PREVALENCE OF *Candida albicans* AMONG PATIENTS ATTENDING HEALTH CARE FACILITIES IN NASARAWA STATE, NIGERIA

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Abstract: Many cases of vulvovaginitis are caused by *Candida albicans*. This study investigated the prevalence of *C. albicans* among patients attending health care facilities in Nasarawa State. Nigeria. A total of 1200 High Vaginal Swabs (HVS) samples were collected across the senatorial zones in Nasarawa State namely; Nasarawa North (NN), Nasarawa South (NS) and Nasarawa West (NW). The *Candida albicans* were isolated, identified and confirmed using RapID Yeast Plus System. The overall prevalence of *Candida albicans* was 12% (144/1200). The prevalence in relation to senatorial zone were; NN (3.8%), NS (4.2%) and NW (4.0%). The prevalence across the senatorial zones in relation to pregnancy status was higher in pregnant women (68.1%) than the non-pregnant women (31.9%). The distribution of the isolates across the senatorial zones in relation to the marital status of the pregnant women was higher among the married (65.3%) than the single (10.2%). The prevalence in relation to age of women in NN and NS were higher in 31-40 years (16.7%); but in NW the prevalence was higher in 21-30 years (18.1%). The distribution of the isolates in relation to educational status of the women shows higher prevalence among the Dropouts (attempted- education) in NN (14.5%), NS (19.6%) and NW (22.5%), respectively. The prevalence in relation to the occupation of the women indicated higher prevalence among the House wife in NW (17.0%) and NS (11.0%) respectively; Trader and Tailoring in NW (7.5%). In relation to the type of toilet used, the distribution of the isolates in women was higher among those who used Water system in NN (16.4%), NS (14.9%) and NW (13.4%) respectively.

Keywords: Candidiasis, *Candida albicans*, HVS, CLSI, RapID yeast plus system

Introduction

Candida albicans is a common commensal fungus in general population (Umeh & Emelugo, 2011; Giovanni *et al.*, 2015; Yang *et al.*, 2015) causing (40%–50%) cases of vulvovaginal candidiasis (VVC). Vaginal candidiasis affects females at least once during their lifetime, although, some may experience a recurrence (Borman *et al.*, 2008; Romeo *et al.*, 2011; Giovanni *et al.*, 2015; Yang *et al.*, 2015; Yazdanpanah & Khaithir 2014).

Genital infections of *C. albicans* are sexually transmitted (Lisboa *et al.*, 2010; Nnadi *et al.*, 2012; Nsofor *et al.*, 2016). Previous studies showed that *C. albicans* in clinical distribution, was most commonly involved in VVC, implicating its tropism for vagina (Borman *et al.*, 2008; Romeo & Criseo, 2011; Yazdanpauah *et al.*, 2014). Due to phenotypic resemblance and unavailability of modern tools, this pathogen was readily misidentified in clinical laboratory (Romeo & Criseo, 2011; Romi *et al.* 2014; Yang *et al.* 2015). Emerging *C. albicans* have been detected in cases of candidiasis by using molecular identification (Li *et al.*, 2008; Criseo *et al.*, 2015; Bettini *et al.*, 2013).

Furthermore, *C. albicans* differs in pathogenicity, adherence ability, and biofilm formation (Romeo and Criseo, 2011), necessitating the need to differentiate them in the clinical laboratory. Reported cases of VVC in Nigeria due to *C. albicans* are available (Nnadi *et al.*, 2012; Nsofor *et al.*, 2016). In Nasarawa State, no/few studies have implicated *C. albicans* in VVC (Agada *et al.*, 2017). This study will enhance the understanding of the distribution of *C. albicans* in VVC cases in Nasarawa State; and provide a basis for appropriate control measures.

Materials and Methods

Study area

This research was carried out in Nasarawa State, Nigeria. The state has a land area of 27,116.8 square kilometer and shares boundaries in the North with Kaduna State, in the West with Abuja, in the South with Kogi and Benue State and East with Taraba and Plateau State. The State has a population of 2,040097 people with a density of 75/Km^2 (National Population Commission, 2006). The 13 Local Government areas are broadly grouped into three (3) Senatorial Zones namely: Nasarawa North (Akwanga, Nasarawa Eggon, Wamba), Nasarawa South (Awe, Doma, Keana, Lafia, Obi) and Nasarawa West (Karu, Keffi, Kokona, Nasarawa, Toto) as shown in Figs. 1 & 2 (National Population Commission, 2006).

