

Epidemiological and Clinical Profile of Vulvovaginitis Caused by *Candida albicans* in Tignère (Cameroon): a case study at the District Hospital

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Abstract

Vulvovaginal candidiasis (VVC) describes infections of the vulva and/or vagina that are brought on by yeast belonging to the genus *Candida*. One of the most well-known fungi that causes these illnesses is *Candida albicans*. The purpose of this study was to evaluate the prevalence and identify the factors associated with *C. albicans* infection among women seeking consultation at Tignère District Hospital. A prospective, cross-sectional, and descriptive investigation was carried out in the laboratory department of the hospital. Women were recruited using a consent form and questionnaire, and a cervical-vaginal swab was taken from each participant. Three methods were used to examine these samples: direct examination, culture on Sabouraud agar with chloramphenicol, and a germ tube test. XLSTAT was used to analyze the data with a significance threshold set at 5%. A variable was considered noteworthy if $P < 0.05$. There were 80 patients in the research population, ranging in age from [15–54]. The most represented age group was [25–34], followed by [15–24]. The prevalence of *C. albicans* infection was 48.80%, while the co-infection with *C. albicans* and *Gardnerella* was 10.00%. Type III pathogenic flora (41.25%, $n = 33$) was highly represented in the participant distribution based on vaginal flora type, followed by normal flora type II (33.75%, $n = 27$). Furthermore, the factors associated with *C. albicans* infection with $P < 0.05$ were parity (primiparous, multiparous, nulliparous with respective frequencies of 65.4%, 46.7%, and 11.1%) ($P = 0.018$), the use of public toilets (rarely, no, yes, with respective frequencies of 60.5%, 60.0%, and 31.3%) ($P = 0.038$), anal cleaning method (back to front, front to back with respective frequencies of 63.5% and 21.4%) ($P = 0.001$), and vaginal flora type (type IV, type III, type II, type I with respective frequencies of 100.0%, 72.7%, 25.9%, and 7.7%) ($P < 0.0001$). The type of underwear was marginally associated with *C. albicans* infection ($P = 0.056$). This study reveals a high prevalence of *C. albicans* infection among these women. However, given the high rate of pathological flora observed and certain identified associated factors, the issue of intimate hygiene among women remains a concern.

Keywords: Prevalence, Vulvovaginal candidiasis, *Candida albicans*, Factors associated.

INTRODUCTION

Candidiasis represents the most common fungal infection in human pathology. Among these, vulvovaginal candidiasis (VVC) is a frequent reason for gynecological consultations, ranking second worldwide after bacterial vaginosis (WHO, 2019). It is estimated that up to 75% of women will experience at least one episode of Candida vaginitis in their lifetime, and 40% to 50% will have recurrent episodes (Delma *et al.*, 2019; Sobel, 2007). The most frequently implicated pathogen is *Candida albicans*, a commensal yeast of the vaginal mucosa (Bergogne, 2007; Pihet *et al.*, 2013). Vulvovaginal candidiasis generally occurs following an imbalance in the vaginal flora and an alteration of local immune mechanisms, thus facilitating *Candida* colonization. Several factors contribute to this disruption, including hormonal changes, the use of oral contraceptives, lack of women's knowledge, poor hygiene practices, little or no awareness, antifungal resistance, and certain general conditions such as diabetes (Durand, 2017; Sobel, 2007). These factors disturb the vaginal flora and trigger clinico-biological manifestations, posing a risk to women's health (Moreira *et al.*, 2006; Vexa, 2006).

In Cameroon, vaginal candidiasis is a common reason for consultation in healthcare facilities and represents a public health concern (WHO, 2019). Recent studies report a high prevalence, estimated between 44.22% and 55.44% (Van Riel, 2021). Moreover, very few studies in Cameroon have focused on VVC caused by *C. albicans* (WHO, 2022). Supporting this view, Dr. Haileyesus Getahum, Director of the Global Coordination Department of Resistance, stated in a report on fungal infections: "We need more data and evidence on fungal infections and antifungal resistance in order to evaluate and improve the response to these priority fungal pathogens" (WHO, 2022). This situation underscores the need for a reevaluation of the epidemiology of vulvovaginal candidiasis to enhance its management.

