

**CO-EXISTENCE OF BACTERIAL VAGINOSIS AND CANDIDIASIS AMONG
PREGNANT WOMEN IN EKPOMA, NIGERIA.**

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ABSTRACT

This study examines the co-existence of candidiasis and bacterial vaginosis among pregnant women in Ekpoma, Edo State, Southern Nigeria for a period of 4 months. Bacteriological and Mycological study was done in Diagnostic and Research Laboratories of Medical Laboratory Science Department of Ambrose Alli University, Ekpoma. Two hundred and ten (210) pregnant subjects and fifty non-pregnant women were examined for reproductive tracts infections of candidiasis, bacterial vaginosis and co-infection of candidiasis and bacterial vaginosis. In this study 46(38.3%) of the pregnant women studied were found to have candidiasis, bacterial vaginosis and co-infections of candidiasis and bacterial vaginosis. Cases of candidiasis was 24(43.5%), bacterial vaginosis was 17(37%), while those with co-infection with bacterial vaginosis and candidiasis was 5(10.8%). The comparison between pregnant women and the control was not statistically significant ($X^2 = 0.03$; P value = 0.99). It was however found out that co-infection of bacterial vaginosis and candidiasis among pregnant women in this study was low and was highest among pregnant women in their 3rd trimester. It was also observed that highest occurrences of co-infections were among pregnant women who are traders.

KEYWORDS: Pregnant, women, vaginosis, candidiasis.

INTRODUCTION

Bacterial vaginosis also referred to as vaginal bacteriosis or Gardnerella vaginitis is a disease of the vagina caused by an alteration of the vaginal bacterial morphotypes (Swidsinski *et al.*, 2005). The dynamic microbial community of the vagina plays a pivotal role in preventing colonization by undesirable organisms, including those responsible for bacterial vaginosis, candidiasis, urinary tract infections, aerobic vaginitis and sexually transmitted diseases. (Fredericks *et al.*, 2005) Lactobacilli are involved in maintaining the normal vaginal microflora by preventing overgrowth by pathogenic and opportunistic organisms (Marrazo, 2009).

Bacterial vaginosis is an extremely prevalent vaginal condition and the number one cause of vaginitis among both pregnant and non – pregnant women (Colebunders & Crucuti, 2013). Symptoms are a minimally irritating, grey – white discharge which has an unpleasant ‘fishy’ odour. Although it is not a reportable disease, studies have found the prevalence of bacterial vaginosis among non-pregnant women to range from 15 percent to 30 percent, up to 50 percent of women have been found to have bacterial vaginosis (Holzman *et al.*, 2001). Previously considered a benign condition, bacterial

vaginosis has been related to many gynecologic conditions and complications of pregnancy including pelvic inflammatory disease, post hysterectomy, vaginal cuff cellulitis, amniotic fluid infection, preterm delivery, preterm labor, premature rupture of the membranes and possibly spontaneous abortion (Larsson *et al.*, 1992; Govender *et al.*, 1996).

The most common species of *Candida albicans* which lives in the bowl can be transferred from back to front passage and can produce vaginitis characterized by intense irritation and thick white discharge (Akinbiyi *et al.*, 2008). Candidiasis is associated with vaginal discharge and pruritis. The discharge appears to be like curded milk and deep erythema of the vulva and vagina is often seen (Blackwell *et al.*, 1993). Up to 75% of women experience genital candidiasis during their life time and 5% to 8% have chronic recurring candidiasis, defined as four or more episodes in the 12 months period (Fang *et al.*, 2007). The incidence of the infection is almost doubled in pregnant women particularly in the third trimester, compared to the non-pregnant women. It always reoccurs during pregnancy as a result of the increased level of estrogens and corticoids that reduce the vaginal defence mechanisms against such

opportunistic infections as *candida* species, a two fold increase from the prevalence rate in non-pregnant women (Alo *et al.*, 2012). Abnormal vaginal flora before 14 gestational weeks is a risk factor for preterm birth. The presence of aerobic microorganisms and an inflammatory response in the vagina may also be important risk factor. Hence, it becomes necessary to determine the co-existence of bacterial vaginosis and candidiasis.

MATERIALS AND METHODS

Study Area: This cross – sectional study was carried out in Ekpoma, the administrative headquarters of Esan West Local Government Area of Edo State, Nigeria. It lies within latitude 6°43'N and 6°45' North of the equator and longitudes 6°6' and 6°8' East of the Greenwich Meridian. It has an estimated population of 127,718 as at 2006 population census.