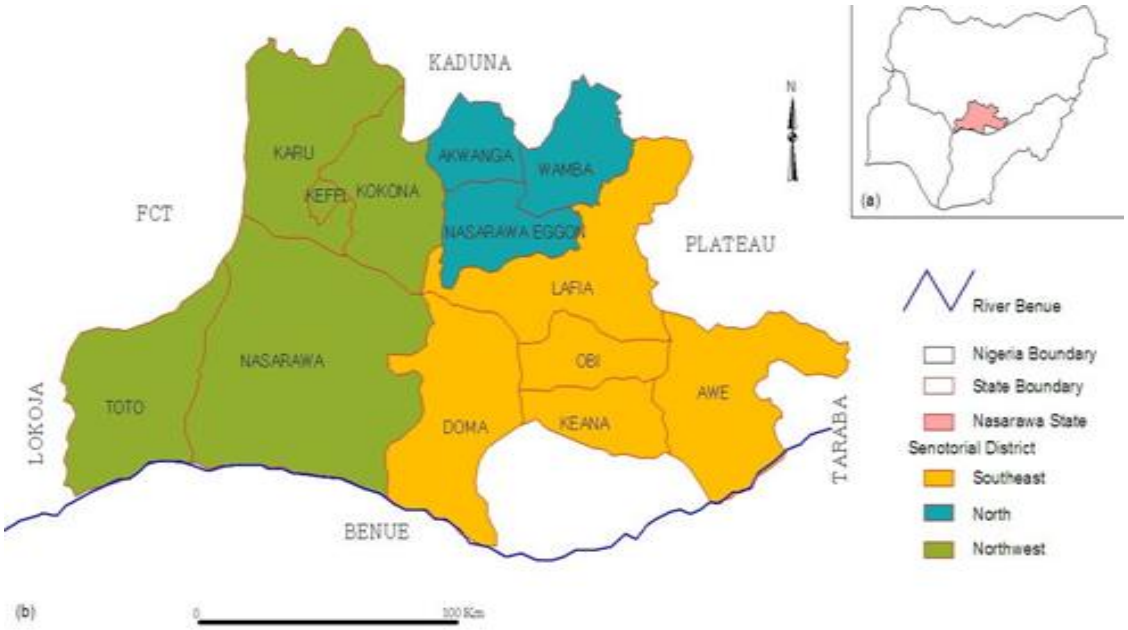

Fig: 1: Map of Nasarawa State showing the three senatorial zones

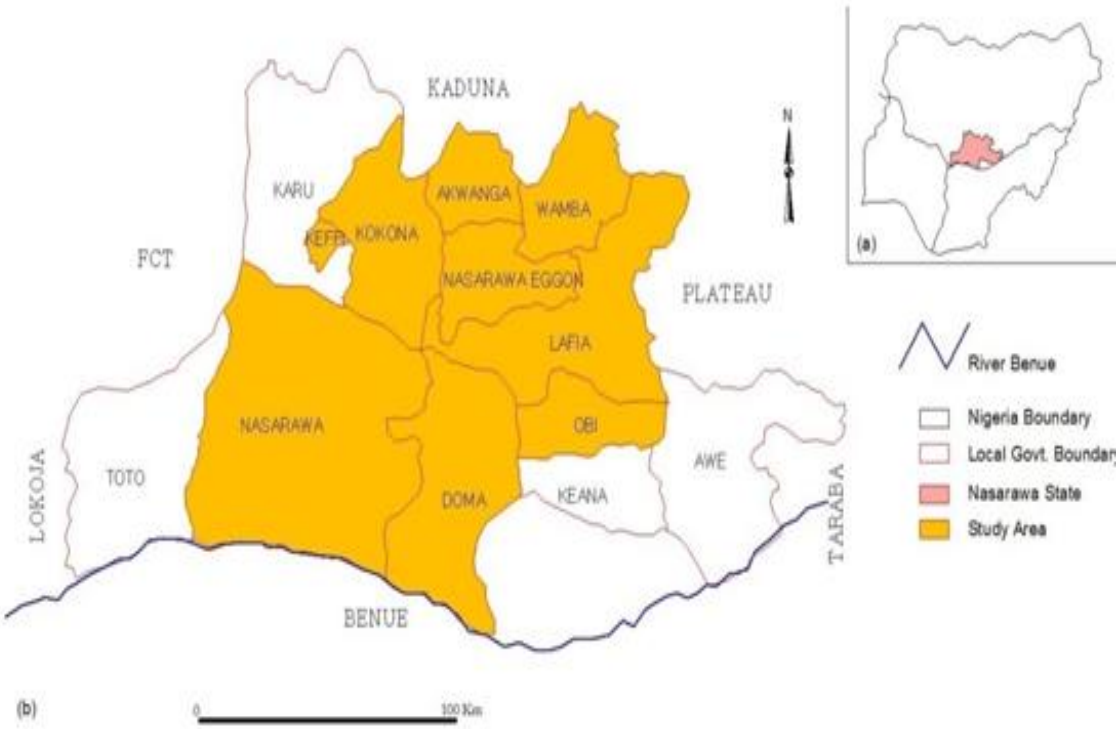

Fig. 2: Map of Nasarawa State showing the study area

Ethical approval

The Ethical approval for this study was obtained from the Ethical Committee on Research of Infectious Diseases of the Dalhatu Araf Specialist Hospital Lafia, Nasarawa State. Consent was also obtained from the female patients that presented themselves for medical treatment in the Health Centres (HC) of the State before sample collection. The approval was on the agreement that participants' anonymity will be maintained, good laboratory practice/quality/ control ensured, and that every finding would be treated with utmost confidentiality and for the purpose of this research only. However, patients that desire to know the results of antifungal susceptibility testing would be given (verbally) free of charge.

Demographic data collection

A well-structured questionnaire were used to collect relevant demographic, clinical and laboratory information of patients.

Study centres

Samples were collected from Primary, Secondary and Tertiary Healthcare centers in the three (3) senatorial zones in Nasarawa State, namely: Nasarawa North (NN), Nasarawa South (NS) and Nasarawa West (NW). In Nasarawa North, one (1) each of PHC and GH in Akwanga, Nasarawa Eggon and Wamba, In Nasarawa South, one (1) each of PHC and GH in Lafia, Doma and Obi were selected as study centers. In Nasarawa West, one (1) each of PHC and GH in Toto, Nasarawa, and Keffi were selected. The two (2) Tertiary Healthcare Centers- DASH Lafia and FMC Keffi, were also selected.

Sample size determination and sample collection

The sample size was determined based on the prevalence rate of a study carried out by Sapkota *et al*, (2010) as follows:

$$N = \frac{Z^2 P(1-P)}{d^2}$$

Where: N= patients to be sampled; Z= the standard normal deviation corresponding to a chosen level of confidence = 1.96; P= expected prevalence v (0.2); d= the degree of accuracy desired (2.5%) = 0.025

In our calculation, we used Z = 1.96, P = 0.2 and d = 0.025. This calculation resulted in a sample size of 1204. This sample size was reduced to 1200 samples to account for the clustered nature of the study design This total sample size was divided by the number of clusters (3 Senatorial Zones) included in the study to determine how many surveys should be administered at each Senatorial Zones. This method of dividing the sample equally among clusters was in accordance with "generic cluster sample" design methods previously described by the WHO Department of Vaccines and Biologicals (Sapkota *et al.*, 2010).

Sample collection

A total of One Thousand Two Hundred (1200) High Vaginal Swabs samples (HVS) were collected using sterile swab sticks from consented patients which attended the study centers from month of April to month of October, 2017. Sampling was assisted by specialists' medical doctors who were given the Consent Form to

was weighed and 200 ml of distilled water was added for broth preparation. The conical administer to patients.

