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Statistical Analysis on The Prevalence of Candidacies Among Pregnant Women in Adamawa State

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Abstract- ***Candidiasis is a globally occurring infection found in both developed and developing nations. It manifests as thrush, invasive candidiasis, or vaginal candidiasis. Candida albicans is a fungus which causes a secondary infection known as candidiasis in mostly individuals with some underlying immune-compromised conditions. This study aimed to determine the prevalence of Candida albicans among pregnant and non-pregnant women, and to identify potential risk factors associated with candida albicans in women attending the Specialist Hospital Yola, Adamawa State. A total of 500 women (250 pregnant and 250 non-pregnant) were examined. Vaginal swabs were collected and cultured for Candida species. The results revealed that there is high rate of Candida albicans among pregnant women compared with non-pregnant women. The results also showed that factors associated with Candida albicans among women include: poor hygiene practice, history of antibiotic, wearing tight-fitting or non-breathable clothing on a regular, history of svaginal infection can influence candida albicans and unprotected sexual intercourse with partner who has a history of yeast infection.***

Index Terms- ***Prevalence, Pregnant and Non-Pregnant Women, Candidacies Statistical Analysis***

I. INTRODUCTION

Candida albicans is a yeast that is a common inhabitant of the human microbiota, residing in areas such as the gastrointestinal tract, oral cavity, and vagina. However, under certain conditions, it can become pathogenic, causing infections that range from superficial mucosal infections to life-threatening systemic diseases (Roubai et al., 2017). Vaginal candidiasis affects a significant number of women globally, with approximately 75% of women experiencing at least one episode in their lifetime (Sangwan et al., 2020).

Candida is the most prevalent cause of fungal infections worldwide, primarily due to various environmental triggers. It is the most frequently isolated invasive fungal pathogen in humans, with most infections localized to the urogenital or oral cavities (Sinah & Guph, 2021). The isolation of Candida in a lab does not necessarily indicate it is the cause of a disease, as other causes of vaginitis may include Abdul-Aziz et al. (2019) observed that 50% of asymptomatic women have Candida organisms in their vaginal flora.

According to ACOG (2021), candidiasis, also known as moniliasis or thrush, can affect the oral cavity, gastrointestinal system, vagina, and other areas, becoming pathogenic only under certain conditions. Oral candidiasis, or thrush, appears as white spots in the mouth and throat, causing soreness and difficulty swallowing. Vaginal candidiasis, also known as a yeast infection, causes itching, burning, and painful urination or intercourse (Tadele & Sileshi., 2019).

The fungus Candida albicans is endogenous to humans and is part of the normal flora of the genital, gastrointestinal, and respiratory tracts. It becomes opportunistic in immunocompromised individuals, causing candidiasis (Fidel, 2020). This infection is more common in women with weaker immune systems and during pregnancy very fatal, especially in pregnant women (Tagnetti & Borin, 2018).

Candida albicans is a dimorphic fungus, existing in both yeast and filamentous forms. It is part of the normal flora but can become pathogenic when the host's immune defenses are compromised or when its ecological niche is disrupted (Yadav & Sharma 2018). This organism is known for its ability to form biofilms on surfaces, which contributes to its virulence and resistance to antifungal therapies (Zon et al., 2015).

The presence of any genital tract infection during pregnancy causes significant concerns due to the risk to the mother's and child's health. Early identification is also crucial since the existence of the foetus may limit treatment options, and maternal physiological changes may make it difficult to diagnose and control the infection (Roudbarin & Abedxedah, 2017). For women, vaginal discharge is a typical sign of a genital tract infection. Finding the reason can be extremely difficult because several microorganisms may be to blame, and multiple illnesses may co-exist (Rashid et al., 2021). The overgrowth of yeast and its penetration into vulvovaginal epithelial cells are believed to be the root of the symptoms (Ahmed et al., 2020). Uncomplicated VVC is characterized by a thick, cheese-like discharge, vaginal and vulvar pruritus, discomfort, burning, erythema, and/or edema. Dysuria and dyspareunia are also possible and can lead to sex and marital discord. On a moist mount, emerging yeast cells and pseudohyphae may be seen, and the vaginal pH is often normal. 10% of women have been reported to be asymptomatic (Ogunbiyi & Osunkule, 2020). *Candida albicans* is the species that most frequently causes VVC, although other *Candida* species, including *Candida glabrata, Candida parapsilosis,* and *Candida tropicalis*, are also developing (Apalata et al., 2014). When antifungal medications were developed, *C. albicans* no longer accounted for the majority of the causes of *Candida* infections; instead, the non-albicans species mentioned above frequently contributed to *Candida* infections (Ohale et al., 2022). Sexual activity, recent antibiotic use, pregnancy, and immunological suppression from illnesses like poorly treated HIV infection or diabetes are risk factors for VVC (Ohale et al., 2020). Thought to have its primary reservoir in the rectum, vaginal colonization is also prevalent (Okonkwo and Umeanaeto, 2010). Different variables, including host vulnerability, host inflammatory responses, and *Candida* virulence factors, are involved in the progression from colonization to symptomatic infection. The actual prevalence of VVC is unclear because it is not a reportable condition, is frequently diagnosed without conclusive testing, and is frequently treated empirically (Nnadi and Singh, 2017).