Study Population and Sampling

The study population comprised of two hundred and ten (210) pregnant women and forty (40) non – pregnant women that served as the control group.

EXCLUSION AND INCLUSION CRITERIA

Samples were collected only from pregnant women registered in the health facilities used for this study. Similarly samples were also collected from non-pregnant women which served as the control. Women with signs and symptoms of any underlying disease were excluded from this study.

ETHICAL CONSIDERATION

Ethical approval was obtained from the local health authority through recommendation from the Head of Department and informed consent was equally sorted from the subjects.

SAMPLE COLLECTION

High vaginal swabs were collected from the pregnant women and controls subjects using a clean sterile vaginal swab sticks after the passage of a sterile bivale speculum. The samples were labeled with subjects names, number and date. Questionnaires were administered to collect data on socio-demographic, health and obstetric history. The samples were transported immediately to the laboratory for analysis.

SAMPLE ANALYSIS

Two vaginal swabs was taken from each women, the first swab was subjected to microscopically wet smear examination and Gram stained according to Ochei and Kolhatter¹² (2008) while the second was cultured. All vaginal swabs were examined and cultured on blood agar and Sabour Dextrose agar. All isolates were diagnosed

based on morphological characters, Gram-stain and biochemical reactions.

Statistical Analysis

Comparative analysis of the result was done using chi-square statistical software. Values were considered statistically significant when P-values are less than 0.05 ($P < 0.05$).

RESULTS

Two hundred and ten (210) pregnant subjects and forty non-pregnant women were examined for reproductive tract infections of candidiasis, bacterial vaginosis and co-infection of candidiasis and bacterial vaginosis in community health centres in Ekpoma.

Out of the two hundred and ten (210) pregnant women examined, 44 (21.0%) were infected with either candidiasis, bacterial vaginosis or co-infection of both as compared with the control that had a prevalence of 7 (17.5%) from the total number of 40.

Table 1 shows the comparism between pregnant women and the control which was not statistically significant ($X^2 = 0.03$; P Value = 0.99).

Table 2 shows the age related prevalence of reproductive tract infection in pregnant women. The age group range 26 – 30 years was the most infected with overall infection prevalence of 18(24.0%), while age group range of < 20 years, 20 – 25 years and > 30 years had 5 (19.2%), 15(23.1%) and 8(18.2%) respectively. The comparism within the age groups was statistically significant (X^2 cal = 9.478; P value = 0.024). Table 3 shows the age related prevalence of candidiasis, bacterial vaginosis and co-infection according to age group ranges was statistically insignificant (X^2 cal = 0.98, P value = 0.98). Table 4 shows the trimester related type infection. Also shown in this table are PH, amine's test and clue cells found in the samples examined. The differences in the distribution according to trimester was statistically significant (X^2 cal = 17.26, P-value = 0.001). Table 5 shows the trimesters related prevalence of candidiasis, bacterial vagionosis and co-infection. The difference of infection distribution according to trimester was statistically insignificant (X^2 cal = 1.50; P-value = 0.83). Table 6 shows the occupation related prevalence of cases of candidiasis, bacterial vaginosis and co-infection. Infections with candidiasis and co-infection was statistically significant ($P < 0.05$) while that of bacteria vaginosis was not statistically significant ($P > 0.05$). Table 7 show the color characterization of the isolated yeast cells in chrom agar and germ tube test. Table 8 shows the characterization of candida species based on the sugar utilization.

Table 1: Prevalence of Reproductive tract infection between pregnant women and non-pregnant women (controls).

State of the subject	NE	NI n(%)	Candidiasis	BV	Co-infection N(%)	X ² cal	P-val	Remarks
Pregnant	210	44(21.0)	24(11.4)	14(6.7)	6(2.9)			
Control	40	7(17.5)	4(10.0)	2(5.0)	1(2.5)			
Total	250	51(20.4)	28(12.0)	16(6.4)	7(2.8)	0.03	0.99	NS

Key

NE = Number Examined
 NI = Number infected
 P < 0.05 = Significant
 P > 0.05 = Not Significant
 NS = Not Significant
 BV = Bacterial vaginosis

Table 2: Age related prevalence of reproductive tract infection in pregnant women