Isolation and identification of Candida albicans

These were carried out as described by Agada *et al*. (2017). Inoculation was carried out by stricken high vaginal swab sample on sabouraud dextrose agar (SDA) media and incubate at 30^{o}C for 3 days for growth. In to a conical flask, 7.9 g of SDA flask was covered using a stopper and swirled to ensure proper mixing of the dried ingredient and was filtered. After preparation of broth, test tubes and bijou bottles were sterilized and 5 ml of the broth were introduced in to each of them. Using sterilized wire loop, the test organisms were inoculated into each of the test tubes containing 5 ml of broth and incubated for 24 h. The broth was standardized by comparing the turbidity to 0.5 McFarland standard. 0.5 ml of the standardized broth culture was pour plated on a newly prepared SDA plate. Using a sterile wire loop each of the fungal isolate was separately inoculated onto the bijou bottles prepared SDA. The inoculated slants were incubated at room temperature for 3 days.

Identification of Candida albicans

The isolates were confirmed by, colonial morphology, microscopic morphology and biochemical characteristics (using RapID kits).

Colonial morphology (Macroscopy)

After the incubation the slants were examined visually for important physical appearance (colour, texture, diffusible pigments)

1. **Colour:** the slants were observed for colour of upside and downside.
2. **Texture:** the slants were observed for texture.
3. **Diffusible pigment:** the reversed side of the slants was observed for diffusible pigments

Microscopy

Wet/Tease mount (Using lactose phenol cotton blue)

On clean grease free slide was placed a drop of 95% ethanol. Using a sterile inoculating needle a small portion of the fungal growth was removed midway between the colony center and the edge. With the aid of two disserting needle, the yeast was teased gently such that it thinly spread out in the mounting medium. A drop of lactose phenol cotton blue was added and covered with a cover slip using × 40 objectives. Morphological characteristics of yeast such as budding were observed (Ochei & Kolhatkar, 2000).

Gram staining

A small amount of inoculum was taken (to ensure a sparsely single layer of yeast) from an isolated colony on Sabouraud Dextrose Agar (SDA) with a wire loop and emulsified in a drop of distilled water placed on a slide. The prepared smear was air-dried and heat-fixed by passing the slide through a flame a few times, without allowing the slide to become hot. It was then covered with crystal violet solution for 1 min. The crystal violet stain was poured off, and the smear was rinsed with water and covered with Lugos iodine solution for another 1 min. The solution was poured off and the slide was rinsed with water. Holding the slide in a tilted position, 95% ethanol was applied several times until no more colour appeared to flow. The slide was then rinsed with water and safranin was applied for 30 seconds as a counter stain. It was then washed, blotted gently and allowed to dry before examination microscopically using oil immersion objective.

Germ tube test

A small portion of 72 h old isolates of the yeast was suspended in human serum in a test tube. The sample procedure was repeated with known positive (*Candida albicans* and negative control (*Candida tropicalis).* All the test tubes were incubated at 37^{0}C for 3 h. A drop of the yeast suspension was placed on a clean grease free slide. It was covered with cover glass and observed under the microscope for presence or absence of germ tubes (a filamentous extension from a yeast cell). Only *C. albicans* produces germ tubes within three h (3 h) at 37°C and formation of chlamydospore. Germ tubes produced by *C. albicans* complex lack constriction (Ochei and Kolhatkar, 2000). Chlamydospores production was assessed by culturing yeast on cornmeal agar at 30°C for 5 days.

RapID identification of Candida albicans

The isolates collected were biochemically identified using one ofthe most widely used kit methods, RapID Yeast Plus System (R8311007). Assimilation profiles were recorded according to the manufacturer's instructions. The isolates were stored at −80°C in Cryo-billes tubes (Laboratoire AES) until genotyping. Prior to molecular testing, isolates were subcultured on Candida ID medium to assess strain viability and purity.

Results and Discussion

Table 1: Prevalence of *Candida albicans*

Candida albicans were isolated from high vaginal swab (HVS) sample of patients and identified based on macroscopical, microscopical and biochemical characteristics as indicated in Table 1.

Table 1: Prevalence of *Candida albicans* in women attending health facilities in Nasarawa State, Nigeria

Macroscopy	Microscopy/Morphology	Biochemical	Inference	No. %
Smooth creamy pasty coloured colonies	Oval shaped single budded cells. Pseudo hyphae and chlamydospores, Germ tube without constriction.	RapID Yeast Plus System (R8311007)	*Candida albicans*	144 (12.0)

Distribution of Candida albicans

The distribution of *Candida albicans* isolated from HVS sample of patients along risk factors such as Pregnancy status, Age, Educational status, Occupation and Toilet facilities are shown in tables 2(a-e).