Candidiasis remains a common yet under-recognized cause of morbidity among women, presenting with symptoms that can significantly disrupt daily life. If left untreated, infections may progress to serious. This study aimed to analyze the effect of candidiasis among pregnant and non-pregnant women attending specialize hospital Yola, Adamawa State.

II. METHODS AND MATERIALS

Study Design

The study employed a descriptive survey design to investigate the effects of Candida albicans among pregnant and non-pregnant women attending the Specialist Hospital, Yola.

Study area

The research was conducted at the Specialist General Hospital, Jimeta-Yola, in Adamawa State, northeastern Nigeria. The facility, formerly known as Yola Specialist Hospital, is situated in Jimeta, within Yola North Local Government Area of Adamawa State, at approximately 9.27444° N latitude and 12.44901° E longitude.

Study Population

The sample size was determined using the formula for minimum sample size estimation, based on the representative proportion of the population from the study area, as recently adopted by Akinneye et al. (2018). The study assumed a prevalence rate of 78.8% for *Candida albicans* in the population.

The formula is given as:

$$n = \frac{p(1-p)(Z/E)^2}{1+\frac{p(1-p)(Z/E)^2}{N}}$$

Where:

n = required sample size

Z = confidence level (1.96 at 96% at 96% confidence internal)

E = desired margin of error (0.05)

p = estimated prevalence of Candida albicans (78.8%)

N = estimated population size

Substituting the values into the formula:

$$n = \frac{350(1-350)(1.96/0.05)^2}{2}$$

$$n = 500$$

Thus, the minimum required sample size for the study was 500 participants.

Ethical considerations

Ethical clearance was obtained from the Ethical Research Committee of Specialist Hospital Yola, Adamawa State, Nigeria, with approval from the committee.

Method of Data Collection

The study employed a structured questionnaire designed on a four-point Likert scale, aligned with the research objectives. A total of 500 questionnaires were developed to collect information on demographic characteristics such as age, marital status, and educational level, as well as on the prevalence of *Candida albicans* among pregnant and non-pregnant women. The questionnaire also captured participants' history of previous infections, antibiotic use, and underlying health conditions. Data were collected through face-to-face interviews conducted by trained research assistants.

Method of Data Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS), version 20. Both descriptive and inferential statistical techniques were employed. Descriptive statistics were presented as frequencies and percentages, while prevalence figures were calculated for the overall study population and stratified by age group, educational level, and pregnancy status.

Risk factors associated with *Candida albicans* infection were computed, analyzed, and compared. Associations between prevalence and various risk factors were illustrated using bar charts. Inferential analysis was conducted with chi-square (χ^2) tests to compare differences in the proportion of isolates between pregnant and non-pregnant women, as well as across age categories. All tests were two-tailed, and a p-value of <0.05 was considered statistically significant.

Laboratory Testing

A total of 500 female participants were recruited for the study, comprising 250 pregnant women and 250 non-pregnant women who attended General Hospital Kashere, Gombe State. Vaginal samples were collected using sterile swab sticks, which were used to swab both the posterior vaginal fornix and the lateral vaginal wall of each participant. After collection, the swab sticks were returned to their appropriately labeled containers, to which 2 mL of normal saline was added. The samples were then sealed and either transported immediately to the microbiology laboratory for processing or stored in a refrigerator and processed within 24 hours. In most cases, the samples were delivered directly to the laboratory for prompt analysis.

Processing of the Sample: Wet Mount Preparation:

Each sample was mixed in its swab-stick vial with 2 mL of normal saline. Two drops of the resulting suspension were transferred into a test tube, after which two drops of 10% potassium hydroxide (KOH) solution were added. The mixture was gently agitated and allowed to stand for 5 minutes until the material cleared. Subsequently, one drop of the suspension was placed on a clean glass slide and examined microscopically under the ×10 objective lens for the presence of budding yeast cells, yeast branches, and pseudohyphae, following the procedure described by Monica.