This study aims to assess the prevalence and factors associated with *Candida albicans* infection among women attending the District Hospital of Tignère (DHT). It is crucial to better understand intimate hygiene practices and risk factors in this population, in order to contribute to reducing VVC and improving prevention strategies.

Significance of the Study

The study aims to improve women's awareness of intimate hygiene practices and risk factors associated with *C. albicans* VVC, reduce infection rates, promote preventive measures, enrich scientific knowledge, and provide valuable information to students.

MATERIALS AND METHODS

Study design

Type and period of the study: The study was cross-sectional and prospective with a descriptive aim. It was conducted from April 2 to May 31, 2024.

Study Population: The study included all women of reproductive age who attended consultations at the District Hospital of Tignère and provided written consent to participate in the study.

Eligibility Criteria: were included all women of reproductive age, sexually active women, and those who provided consent to participate. Additionally, participants needed to meet the required conditions for sample collection, and parental consent was obtained when necessary. On the other hand, women who did not meet the sample collection conditions as well as those with a history of antifungal treatment, were excluded.

Sampling Method: a non-probability sampling method was used, and the sample size was equal to the number of available participants who met the inclusion criteria during the study period.

Data Collection and Analysis

A survey form containing multiple-choice, open-ended, and semi-open-ended questions was used during this study. Data were collected directly from patients during consultations, and the questionnaire was administered in a manner that ensured the confidentiality and accuracy of the responses provided.

Variables Used in This Study: The variables employed in this study encompass a wide range of demographic, clinical, epidemiological, microbiological, and hygiene characteristics.

Reception and Registration of the Patient: Once the patient arrives at the laboratory after registration, she is directed to the consultation room where the purpose of the study is presented to her. After agreeing to participate, the conditions for sample collection are explained. If she meets the eligibility criteria, a survey form is completed in her presence. After the consultation, the patient is then directed back to the collection room for the sample collection.

Sample Collection: All vaginal samples were collected using a sterile vaginal speculum and two sterile swabs (one for direct examination and the other for culture). This involved collecting secretions from the entire vaginal cavity (excluding the endocervix) using both swabs. The patient is positioned on a previously disinfected gynecological examination table with bleach. Once in the gynecological position, she is informed about the simplicity of the examination. This is performed by inserting a single-use sterile speculum into the vagina while avoiding the sensitive suburethral area and the clitoris. When the speculum is inserted three-quarters of the way into the vagina, gentle pressure is applied to the perineum, either perpendicular to the vulvar axis or parallel by rotating 90°, to locate the cervix. As soon as the cervix is visualized, the speculum is positioned to keep the labia apart, allowing for a better assessment of the cervix's condition. One sterile swab is first used to collect samples from the vaginal fornices, followed by a second swab for collecting from the endocervix. After the sample collection, the speculum is unscrewed and removed, and the patient is invited to dress (Foughali & Tafer, 2021).

Sample analysis

Macroscopic Examination: This examination provided information about the appearance of the cervix, as well as the appearance and color of the leucorrhea.

Microscopic Examination: In the fresh state, a drop of physiological saline was placed and homogenized on a clean slide using the secretions collected from the vaginal fornix, and the preparation was subsequently covered with a cover slip. This was observed under a 10X objective, followed by a 40X objective. For the Gram-stained samples, two smears were prepared on a labeled slide—one from the secretions collected from the cervix and the other from the secretions collected from the vaginal wall. These smears were fixed by flame, and the second smear was then Gram-stained and examined under a 100X objective using a drop of immersion oil.

Mycological examination: isolation was performed on Sabouraud-Chloramphenicol (SC) medium, which was incubated at 37°C for 24 to 48 hours. The identification of yeasts was conducted using a filamentation test. After incubation, the sample plates containing fungi exhibited growth, and it was recommended to examine the Petri dishes against a white background. If the colonies appeared as white, creamy, and smooth, or as shiny, flat, or rough colonies, these were indicative of *Candida albicans* (Ghaddar *et al.*, 2020).