Distribution of *Candida albicans* with respect to Pregnancy status of women attending health facilities in Nasarawa State, Nigeria showed that a total of 1200 HVS samples were examined. Married women were 879, Single 201 and Co-inhabiting 120. Within the senatorial zones; in Nasarawa South Senatorial Zone (NSSZ), Nasarawa North Senatorial Zone (NNSZ) and Nasarawa West Senatorial Zone (NWSZ), Co-inhabiting had the highest prevalence rate of 10(8.3%), 11(9.2%) and 31(3.5%) respectively while Single women had the lowest prevalence rate of 3(1.5%), 5(2.5%) and 2(1.0%), respectively. Across the senatorial zones, for Married women, NWSZ had the highest prevalence rate of 31(3.5%) while NSSZ had the lowest prevalence rate of 13(1.5%); for Single women, NNSZ had the highest prevalence rate of 5(2.5%) while NWSZ had the lowest prevalence rate of 2(1.0%); for Co-inhabiting, NSSZ had the highest prevalence rate of 11(9.2%) while NWSZ had the lowest prevalence rate of 3(2.5%). The senatorial zones had same prevalence rate of 36(3.6%). Married women statistically differ significantly ($p<0.05$) across the senatorial zones as shown in table 2a.

Distribution of Candida albicans with respect to pregnancy status

Tables 2a(i): Distribution of *Candida albicans* among women with suspected cases of vaginal candidiasis in some selected hospital in Senatorial zones of Nasarawa State, Nigeria in relation to pregnancy status

Pregnancy status	No. (%) *C. albicans*			
	NN (n=46)	NS (n=50)	NW (n=48)	Total (n=144)
Pregnant	36 (78.3)	26 (52.0)	36 (75.0)	98 (68.1)
Non-pregnant	10 (21.7)	24 (48.0)	12 (25.0)	46 (31.9)

NN =Nasarawa North; NS =Nasarawa South; NW =Nasarawa West

Tables 2a(ii): Distribution of *Candida albicans* among women with suspected cases of vaginal candidiasis in some selected hospital in Senatorial zones of Nasarawa State, Nigeria in relation to marital status of pregnant women

Senatorial zones	No. (%) *C. albicans*		
	Pregnant (n=98)		
	Married	Single	Co-habiting
NN	20 (20.4)	5 (5.1)	11 (11.2)
NS	13 (13.3)	3 (3.1)	10 (10.2)
NW	31 (31.6)	2 (2.0)	3 (3.1)
Total	**64 (65.3)**	**10 (10.2)**	**24 (24.5)**
P value	0.021*	0.497	0.093

NN =Nasarawa North; NS =Nasarawa South; NW =Nasarawa West; ***** = statistically significant at 95% confident interval ($p<0.05$)

Tables 2(b): Distribution of *Candida albicans* among women with suspected cases of vaginal candidiasis in some selected hospital in Senatorial zones of Nasarawa State, Nigeria in relation to age

Senatorial zones	No. (%) *C. albicans*			
	Age (n=144)			
	<20	21-30	31-40	41>
NN	5 (3.5)	17(11.8)	24 (16.7)	0 (0.0)
NS	4 (2.8)	22(15.3)	24 (16.7)	0 (0.0)
NW	16 (11.1)	26 (18.1)	6 (4.2)	0 (0.0)
Total	**25 (17.4)**	**65 (52.1)**	**54 (37.5)**	**0(0.0)**
P value	0.373	0.988	0.002**	

NN =Nasarawa North; NS =Nasarawa South; NW =Nasarawa West; ***** = statistically significant at 95% confident interval ($p<0.05$) ****** = statistically significant at 99% confident interval ($p<0.01$)

