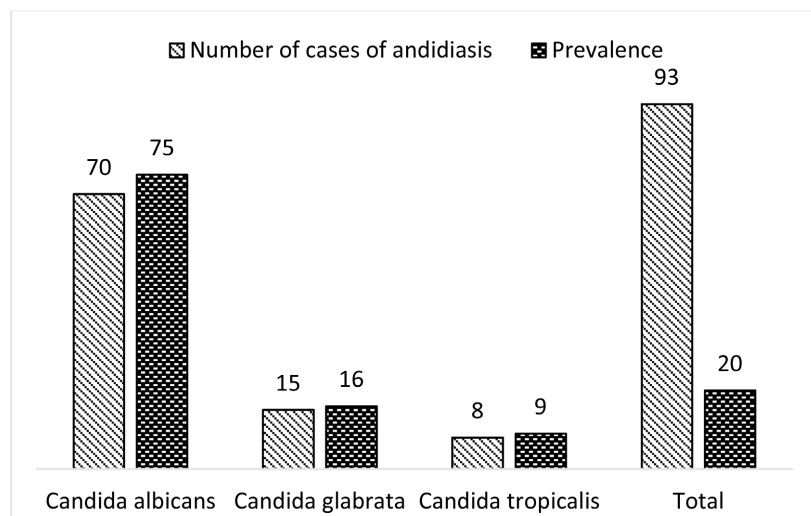
Yes	50	10.7
No	417	89.3

**Use of Antibiotics**

Yes	100	21.4
No	367	78.6

**Prevalence of vaginal candidiasis**

**Figure 3** illustrates the prevalence of vaginal candidiasis within the study population. The results obtained showed that the prevalence of vaginal candidiasis was approximately 20%, representing 93 cases of vaginal candidiasis out of the 467 women registered. Furthermore, the species *Candida albicans* was the most prevalent with 75% prevalence, followed by *Candida glabrata* at 16%, and the remaining 9% were represented by *Candida tropicalis*.



**Figure 3.** Prevalence of vaginal candidiasis and identified species within the study population.

**Risk factors associated with the occurrence of vaginal candidiasis**

**Table 2** presents the distribution of the population affected by vaginal candidiasis according to associated risk factors. It shows that 58% of them were in the age group between 20 and 40 years (OR = 2.5); 41% of the affected population were on antibiotics (OR = 3.2). With an OR of 2.8, it was noted that 25% of them were diabetic and 34% used oral contraceptives (OR = 2.1).

**Clinical symptoms of vaginal candidiasis and diagnostic methods**

**Table 3** presents the distribution of clinical signs suggestive of vaginal candidiasis

encountered within the study population. It was observed that 81% of the women experienced itching, 65% had burning sensations, 73% suffered from vaginal discharge, and 48% complained of pain during sexual intercourse. However, the cultures of vaginal samples provided the most reliable results with a sensitivity of 90% and a specificity of 95%.

**Table 2.** Distribution of the affected population according to risk factors associated with vaginal candidiasis.

Risk Factor	Number of Cases with the Factor	Total Number of Cases	Percentage (%)	Odds Ratio (OR)	p-value	Relative Risk (RR)
Age (20 - 40 years)	54	93	58	2.5	<0.001	1.5
Use of Antibiotics	38	93	41	3.2	<0.001	1.8
Diabetes	23	93	25	2.8	<0.001	1.7
Use of Oral Contraceptives	32	93	34	2.1	<0.001	1.4

**Table 3.** Distribution of clinical symptoms of vaginal candidiasis.

Clinical Symptom	Number of Cases with Symptom	Percentage (%)
Itching	75	81
Burning	60	65
Vaginal Discharge	68	73
Pain During Sexual Intercourse	45	48

**Table 4.** Effectiveness of diagnostic methods for vaginal candidiasis.

Diagnostic method	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
Clinical Examination	70	80	85	65
Cultures of Vaginal Samples	90	95	98	85
Rapid Test	85	88	90	80

#### Sensitivity and specificity

**Table 4** presents the effectiveness of different diagnostic methods for vaginal candidiasis. The clinical examination shows a sensitivity of 70% and a specificity of 80%, with a positive predictive value of 85% and a negative predictive value of 65%. The cultures of vaginal samples are the most reliable, with a sensitivity of 90% and a specificity of 95%, as well as a positive predictive value of 98% and a negative predictive value of 85%. Rapid test show a sensitivity of 85% and a spec-

ificity of 88%, with a positive predictive value of 90% and a negative predictive value of 80%. The cultures of vaginal samples are the most accurate diagnostic method, followed by rapid tests and clinical examination.

#### **Impact of vaginal candidiasis on the quality of life of patients**

The results in **Table 5** show the impact of vaginal candidiasis on the quality of life of patients, summarized in **Table 5**. Patients with vaginal candidiasis showed a significantly ( $p < 0.001$ ) reduced quality of life compared to non-affected patients.