III. FINDINGS

The distribution of respondents by educational level is presented in Table 1. The results indicated that the majority of women, 207 (41.4%), had attained secondary education. This was followed by 133 (26.6%) with tertiary education, 97 (19.4%) with primary education, and 63 (12.6%) with no formal education. A chi-square (χ^2) test revealed that the differences across educational levels were statistically significant ($p \leq 0.05$).

The prevalence of *Candida albicans* infection among respondents, based on pregnancy status, is presented in Table 2. Out of the 250 pregnant women examined, 164 (59.8%) tested positive for *Candida albicans*, while 86 (38.0%) were negative. Among the 250 non-pregnant women, 110 (40.2%) were infected, whereas 140 (62.0%) were not infected.

A chi-square (χ^2) test revealed that the difference in infection rates between pregnant and non-pregnant women was statistically significant (χ^2 calculated =

5.83; χ^2 critical = 3.84; df = 1; $p \leq 0.05$). Furthermore, a comparison of mean infection rates showed that pregnant women had a mean prevalence of 10.97%, while non-pregnant women recorded a mean prevalence of 27.27%.

The overall occurrence of *Candida albicans* among the 500 women, either as a single infection or in combination with other microbial agents, is presented in Table 3. Out of the total, 274 (54.8%) women were infected with *Candida albicans*, including mixed infections involving *Staphylococcus aureus*, *Streptococcus pyogenes*, *Klebsiella* species, and *Pseudomonas* species. Among pregnant women, 164 (59.8%) tested positive for *Candida albicans* in association with the same microbial agents. Chi-square (χ^2) analysis revealed a statistically significant difference in the prevalence of mixed infections between pregnant and non-pregnant women (χ^2 = 5.832, df = 1, $p \leq 0.05$).

Table 4 presented the results of the Tukey HSD (Honestly Significant Difference) multiple comparisons for the prevalence rate and effect of *Candida albicans* among women of childbearing age, categorized by age groups. The analysis aimed to identify specific differences in mean prevalence rates between the various age groups.

In the comparison between the age groups 18–25 and 26–35, the mean difference was reported as 0.8649, with p = 0.000. This indicated a statistically significant difference in prevalence rates, suggesting that women aged 18–25 experienced a notably higher effect from *Candida albicans* compared to those aged 26–35. Similarly, the comparison between the 18–25 and 36–45 age groups showed a mean difference of 0.8845, also with a p-value of 0.000. This further reinforced the finding that younger women faced a greater prevalence and effect of the condition compared to those in the older age group.

In contrast, the comparison between the 26–35 and 36–45 age groups yielded a mean difference of 0.0196, with a p-value of 0.945. This result indicated that there was no statistically significant difference in prevalence rates between these two groups. This implied that women aged 26–35 and 36–45 experienced similar impacts from the pathological effects of *Candida albicans*.

The reverse comparisons aligned with these findings. The mean difference when comparing 26–35 to 18–25 was -0.8649, with a p-value of 0.000, confirming the earlier observation that younger women had a higher prevalence of candidiasis. The mean difference between 36–45 and 26–35 was -0.0196, with a p-value of 0.945, indicating no significant difference. Lastly, the comparisons from the perspective of the 36–45 age group showed a mean difference of -0.88450 when compared to 18–25, with a p-value of 0.000, and a mean difference of -0.01962 when compared to 26–35, with a p-value of 0.945, which was not statistically significant.

Table 5 illustrated the mean responses of women regarding the risk factors associated with the transmission of Candida albicans. The results in Table 4.7 showed that most of the women agreed that poor hygienic conditions significantly contributed to the transmission of Candida albicans, with a mean of 2.96 and a standard deviation (SD) of 0.94.

The response to Item 2, which addressed the use of antibiotics during pregnancy, indicated strong agreement that such medication predisposed individuals to candidiasis, with a mean of 3.61 and an SD of 0.49. The low SD suggested that respondents were largely unanimous in affirming that antibiotic use during pregnancy increased the risk of Candida albicans.

The results for Item 3 showed that the majority of respondents disagreed that hormonal changes during pregnancy were a leading cause of candidiasis, as reflected by a mean of 1.77 and an SD of 0.42. In contrast, Item 4 revealed that respondents generally agreed that antibiotics or other medications could affect the immune system during and after pregnancy, with a mean of 3.42 and an SD of 0.72. This suggested that the use of certain medications might compromise the immune system, thereby increasing susceptibility to Candida albicans infections.