Data Analysis

The collected data were encoded, entered, processed, and statistically analyzed using computer software, with Xlstat 2016 for raw data analysis and MS Excel 2021 for creating graphs and tables. The prevalence of VVC among women attending consultations at the DHT was determined using the formula:

$$P(\%) = \frac{\text{Number of women with a positive culture for } C. \text{albicans}}{\text{Total number of patients}} \times 100$$

The Chi² test was used to compare the proportions of women with VVC for each variable and to assess the relationship between the associated factors. The significance threshold was set at 5%. Only factors with a P-value < 0.05 were considered statistically significant.

RESULTS

Sociodemographic Characteristics of Patients

A total of 80 women were included, and their samples (80) were collected based on predefined inclusion criteria.

Age Distribution of the Study Population

Figure 1 below shows the distribution of the study population according to age group.

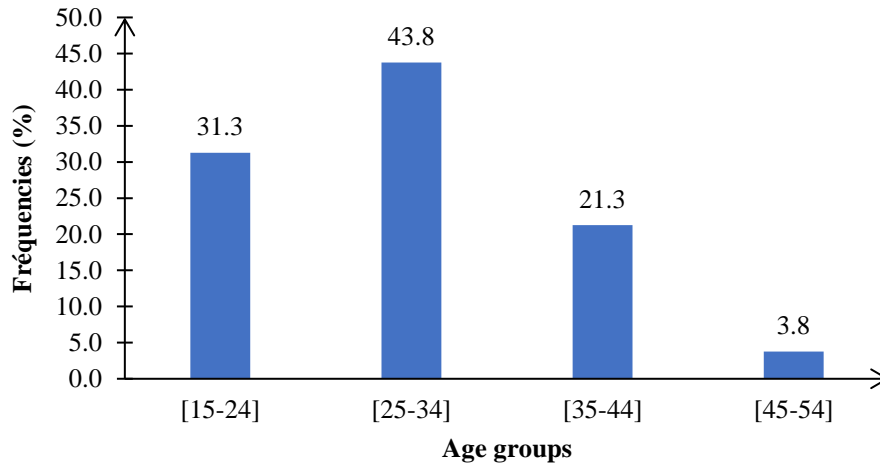


Figure 1: Age Distribution of the Study Population

From Figure 1, it appears that 43.75% of the patients belonged to the [25–34] age group, which was the modal class, whereas the [45–54] age group represented the minority with 3.75%.

Distribution of Participants by Education Level

The distribution of participants according to their education levels is shown in Figure 2.

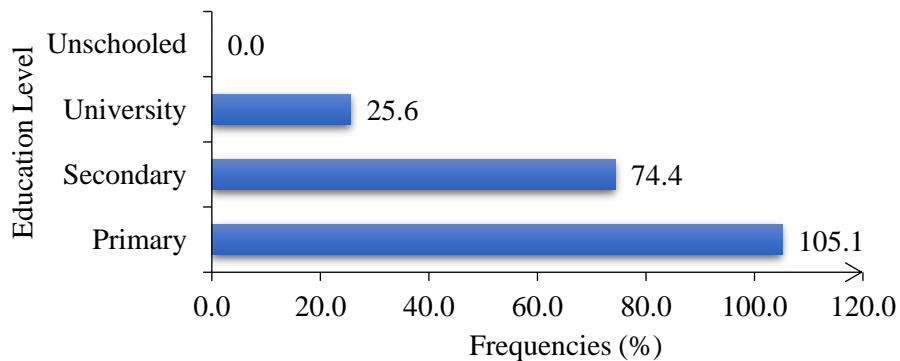


Figure 2: Distribution of Participants by Education Level

In general, it is noted that the majority of participants, 51.3% (41), had a primary level of education, followed by 36.3% (29) with a secondary level, and only 12.5% (10) with a university level. Additionally, none of the participants were unschooled.

Distribution of the Population by Family Structure

Figure 3 represents the frequency of the population based on family structure. The analysis of the diagram reveals that up to 56.25% (45/80) of participants live in a polygamous household, followed by 25% (20/80) in a monogamous household, and finally, 18.75% (15) are single.