Distribution of Candida albicans with respect to age

Distribution of *Candida albicans* with respect to Age of women attending health facilities in Nasarawa State, Nigeria showed that a total of 1200 HVS samples were examined. <20 were 198, 21-30 had 600, 31-40 were 300 and 41> were 142. Within the senatorial zones; in NSSZ, and NNSZ 31-40 had the highest prevalence rate of 24(8.0%) each, respectively. In NWSZ, 21-30 had the highest prevalence rate of 26(4.3%), while 41> had the lowest prevalence rate of 0(0.0%) within the senatorial zones, respectively. Across the senatorial zones; for <20, NNSZ had the highest prevalence rate of 5(2.5%) while NWSZ had the lowest prevalence rate of 1(0.5%). 21-30, NSSZ, and NNSZ had the highest prevalence rate of 27(4.5%) each respectively while NWSZ had the lowest prevalence rate of 26(4.3%). 31-40, NSSZ, and NNSZ had the highest prevalence rate of 24(8.0%) each respectively while NWSZ had the lowest prevalence rate of 6(2.0%). NSSZ had the highest total prevalence rate of 46(3.8%) while NWSZ had the lowest prevalence rate of 33(2.8%). Age 31-40 statistically differ significantly ($p<0.05$) across the senatorial zones as shown in table 2b.

Distribution of Candida albicans with respect to educational status

Distribution of *Candida albicans* with respect to Educational status of women attending health facilities in Nasarawa State, Nigeria showed that a total of 1200 HVS samples were examined. No educational qualification had 600, Primary school certificate had 399, Secondary school certificate were 132 and Post secondary school certificate were 69. Within the senatorial zones; in NSSZ, NNSZ and NWSZ, Post secondary school certificate the highest prevalence rate of 5(7.2%), 3(4.3%) and 6(8.7%) respectively while Secondary school certificate had the lowest prevalence rate of 4(3.0%) for NSSZ, No educational qualification had the lowest prevalence rate of 20(3.3%) and Primary school certificate had the lowest prevalence rate of 5(1.3%), respectively. Across the senatorial zones, for No educational qualification, NWSZ had the highest prevalence rate of 31(5.2%) while NNSZ had the lowest prevalence rate of 20(3.3%); for Primary school certificate, NSSZ, and NWSZ had the highest prevalence rate of 14(3.5%) respectively while NNSZ had the lowest prevalence rate of 5(1.3%); for Secondary school certificate, NNSZ had the highest prevalence rate of 5(3.8%) while NSSZ and NWSZ had the lowest prevalence rate of 4(3.0%) respectively; for Post secondary school certificate, NWSZ had the highest prevalence rate of 6(8.7%) while NNSZ had the lowest prevalence rate of 3(4.3%) Educational status statistically do not differ significantly ($p<0.05$) across the senatorial zones as shown in Table 2c.

Tables 2c(i): Distribution of *Candida albicans* among women with suspected cases of vaginal candidiasis in some selected hospital in Senatorial zones of Nasarawa State, Nigeria in relation to educational status

Educational status	No. (%) *C. albicans*			
	NN (n=46)	NS (n=50)	NW (n=48)	Total (n=144)
Educated	42 (91.3)	50 (100.0)	46 (95.8)	138 (95.8)
Non-Educated	4 (8.7)	0 (0.0)	2 (4.2)	6 (4.2)

NN =Nasarawa North; NS =Nasarawa South; NW =Nasarawa West

Table 2c(ii): Distribution of *Candida albicans* among women with suspected cases of vaginal candidiasis in some selected hospital in Senatorial zones of Nasarawa State, Nigeria in relation to educational status

Senatorial zones	No. (%) *C. albicans* Education (n=138)			
	Dropout (attempted) education	Primary education	Secondary education	Tertiary education
NN	20 (14.5)	14(10.2)	5(3.6)	3(2.2)
NS	27(19.6)	14(10.2)	4(2.9)	5(3.6)
NW	31(22.5)	5(3.6)	4(2.9)	6(4.3)
Total	**78(56.5)**	**33(23.9)**	**13(9.4)**	**14(10.2)**
P value	0.304	0.086	0.926	0.607

Statistically not significant at 95% confident interval (p>0.05); NN =Nasarawa North; NS =Nasarawa South; NW =Nasarawa West