Age	NE	NI n(%)	Amine's test	P ^H		Clue cells
				4.0 – 4.5	> 4.5	
< 20	26	5(19.2)	2	3	2	2
20 – 25	65	15(23.1)	6	9	6	6
26 – 30	75	18(24.0)	6	12	6	6
> 30	44	8(18.2)	3	5	3	3

(X² Cal = 9.478; P Value = 0.024)**Key**

NE = Number Examined
 NI = Number infected
 R = Remarks
 P < 0.05 = Significant
 P > 0.05 = Not Significant

Table 3: Age related prevalence of Candidiasis, Bacterial Vaginosis and Co-infection

Age	NE	NI	Candidiasis n(%)	BV n(%)	Co-infection n(%)	X ² cal	p-val	Remarks
<20	26	5(19.2)	3(11.5)	2(7.7)	0(0.0)			
20-25	65	15(23.1)	7(10.8)	6(9.2)	2(3.1)			
26-30	75	18(24.0)	10(13.3)	6(8.0)	2(2.7)			
>30	44	8(18.2)	4(9.1)	3(6.8)	1(2.3)			
Total	210	46(21.9)	24(11.4)	17(8.1)	5(2.4)	0.96	0.98	NS

Key

Candidiasis (X² Cal = 5.00; P value = 0.17)
 Bacterial vaginosis (X² Cal = 3.00; P value = 0.39)
 NE = Number Examined
 NI = Number infected
 P < 0.05 = Significant
 P > 0.05 = Not Significant
 NS = Not Significant
 BV = Bacterial vaginosis

Table 4: Trimester related prevalence of reproductive tract infection in pregnant women

Trimester	NE	NI n(%)	Amine's Test	P ^H		Clue cells
				4.0 – 4.5	> 4.5	
1 st	14	4(28.6)	2	2	2	2
2 nd	84	15(17.9)	5	10	5	5
3 rd	112	27(24.1)	10	17	10	10
Total	210	46(21.9)	17	29	17	17

(X² Cal = 17.26; P Value = 0.001)**Key**

NE = Number Examined
 NI = Number infected

P < 0.05 = Significant
 P > 0.05 = Not Significant

Table 5: Trimester related prevalence of Candidiasis, Bacterial Vaginosis and Co-infection.

Trimester	NE	NI	Candidiasis n(%)	BV n(%)	Co-infection n(%)	X ² cal	p-val	Remarks
1 st	14	4(28.6)	2(14.3)	2(14.3)	0(0.0)			
2 nd	84	15(17.9)	9(10.7)	4(4.8)	2(2.4)			
3 rd	112	27(24.1)	13(11.6)	11(9.8)	3(2.7)			
Total	210	46(21.9)	24(11.4)	17(8.1)	5(2.4)	1.50	0.83	NS

Key

Candidiasis (X² Cal = 7.75; P value = 0.02)
 Bacterial vaginosis (X² Cal = 7.88; P value = 0.02)
 Co infection (X² Cal = 2.80; P value = 0.25)
 NE = Number Examined
 NI = Number infected
 P < 0.05 = Significant
 P > 0.05 = Not Significant
 BV = Bacterial vaginosis
 NS = Not Significant

Table 6: Occupation related prevalence of candidiasis, Bacterial Vaginosis and Co-infection.

Occupation	NE	NI	Amine's test	PH 4.0-4.5	>4.5	Clue cells	Candidiasis n(%)	BV n(%)	Co-infection n(%)	p-value
Traders	136	28	10	18	10	10	14(10.3)	8(5.9)	4(2.9)	0.05
Teachers	26	7	3	4	3	3	4(15.4)	3(11.5)	0(0.0)	0.16
Students	18	4	1	3	1	1	2(11.1)	1(11.1)	1(5.6)	0.82
Tailors	21	5	2	3	2	2	3(14.3)	2(9.5)	0(0.0)	0.25
House wife	9	2	1	1	1	1	1(11.1)	2(22.2)	0(0.0)	0.37
Total	210	46	17	29	17	17	24(11.4)	17(8.1)	5(2.4)	0.002

Key

Candidiasis (X² Cal = 23.08; P value = 0.002)
 Bacterial vaginosis (X² Cal = 8.00; P value = 0.09)
 Co infection (X² Cal = 12.00; P value = 0.017)
 NE = Number Examined
 NI = Number infected
 P < 0.05 = Significant
 P > 0.05 = Not Significant
 BV = Bacterial vaginosis