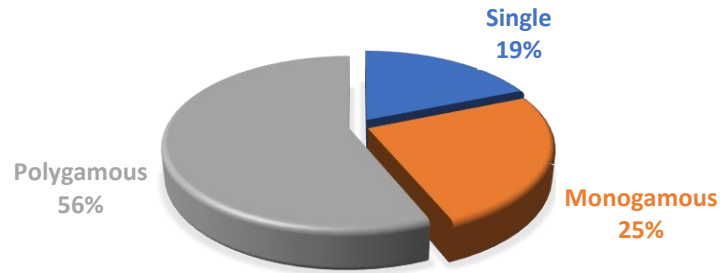


Figure 3: Distribution of Participants by Family Structure

Distribution of the Population by Occupation

Figure 4 below shows the distribution of the population by occupation. It reveals a predominance of housewives, with a frequency of 61.3% (49/80), followed by civil servants at 16.3%, students at 12.5%, traders at 6.3%, and a minority of university students at 3.8%.

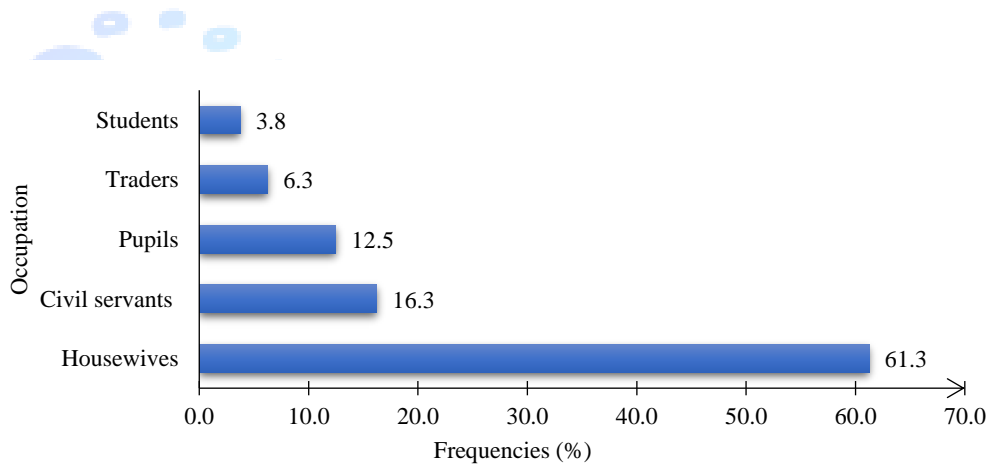


Figure 4: Distribution of the Population by Occupation

Microscopic characteristics of samples

Mycological Characteristics of Collected Samples

The diagram (Figure 5) below presents the mycological characteristics of the samples collected in our study.

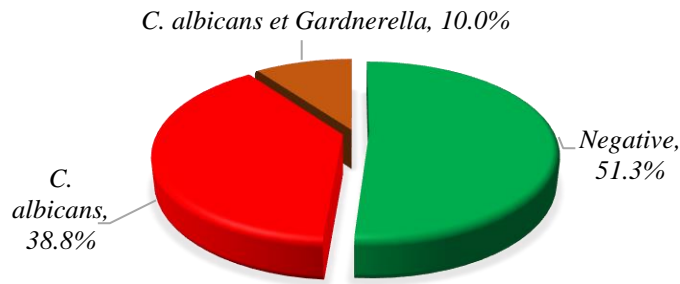


Figure 5: Distribution of Isolated Microorganisms

Mycological analysis of the 80 samples revealed CVV (Candida Vulvovaginitis) in 39 women, resulting in a prevalence of 48.8% ((31+8)/80) in the studied population.

Distribution of Microorganisms by Flora Type

Figure 6 below illustrates the distribution (recurrence) of microorganisms based on flora types.