Distribution of Candida albicans with respect to occupation

Distribution of *Candida albicans* with respect to Occupation of women attending health facilities in Nasarawa State, Nigeria showed that a total of 1200 HVS samples were examined. Civil servant had 90, Students had 99, Trader had 60, House wife had 501, Hair dressing had 201 and Tailoring were 249. Within the senatorial zones; In NSSZ, Trader had the highest prevalence rate of 7(12.0%) while House wife had the lowest prevalence rate of 1(0.2%). In NNSZ, Trader had the highest prevalence rate of 7(12.0%) while Tailoring had the lowest prevalence rate of 4(2.0%). In NWSZ, Trader had the highest prevalence rate of 6(10.0%) while Students had the lowest prevalence rate of 1(1.0%). Across the senatorial zones, for Civil servant, NWSZ had the highest prevalence rate of 5(6.0%) while NNSZ had the lowest prevalence rate of 2(2.2%). Students, NNSZ had the highest prevalence rate of 5(5.1%) while NWSZ had the lowest prevalence rate of 1(1.0%). Trader, NSSZ and NNSZ had the highest prevalence rate of 7(12.0%) respectively while NWSZ had the lowest prevalence rate of 6(10.0%). House wife, NWSZ had the highest prevalence rate of 20(4.0%) while NSSZ had the lowest prevalence rate of 1(0.2%). Hair dressing, NWSZ had the highest prevalence rate of 10(5.0%) while NSSZ and NWSZ had the lowest prevalence rate of 8(4.0%) and 7(4.0%) respectively. Tailoring, NWSZ had the highest prevalence rate of 9(4.0%) while NNSZ had the lowest prevalence rate of 4(2.0%). House wife statistically differ significantly (p<0.05) across the senatorial zones as shown in Table 2d.

Table 2d(i): Distribution of *Candida albicans* among women with suspected cases of vaginal candidiasis in some selected hospital in Senatorial zones of Nasarawa State, Nigeria in relation to occupation

Occupational status	No. (%) *C. albicans*			
	NN (n=46)	NS (n=50)	NW (n=48)	Total (n=144)
Occupied	29 (63.0)	41 (82.0)	48 (95.8)	118 (95.8)
Non-Occupied (idle)	17 (37.0)	9 (18.0)	0 (0.0)	26 (18.1)

NN =Nasarawa North; NS =Nasarawa South; NW =Nasarawa West

Table 2d(ii): Distribution of *Candida albicans* among women with suspected cases of vaginal candidiasis in some selected hospital in Senatorial zones of Nasarawa State, Nigeria in relation to occupation

Senatorial zones	No. (%) *C. albicans* Occupation (n=118)					
	Civil servant	Student	Trading	House wife	Hair dressing	Tailoring
NN	3(2.5)	3(2.5)	7(5.9)	1(0.9)	8(6.8)	7(5.9)
NS	2(1.7)	5(4.2)	7(5.9)	13(11.0)	10(8.5)	4(3.4)
NW	5(4.2)	1(0.9)	6(5.1)	20(17.0)	7(5.9)	9(7.6)
Total	**10 (8.5)**	**9(7.6)**	**20(17.0)**	**34(28.8)**	**25(21.2)**	**20(17.0)**
P value	0.497	0.264	0.951	0.000**	0.607	0.368

***** = Statistically significant at 95% confident interval (p<0.05); ****** = statistically significant at 99% confident interval (p<0.01); NN =Nasarawa North; NS =Nasarawa South; NW =Nasarawa West

Table 2e(i): Distribution of *Candida albicans* among women with suspected cases of vaginal candidiasis in some selected hospital in Senatorial zones of Nasarawa State, Nigeria in relation to type of toilet facilities used

Toilet facilities used	No. (%) *C. albicans*			
	NN (n=46)	NS (n=50)	NW (n=48)	Total (n=144)
Toilet facility users	44 (95.7)	50 (100.0)	40 (83.3)	134 (93.1)
Bush (free range)	2 (4.4)	0 (0.0)	8 (25.0)	10 (6.9)

NN =Nasarawa North; NS =Nasarawa South; NW =Nasarawa West

Table 2e(ii): Distribution of *Candida albicans* in relation to the type of toilet system used by the women with suspected cases of vaginal candidiasis in selected healthcare facilities in Nasarawa State, Nigeria

Senatorial Zones	No. (%) *C. albicans* (n=134) Toilet facility		
	Bucket System	Pit	Water System
NN	12 (9.0)	10 (7.5)	22 (16.4)
NS	14 (10.5)	16 (11.9)	20 (14.9)
NW	10 (7.5)	12 (9.0)	18 (13.4)
Total	**36 (26.9)**	**38 (28.4)**	**60 (44.8)**
P value	0.717	0.497	0.819