Table 7: Color Characterization of the isolated Yeast cells on Chrom agar and germ tube result

Trimester	NE	NI with yeast cells n(%)	Germ tube test n(%)	Chrom agar color characteristic	
				<i>Candida albicans</i>	<i>Candida krusei</i>
1 st	14	2(14.3)	2(14.3)	2(14.3)	0(0.0)
2 nd	84	9(10.7)	6(7.1)	6(7.1)	3(7.1)
3 rd	112	13(11.6)	10(8.9)	10(8.9)	3(2.7)
Total	210	24(11.4)	18(8.6)	18(8.6)	6(2.9)

Key

NE = Number Examined
 NI = Number infected
 R = Remarks

Table: 8 Speciation of Candida species with Sugar Reaction.

S/N	N	GT	Chromagar	Glu	Mal	Lact	Specie
X	24	+	Green	+	+	-	<i>Candida albicans</i>
Y	11	-	Pink	+	-	-	<i>Candida krusei</i>

DISCUSSION

In this study, 46 (21.9%) and 7 (17.5%) of the pregnant and non-pregnant women (controls) studied were infected with candidiasis, bacterial vaginosis and co-infection of candidiasis and bacterial vaginosis. Candidiasis had 24 (11.4%), bacterial vaginosis 14(6.7%) and co-infection with bacterial vaginosis and candidiasis had 6(2.9%). The findings in this study was higher than the prevalence of 17% found in a similar study in south – East Nigeria (Adinma et al, 2001), but in agreement with 21% and 29% reported in studies among pregnant women in Kenya and south Africa (Govender et al., 1996; Thomas et al., 1996; Schneider et al, 1998) and higher than the 11 – 15% from industrialized countries. (Holzman et al., Morris et al., 2001). The higher rate in our study may be due to the difference in methodology, Amsel's criteria was used in the later while Nugent's criteria was utilized in the Kenya and south Africa study. The prevalence of bacterial vaginosis in this current study was also found to be in agreement with the findings of Ibrahim et al (2014) who reported 17.4% of bacterial vaginosis. The levels of education and other socio-economics factors have also been proposed as possible reasons for lower rate of BV in industrialized countries than in our environment (Holzman et al., 2001; Morris et al., 2001).

The prevalence of 6(2.9%) for co-infection of bacterial vaginosis and candidiasis was found to be in agreement with findings of (Alo and Coleagues (2012)) who reported similar prevalence, but in disagreement with the findings of 3(1%) by Afroza & colleagues (2003).

With regards to age group ranges, candidiasis was found to be higher in the age group range 26 – 30 with 10(13.3%), but was not in agreement with Nwadioha et al., (2010) and Isibor et al., (2011) who reported a prevalence rate of 60%, 62.2% and 67% respectively for vaginal candidiasis. The occurrence of *C. albicans* observed in this study is an indication that it is a leading causative agent of the reproductive tract yeast infection in women of child bearing age as also observed by Isibor et al., 2011. It can also be deduced that the incidence of *C. albicans* could be due to increased physiological changes, estrogen and rich glycogen content of the vaginal mucosa, thereby providing an adequate supply of utilizable sugar that favor its ground during pregnancy.

Co-infections were found to be higher in age group 20 – 25 and 26 – 30. This disparity could be attributed to the physiological and biochemical changes associated with changes in age which affect the pH at the vagina (Trofa et al., 2008). With regards to co-infection of candidiasis and bacterial vaginosis according to trimesters, pregnant women in 3rd trimester were found to be more predisposed to co-infection. This findings agrees with studies done by Alo & Colleagues (2012) who reported same in their research in Abakaliki. This finding could be attributed to reduction of immunity of the pregnant

women with reduced infections as hypothesized by (Alo et al., 2012).

There are a number of micro organisms that may cause vaginal infections and several many coexist e.g thrush infection caused by yeast organisms that are found in vagina in 25% of women usually without symptoms. Therefore it is important that candidiasis and bacterial vaginosis be included in pretest carried out during pregnancy. Women with previous history of reproductive tract infections should be monitored for reproductive tract infections during the first trimester of pregnancy. Personnel hygiene especially proper toilet habits should be strictly adhered to by pregnant women to avoid contamination.

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