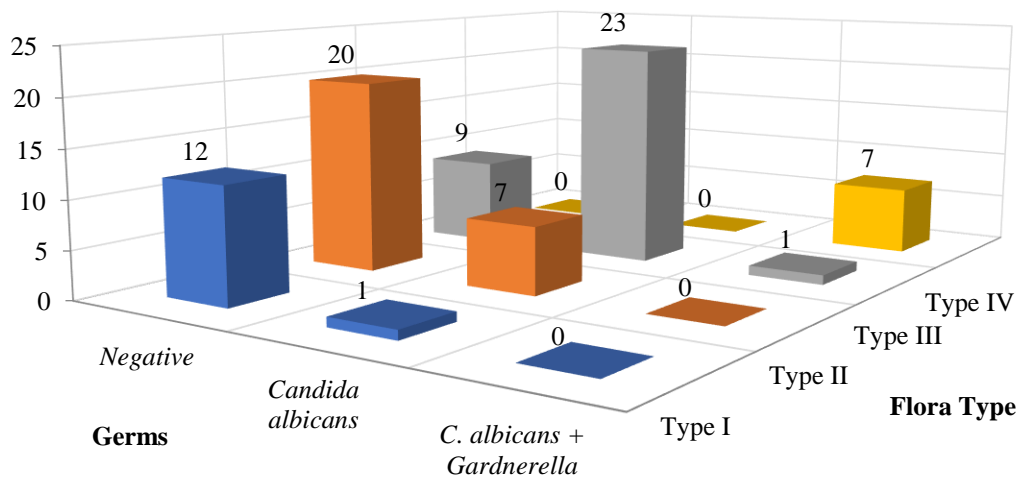


Figure 6: Distribution of Microorganisms by Flora Type

From this distribution, it is evident that the most representative vaginal flora is the pathological type III flora (33/80), while the least representative is type IV flora. Additionally, more than half of the women, regardless of flora type, tested negative for *C. albicans*. Moreover, the women most affected by *C. albicans* infection were among those with type III pathological flora, with 24 out of the 33 women having type III flora, representing a prevalence of 72.7% (24/33). Furthermore, 100% of women with type IV flora exhibited co-infection with *C. albicans* and *Gardnerella*.

Frequency of candidoses and influence of study variables

Table 1 presents the results of the frequency of *C. albicans* infection based on various risk factors analyzed through a multivariate approach. The following observations can be made:

Women aged [45-54] were the most affected by vulvovaginal candidiasis due to *C. albicans*, with a prevalence of 100%, although this difference was not statistically significant (p -value = 0.075). In contrast, the level of education did not show a significant relationship with the infection, with university-educated women being slightly more affected (50%) compared to those who had stopped their education at the secondary level.

Regarding parity, primiparous women were significantly more affected (65.4%, p -value = 0.018), while the use of public toilets also demonstrated a significant association, with women using them rarely being the most affected (60.5%, p -value = 0.038).

Cleaning the anus from back to front emerged as an important risk factor, with an infection prevalence of 63.5%, compared to 21.4% for those cleaning from front to back (p -value = 0.001). The type of vaginal flora was also a key factor, showing a prevalence of 100% among women with type IV flora (p -value < 0.0001).

Other variables, such as household type, occupation, wearing tight clothing, and the practice of cunnilingus, did not exhibit statistically significant relationships with *C. albicans* infection (all with p -values greater than 0.05).

Table 1: Distribution of Vulvovaginal Candidiasis According to Study Variables

Variables	CVV due to <i>C. albicans</i>		Total	%	p -value	
	Absence	Presence				
Age groups	[15-24]	14	11	25	44.0	0.075
	[25-34]	15	20	35	25.0	
	[35-44]	12	5	17	6.3	
	[45-54]	0	3	3	3.8	
Educational level	Primary	21	20	41	25.0	0.996
	Secondary	15	14	29	17.5	
	University	5	5	10	6.3	
Household	Polygamy	22	23	45	28.8	0.133
	Monogamy	8	12	20	15.0	
	Single	11	4	15	5.0	
Parity	Multiparous	24	21	45	26.3	0.018*
	Primiparous	9	17	26	21.3	