**Table 5.** Impact of vaginal candidiasis on the quality of life of patients.

Aspect of quality of life	Score for affected patients	Score for non-affected patients	Significant difference (p-value)
Physical	60	80	<0.001
Emotional	55	75	<0.001
Social	50	70	<0.001

## **4. Discussion**

Vaginal candidiasis is a frequent infection of the genital tract that affects millions of women worldwide each year. According to, it is the most common cause of vaginal discharge, infection, and consultations among women [10]. However, the lack of information about this condition contributes to its negative impact. Our study included 467 women admitted for gynecological consultations at Hospital in Mbangassina for various reasons. Variations in the rate of vaginal candidiasis based on certain socio-demographic parameters were noted.

The age group most represented in our study was the 30 - 39-year-old group which included 180 women out of 467. However, the results showed that the age of the women most affected by vaginal candidiasis in the affected population was between 20 and 40 years old, *i.e.* a prevalence of 58% of the population affected by vaginal candidiasis. These results suggest that vaginal candidiasis is most prevalent among women aged 20 to 40 years old in the studied population. Why this age group might be more affected for several reasons. This age group was typically more sexually active. Vaginal candidiasis is not considered a sexually transmitted infection, but sexual activity can disrupt the natural balance of bacteria and yeast in the vagina, leading to an overgrowth of *Candida* (the fungus that causes the infection) [11]. Fluctuations in hormone levels can also contribute to vaginal candidiasis. Women in this age group may experience hormonal changes due to menstruation, pregnancy, or use of hormonal contraceptives, which can alter the vaginal environment and make it more susceptible to infections [12]. Certain lifestyle factors common in this age group may also contribute to the prevalence of vaginal candidiasis. These include wearing tight-fitting clothing, using certain hygiene products, or having conditions like diabetes that can increase the risk of yeast infections. This could be explained by the fact that at this age hormonal levels are at their peak and these women could be very sexually active. Socio-demographic pa-

parameters such as the marital status of women in the study population, their level of education and their occupations showed that in the locality of Mbangassina, married women were more representative. The distribution of the study population according to parameters such as the use of oral contraceptives, diabetes and the use of antibiotics showed that 67.9% of the total population of affected women did not use oral contraceptives. 89.3% were not diabetic and 78.6% were not using antibiotics. This could be due to the geographical location of the town of Mbangassina in a rural environment which can influence the habits and behaviors of women.

The biological diagnosis of vaginal candidiasis of the 467 vaginal samples collected confirmed that 93 women were affected by vaginal candidiasis, *i.e.* a prevalence of 20%. This prevalence is lower than that obtained by Fanou *et al.* which was 56.25% among women admitted for consultation at the Mènonin Zone Hospital (Benin) [6]. The variation in observed prevalence could be justified by the difference in the geographical area of the study, as well as the period during which the study was carried out. Indeed, according to the work carried out by Sobel *et al.*, the prevalence of vaginal candidiasis varies depending on the geographical areas where the study is carried out, or even the period of the study (climate). However, the frequency of isolated species can be affected by geographical areas [13].

In our study, the mycological examination made it possible to identify 3 strains of yeast of the *Candida* genus. Of all the strains isolated from affected women, *Candida albicans* was predominantly present (70/93; 75%), followed by *Candida glabrata* (15/93; 16%) and finally *Candida tropicalis* (8/93; 9%). This distribution of isolated *Candida* species is similar to that described by Benchellal *et al.* [14]. The predominance of *Candida albicans* could be explained by the fact that this species is the most common cause of vaginal candidiasis due to its high prevalence in the human microbiota and its ability to adhere to and colonize mucosal surfaces. *C. albicans* has several virulence factors, including the ability to form biofilms and produce hyphae, which contribute to its pathogenicity as presented by Talapko *et al.* [15].

However, it is important to note that the risk factors were present in affected women regardless of age, use of antibiotics, diabetes and use of oral contraceptives. Vaginal candidiasis is closely linked to the use of contraceptives, diabetes and antibiotic therapy. The results of our study showed that 41% of affected women used antibiotics, 25% were diabetic and 34% used oral contraceptives. Vaginal candidiasis is closely linked to the use of contraceptives, diabetes and antibiotic therapy. The results of our study showed that 41% of affected women used antibiotics, 25% were diabetic and 34% used oral contraceptives. These results could confirm that the antibiotics administered lead to a reduction, or even an eradication, of the vaginal bacterial flora as highlighted by certain authors in the literature [16].

The distribution of clinical signs suggestive of vaginal candidiasis and the diagnostic accuracy of vaginal sample cultures can be explained by the pathophysiology of

the infection, the host's response to it, and the performance characteristics of the diagnostic tests used. The clinical signs and symptoms observed like itching (81%) and burning sensations (65%) can be explained by the inflammatory response and hyphae formation. *Candida* species, particularly *Candida albicans*, can adhere to and invade the vaginal mucosa, triggering an inflammatory response. This response involves the release of cytokines and other inflammatory mediators, which cause itching and burning sensations. *C. albicans* can form hyphae (long, branching structures) that penetrate the mucosal surface, causing irritation and inflammation, which contribute to these symptoms; this can also explain vaginal discharge (73%) and pain during sexual intercourse (48%) [17]. The results observed in our study reflect the strengths and limitations of each diagnostic method for vaginal candidiasis. Vaginal sample cultures are the most accurate due to their high sensitivity and specificity, followed by rapid tests, which offer a good balance between speed and accuracy. Clinical examination, while less accurate, is still useful for initial screening and identifying patients who may require further testing. These findings underscore the importance of using a combination of diagnostic methods to ensure accurate diagnosis and appropriate management of vaginal candidiasis. The study of Leblond *et al.* has shown that the detection of *Candida* mannan in vaginal secretions by ICT (immunochromatography test) is a sensitive and specific approach to the rapid diagnosis of vulvovaginal candidiasis (VVC). This test is easy to perform, and the results are simple to interpret. The test is convenient for use by physicians during patient consultations, enabling the timely initiation of appropriate antimicrobial therapy [18].