Statistically not significant at 95% confidence interval (p>0.05); NN=Nasarawa North; NS=Nasarawa South; NW=Nasarawa West

Distribution of Candida albicans with respect to toilet facilities

Distribution of *Candida albicans* with respect to Toilet facilities of women attending health facilities in Nasarawa State, Nigeria showed that a total of 1200 HVS samples were examined. Bush (free range) had 270, Pits had 300 and Water system had 630. Within the senatorial zones; In NSSZ, Pits had the highest prevalence rate of 16(5.3%) while Water system had the lowest prevalence rate of 20(3.2%). In NNSZ, Bush (free range) had the highest prevalence rate of 12(4.4%) while Pits had the lowest prevalence rate of 10(3.3%). In NWSZ, Bush (free range) and Pits had the highest prevalence rate of 10(4.0%) and 12(4.0%) respectively while Water system had the highest prevalence rate of 18(3.0%). Across the senatorial zones; for Bush (free range), NSSZ had the

highest prevalence rate of 14(5.2%) while NWSZ had the lowest prevalence rate of 10(4.0%). Pits, NSSZ had the highest prevalence rate of 16(5.3%) while NNSZ had the highest prevalence rate of 10(3.3%). Water system, NWSZ had the highest prevalence rate of 22(4.0%) while NWSZ had the lowest prevalence rate of 18(3.0%). Toilet facilities statistically, do not differ significantly ($p<0.05$) across the senatorial zones as shown in Table 2e.

Of the 1200 HVS samples collected, 144 isolates of *Candida albicans* were obtained accounting for 12% which is less than 40% obtained by Rather (2005) and Barbic & Hukie (2010).

The high prevalence of *Candida albicans* in High Vaginal Swab (HVS) samples of Married Pregnant women across the three (3) senatorial zones could be attributed to high level of promiscuity, multiple sex partners and poor hygiene. This high prevalence observed agrees with the findings of Haward and Kent (1991); *Candida* infections increases with release of reproductive hormones in pregnancy. Sobel (2007) had it that vagina is often more sensitive during pregnancy. Married pregnant women statistically differ significantly ($p<0.05$) across the senatorial zones, indicating that location affects the occurrence of Candida infection.

The findings on the distribution of *Candida albicans* in terms of Age group agrees with the findingss of Okungbowa *et al*. (2003) and Enweani *et al*. (1987). The differences observed may be due to geographical location and personal hygiene. Increase in prevalence with increase in Age of the women; disagree with the findings of Kolawole *et al.* (2009) where it was found that there is decrease in immune system of the women as they increase in age or advance. The sturdy also observed a no-positive in age 41> (0.00) which agrees with the findings of Howard and Kent (1991); candidaisis was not common in menopause (sexually less active), since candidaisis is reproductive hormone depended. Age 31-40 statistically differ significantly across the senatorial zones. The findings of this study suggest that at age 31-40, the women are more sexually active and are at the peak of reproductive stage.

The findings on the distribution of *Candida albicans* in terms of Educational status in which the prevalence rate was high amongst Dropout (Attempted) education. The findings disagree with Nsofor *et al*. (2016), which recorded highest rate of 45.0% observed among students between the age group 23-25 This could be attributed to care-free attitude towards hygiene by dropouts from school. Educational status was statistically insignificant ($p<0.05$) across the senatorial zones.

The findings on the distribution of *Candida albicans* in relation to Occupation, showed a high prevalence among House wife. This disagrees with the findings of Fonck *et al*. (2000) who observed high prevalence among unemployed women. House wife statistically differ significantly ($p<0.05$) across the senatorial zones.

The study on the distribution of *Candida albicans* in terms of Toilet facilities observed high prevalence of *Candida albicans* among the women using Water system. Analysis of the participants' response to the questionnaire indicates that *C. albicans* carrier rate may be associated with poor personal hygiene and improper flushing of the water system with water. This agree with the findings of Nsofor *et al.* (2016)

Conclusion

So far, a total of 1200 HVS samples were collected, 144 isolates of *Candida albicans* were obtained accounting for 12%, the prevalence of *Candida albicans* with respect to pregnancy, age and occupation are affected by geographical locations or zones. Educational status and Toilet facility used were not affected by geographical zones.

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