	Nulliparous	8	1	9	1.3	
Occupation	Housewives	20	29	49	36.3	
	Civil servants	9	4	13	5.0	
	Pupils	7	3	10	3.8	0.226
	Traders	3	2	5	2.5	
	Students (university)	2	1	3	1.3	
Wearing tight clothes	No	30	27	57	33.8	0.697
	Yes	11	12	23	15.0	
Practice of cunnilingus	No	26	24	50	30.0	0.862
	Yes	15	15	30	18.8	
Use of public toilets	Rarely	15	23	38	28.8	
	Yes	22	10	32	12.5	0.038
	No	4	6	10	7.5	
Frequency of intimate hygiene per day	More than twice	29	24	53	30.0	
	Once	10	12	22	15.0	0.669
	Twice	2	3	5	3.8	
Product used for vaginal douching	Water + salt	9	14	23	17.5	
	Plain water	16	8	24	10.0	
	Water + soap	6	7	13	8.8	0.342
	Water + cloves	2	4	6	5.0	
	Menthol crystals	2	3	5	3.8	
	Hot water	6	3	9	3.8	
Site of intimate hygiene	Vulva + Vagina	35	37	72	46.3	0.157
	Vulva	6	2	8	2.5	
Type of underwear	Cotton & Synthetic	23	23	46	28.8	
	Cotton	5	11	16	13.8	0.056
	Synthetic	13	5	18	6.3	
Type of underwear (style)	Pant	15	19	34	23.8	
	Boxer	11	6	17	7.5	
	String	4	6	10	7.5	0.510
	String & Boxer	5	5	10	6.3	
	String & Pant	6	3	9	3.8	
Use of vaginal suppositories	Yes	35	37	72	46.3	0.157
	No	6	2	8	2.5	
Cleaning the anus	Back to front	19	33	52	41.3	0.001*

	Front to back	22	6	28	7.5
Vaginal flora type	I	12	1	13	1.3
	II	20	7	27	8.8
	III	9	24	33	30.0
	IV	0	7	7	8.8

<0.0001**

%; percentage; *: Statistically significant value; **: Very statistically significant value

DISCUSSION

Vulvovaginal Candidiasis (VVC) is a common reason for gynecological consultations. The epidemiology of this condition has been the subject of several studies aimed at determining its prevalence and associated risk factors based on mycological diagnosis. To determine the prevalence of VVC due to *C. albicans* and the associated factors, a cross-sectional, descriptive, and prospective study was conducted at the laboratory of TDH. A survey was carried out among 80 women, and cervical-vaginal samples were collected and analyzed.

Sociodemographic Characteristics of Patients

The age distribution of patients shows a significant representation of subjects aged [25-34] years, with a frequency of 43.75%, followed by the [15-24] age group at 31.3%. This finding is similar to that of **Fanou et al. (2022)** in their study on the prevalence and associated factors of VVC among women admitted to Mènonin Zone Hospital (Benin), where the 21-33 age group was the most represented (76.56%) among 1,336 patients. Our results are also consistent with those of **Nkouanga et al. (2015)**, who reported a frequency of 32.15% in the same age group. This can be explained by the fact that these age groups are typically sexually active, often consulting for gynecological issues (**Ogouyèmi et al., 2014**).

The occupational distribution of patients reveals a strong predominance of housewives at 61.3% (49/80), followed by civil servants at 16.3%. This result is close to that of **Ekpenyong (2012)**, who found 59% of non-employed women, contrasting with **Fanou et al. (2022)**, whose study showed that less than half (42.97%) of the surveyed patients were professionally employed. Our study, like that of Ekpenyong, was conducted on rural populations, unlike that of **Fanou et al. (2022)**. These observations may be justified by the fact that urban living often necessitates employment for women to contribute to household expenses, unlike the rural context.

The marital status distribution shows a high representation of married subjects in polygamous unions at 56% (45/80). Our results differ from those of **Helena (2012)** in France, who found that 63.5% of subjects were married under monogamous unions. This discrepancy may be attributed to the socio-cultural differences between France (Europe) and Africa (Cameroon), where polygamy is accepted.

The distribution of patients according to their type of vaginal flora indicates a significant presence of pathological flora type III at 41.25% (33/80), while flora type IV was the least represented at 8.75% (7/80). Our findings differ from those of **Ngo et al. (2014)**, who reported frequencies of 24.5% and 43.63%, respectively. This could be attributed to the fact that many of the patients presented with gynecological issues.

Prevalence of Candidiasis and Influence of Study Variables

In this study, mycological analysis of the 80 samples revealed VVC in 39 women, yielding a specific prevalence of 48.8%, which is close to the 40% reported by **Amouri et al. (2008)** in Tunisia. Our results are higher than those of **Kechia et al. (2015)** in Yaoundé, who found a prevalence of 35.52% among 397 women, and those of **Khadime (2018)** in Senegal, who reported 32.6% among 1,141 patients. The observed differences could be attributed to the fact that Tignère is a rural area compared to the settings of previous studies, coupled with a low literacy rate.