With a mean of 3.05 and an SD of 0.91, responses to Item 5 indicated agreement that sexual contact with partners who had a history of yeast infection could contribute to the transmission of Candida albicans. For Item 6, a mean of 1.75 and an SD of 0.60 demonstrated strong disagreement with the notion

that demographic factors significantly influenced infection risk, reflecting a unified stance among respondents. Item 7 showed a mean of 2.89 and an SD of 0.99, indicating general agreement, though the variation in responses suggested some differences of opinion regarding whether clothing choices affected infection risk.

Responses to Item 8 revealed a mean of 3.51 and an SD of 0.64, indicating strong agreement that a history of vaginal infections increased the risk of Candida albicans, with a moderate level of consensus. Item 9, which examined the effect of travel to areas with high fungal prevalence, recorded a mean of 1.76 and an SD of 0.44, showing that the majority of respondents disagreed with this factor as a significant risk. Finally, Item 10, with a mean of 1.61 and an SD of 0.49, reflected strong disagreement that fermented foods influenced the risk of Candida albicans, indicating a shared perspective among participants.

The grand mean of 2.64 indicated an overall moderate level of agreement across all items. While some factors, such as hygiene and antibiotic use, were clearly acknowledged as risks, others remained contested, highlighting areas that required further exploration in health education campaigns or interventions.

CONCLUSION

The findings revealed that pregnant women were more frequently infected with Candida albicans than non-pregnant women, with infection rates of 65.6% and 44.0%, respectively. The overall positivity rate of 54.8% across all samples indicated that candidiasis constituted a significant fungal infection among pregnant women in the Yola area. These results emphasized the need for targeted health interventions, particularly for pregnant women, to mitigate the condition and reduce its potential adverse effects on both mothers and their infants.

APPENDIX

Table1: Educational levels of women who Participated in candida albicans survey in Specialist Hospital, Yola Adamawa State

Educational Level	No, taken	Percentage (%)
No Formal Education	63	12.6
Primary Education	97	19.4
Secondary Education	207	41.4
Tertiary Education	133	26.6
Total	500	100

Table 2: Prevalence of Candida albicans Infection among Pregnant and Non-Pregnant Women

Status of Women	No. Examined	Positive with *C. albicans*	Negative with *C. albicans*	Total (%)
Pregnant	250	164 (59.8%)	86 (38.0%)	250 (50.0)
Non-pregnant	250	110 (40.2%)	140 (62.0%)	250 (50.0)
Total	500	274 (54.8%)	226 (45.2%)	500 (100)

Table 3: Prevalence of mixed infection of candida albicans with other microbial agents among women in Specialist Hospital, Yola Adamawa Sate

Age group in years	No. sampled	No. Negative	No. Positive	Candida + Staphylococcus	Candida + E.coli	Candida + pseudomonas	Candida + Klebsilla	Total
18-25	143	49	70(48.95)	20	21	12	17	119
26-35	174	37	86(49.42)	23	22	20	21	123

36-45	104	62	65(62.50)	21	15	15	14	127
< 45	79	78	53(67.09)	19	13	12	9	131
Total	500 (100%)	226	274 (54.80)	83 (16.60)	71 (14.20)	51 (11.40)	61 (12.50)	500(100%)

Table 4: Honestly Significant Difference (HSD) analysis of Prevalence of candidiasis with age group of women in Specialist Hospital Yola, Adamawa Sate

(I) Age Group	(J) Age Group	Mean Difference (I-J)	Sig.
18-25	26-35	0.8649*	0.000*
	36-45	0.8845*	0.000*
26-35	18-25	-0.8649*	0.000*
	36-45	0.01962	0.945
36-45	18-25	-0.8845*	0.000*
	26-35	-0.0196	0.945

*Significant; $p < 0.05$.