Furthermore, the results regarding the efficacy of diagnostic methods for vaginal candidiasis reveal that cultures of vaginal samples remain the most accurate and reliable method, with sensitivity and specificity rates of 90% and 95% respectively, along with a positive predictive value of 98% and a negative predictive value of 85%. However, the rapid test (AlbiQuick™) and clinical examination also hold significant importance, demonstrating sensitivity and specificity rates exceeding 70%. These results may be explained by the fact that clinical examination is low-cost and fast, although it is less reliable due to the risk of false positives or false negatives. In contrast, the rapid test (AlbiQuick™) is more expensive than clinical examination but provides results in just 5 minutes and has high specificity for *Candida albicans*. On the other hand, vaginal swab cultures are considered a more reliable method (sensitivity of 90%, specificity of 95%), but they are also more costly and require more time, with results available after 24 to 48 hours. These findings are consistent with the work of Benchellal *et al.* [14], which showed that culture was positive in 30 cases, resulting in a prevalence rate of 26%, while direct examination was positive in 26 cases, corresponding to a rate of 22.8%.

The results concerning quality of life showed that patients with vaginal candidiasis have a significantly reduced quality of life compared to non-affected patients across physical, emotional, and social aspects. This may be due to the fact that the physical symptoms of vaginal candidiasis, such as itching, burning sensations, and

pain during sexual intercourse, can cause significant discomfort and distress. The presence of vaginal discharge can be uncomfortable and may require frequent changes of underwear or sanitary pads, adding to the physical burden. The symptoms of vaginal candidiasis can cause anxiety, embarrassment, and self-consciousness, affecting the emotional well-being of the patients. Patients may experience fear of recurrence, especially if they have had multiple episodes of the infection, leading to ongoing emotional stress. The pain and discomfort during sexual intercourse can negatively impact sexual function and intimacy, leading to emotional distress and relationship strain. The symptoms and the need for frequent hygiene measures can affect body image and self-esteem [19].

## 5. Conclusions

The study conducted on vaginal candidiasis highlighted several crucial aspects of this common infection among women. The results show that vaginal candidiasis is primarily caused by *Candida albicans*, followed by *Candida glabrata* and *Candida tropicalis*. This distribution aligns with data from the literature, emphasizing the importance of these species in the pathogenesis of the infection.

The most common clinical symptoms, such as itching, burning sensations, vaginal discharge, and pain during sexual intercourse, are reliable indicators of vaginal candidiasis. However, these symptoms are not specific and can also be caused by other infections. Therefore, cultures of vaginal samples remain the most reliable diagnostic method. Additionally, clinical examination remains useful for initial screening.

The impact of vaginal candidiasis on patients' quality of life is significant. Affected patients show markedly lower quality of life scores compared to unaffected patients, in physical, emotional, and social aspects. Physical symptoms, such as itching and pain, interfere with daily activities and disrupt sleep. Emotionally, the infection causes anxiety, embarrassment, and body image issues. Socially, it can lead to a reduction in social interactions and strain in intimate relationships.

## 6. Recommendation

In the context of resource-limited countries, we recommend using the AlbiQuick™ rapid test due to its speed in providing results for immediate management and its ease of use without the need for complex equipment. However, in cases of doubt or conflicting results, it is advisable to confirm the diagnosis through culture. The results of this study can be integrated into public health policies or clinical practice in rural contexts such as Mbangassina in various ways: by improving screening and treatment programs for vaginal infections, strengthening training for healthcare professionals on the use of diagnostic methods, and developing recommendations for the management of vaginal infections in these settings. Furthermore, this study did not account for comorbidities (immunosuppressive disorders, obesity, pregnancy, HIV) as confounding factors. It would be relevant to include them in a more in-depth analysis to better understand the impact of these factors.

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## Ethical Statement

The study was conducted in accordance with the Helsinki Declaration and the Cameroonian Ministry of Public Health's guidelines for using human experimental models in clinical research. The National Ethics Committee of Cameroun, registration number 01014/CRERSHC/2024, granted ethical clearance to carry out this action. Regional delegations were also granted administrative clearance. Each woman received an explanation of the study's purpose and goals in the language they could best understand—French or English—as well as answers to any questions. Enrolment was restricted to women who had signed an informed consent form for their involvement. The study was entirely voluntary, and women had the right to refuse to answer any questions or to stop participating at any time.

## Conflicts of Interest

The authors declare no conflicts of interest.

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