The distribution of *C. albicans* infection based on age indicates that women aged [25-34] predominated at 43.75%, reflecting a general prevalence of 57.1% in this age group. This age interval corresponds to a period of maximum hormonal activity and is also characterized by sexually active couples often seeking children. Thus, it is the age range where women are most exposed to vaginitis, including candidiasis (**Sobel, 2017**). Furthermore, the distribution of *C. albicans* infection in relation to age yielded a p-value of 0.075 (>0.05), indicating that the infection was not statistically significant. This finding aligns with that of **Fanou et al. (2022)**, where the p-value was 0.231, demonstrating no specific relationship between age and susceptibility to VVC due to *C. albicans*. This concordance may suggest that *C. albicans* infection is independent of a woman's age (**Fanou et al., 2022**).

The distribution of risk factors related to *C. albicans* infection highlights the following: parity (p-value = 0.018), frequency of public toilet use (p-value = 0.038), anal cleaning technique (p-value = 0.001), and type of vaginal flora (p-value < 0.0001) appear to be associated with the occurrence of *C. albicans* infection. This may be explained by the fact that the female vagina self-cleans through lactobacilli, and certain products can destroy these beneficial bacteria, leading to infections. Marital status, occupation, frequency of intimate hygiene per day, products used for vaginal douching, level of education, type of household, intimate toilet site, wearing tight clothing, practicing cunnilingus, type of underwear, and the use of vaginal ovules did not have a significant influence on the rate of VVC. Our results are consistent with findings from some studies on factors associated with VVC in Ghana and Cameroon, where no significant differences were observed between married and single women, even though the former predominated in their samples (**Konadu et al., 2019**). Conversely, studies conducted in Côte d'Ivoire and Senegal demonstrated a link between VVC prevalence and marital status, but their prevalence rates did not exceed 50% (**Sylla et al., 2018**). Regarding the frequency of intimate hygiene, our observations (60.0%) align with those of **Konadu et al.** and **Fanou et al.**, who reported lower proportions of women practicing intimate hygiene twice a day (36.2% and 52.44%, respectively) (**Konadu et al., 2019**). These observations may be explained by the fact that women in rural areas may lack education and awareness regarding sexual health and hygiene, particularly concerning vaginal douching.

CONCLUSION

This study evaluated the prevalence of VVC due to *C. albicans* among women of reproductive age at the DHT, as well as the associated factors, in order to improve management and prevention strategies. The findings indicate that VVC affects more than one in two women in the population and is significantly influenced by several factors. It is known that the prevalence of VVC varies from one region to another; it was reported at 35.52% among a population of 397 women in Yaoundé according to **Kechia et al. (2015)** and at 32.6% among 1,141 patients in Senegal (**Khadime, 2018**). Research by **Ogouyèmi et al. (2014)** found that at the mother and Child Hospital, the incidence of VVC was 38.9% in a population of 131 women. This study is the first to determine the prevalence of VVC due to *C. albicans* in the Adamaoua region, specifically in the city of Tignère, revealing a prevalence of 48.8%. Furthermore, the percentage of this infection increases with the number of pregnancies (parity), frequency of public toilet use, anal cleaning technique from back to front, and type of vaginal flora. The findings also suggest, in comparison to the results of **Kechia et al. (2015)** in Yaoundé, that the prevalence of VVC is on the rise in Cameroon. The collected information will contribute to a better understanding of the causes of VVC and the recommended preventive measures.

Limitations of the Study: a small sample size of 80 women from a single district hospital, which may not represent the broader population in the Adamawa region or Cameroon. The cross-sectional design limits the ability to establish causality between identified risk factors and VVC prevalence. Additionally, the study did not fully explore the influence of cultural and socioeconomic factors, and regional variability in prevalence was not accounted for. These limitations highlight the need for further research to better understand VVC and its associated risk factors.

Competing Interests

The authors declare that they have no competing interests.

Ethical considerations

This study was conducted in accordance with ethical principles, including the confidentiality and anonymity of patient data. Prior authorization for the research was obtained from the Regional Health Delegation of Adamawa and from the Director of DHT.

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