Table 5: Summary of Descriptive Statistics Mean and Standard Deviation of Potential factors associated with Candidacies among Women

S/No	Item N = 500	Mean	SD	Remark
1.	Poor hygiene practices contribute significantly to *candida albicans* among women	2.96	.94	Agreed
2.	The use of antibiotics during pregnancy increases the risk of *candida albicans* infection	3.61	.49	Agreed
3.	Hormonal changes in pregnancy are a leading cause among *candida albicans* among women	1.77	.42	Disagreed
4.	Antibiotics or other medication may affect the immune system pregnancy and after pregnancy	3.45	.72	Agreed
5.	Unprotected sexual intercourse with partner who has a history of yeast infection can lead to the infection of *candida albicans*	3.05	.91	Agreed
6.	Age,sex and ethnicity influence the risk of *candida albicans*	1.75	.60	Disagreed
7.	Wearing tight-fitting or non-breathable clothing on a regular basis can influence *candida albicans*	2.89	.99	Agreed
8.	History of vaginal infection can influence *candida albicans*	3.51	.64	Agreed
9.	Travelling to area with high fungi rate area can influence *candida albicans*	1.76	.44	Disagreed
10.	Eating of fermented food can inlence *candida albicans*	1.61	.49	Disagreed
	Grand Mean	2.64	0.66	

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REFERENCES

[1] Abdul-Aziz, M., Mahdy, M., Abdul-Ghani, R., & al., e. (2019). Bacterial vaginosis, vulvovaginal candidiasis, and trichomonas vaginitis among reproductive-aged women seeking primary

[2] Ahmad, N., Jafri, Z., Khan, Z. H. (2020). Evaluation of nanomaterials to prevent oral Candidiasis in PMMA based denture wearing

patients. *A systematic analysis. J Oral Biol Craniofa*c Res,10(2): 189-193. [PMC free article: PMC7193251] [PubMed: 32373449].

[3] Bakhtiari, S., Jafari, S., Taheri, J. B., Kashi, T. S. J., Namazi, Z., Iman, M., & Poorberafeyi, M.(2019). The effects of cinnamaldehyde (Cinnamon derivatives) and nystatin on *Candida albicans* and *Candida glabrata*. *Open Access Macedonian Journal of Medical Sciences, 7(7).*

[4] Ogunbiyi, J. O., & Osunkunle, O. F. (2020). Prevalence of *Candida* species amongasymptomatic pregnant women attending antenatal clinic in a tertiary hospital in Southwestern Nigeria. BMC Pregnancy and Childbirth, 20(1), 1-8.

[5] Onwukwe, N., & Duru, C. (2018). Current approaches to the treatment of recurrent vulvovaginal candidiasis: *A review. Journal of Pharmaceutical Sciences, 15(1), 1-6*.

[6] Ohale, O. J., Wemedo, S. A. & Akani, N. P. (2022). Prevalence of candidiasis among pregnant and non-pregnant women in Eleme and Okrika Local Government Areas of Rivers State. South Asian Journal of Research in Microbiology 14(3-4),

[7] Rashid, M. A., Alqahtani, N. M., & Alhusseini, N. (2021). Identification and antifungal susceptibility of *Candida albicans* in patients with vulvovaginal candidiasis. International Journal of Infectious Diseases, 108, 69-74.

[8] Roudbari, F., & Abedzadeh, M. (2017). The relationship between Candida species and Trichomonas vaginalis in the vaginal flora of women of childbearing age. Caspian Journal of Internal Medicine, 8(3), 183-188.

[9] Sangwan, R., Ghosh, D., & Mavlankar, D. (2020). Assessing the diagnostic utility ofmycological and cytological tests in the diagnosis of vulvovaginal candidiasis. International Journal of Gynecology & Obstetrics, 151(2), 137-142.

[10] Singh, A., & Gupta, V. K. (2021). Molecular characterization of *Candida* species from patients with recurrent vulvovaginal candidiasis. Journal of Obstetrics and Gynaecology, 41(5), 703-709.

[11] Tadele, S., & Sileshi, T. (2019). The frequency of *Candida albicans* and non-albicans species among pregnant women in Addis Ababa, Ethiopia. Journal of Medical Mycology, 29(1), 56-63.

[12] The American College of Obstetricians and Gynecologists. (2021). Practice Bulletin: Vulvovaginal Candidiasis. Obstetrics & Gynecology, 137(3), e1-e17.

[13] Tognetti, M., & Borin, R. (2018). The role of *Candida albicans* in vulvovaginal candidiasis: anupdate on clinical relevance and laboratory diagnosis. Infectious Disease Clinics, 32(4), 779-792.

[14] Yadav, A., & Sharma, M. (2018). A study of the prevalence of *Candida* species in patients of recurrent vulvovaginal candidiasis. International Journal of Reproduction, Contraception, Obstetrics, and Gynecology, 7(1), 156-161.

[15] Zou, Y. L., Chen, Q., Liu, T., & Liu, L. C. (2019). Screening for *Candida* species from patients with vulvovaginal candidiasis in Hong Kong. BMC Infectious Diseases, 19(1), 1-9