Effect of contraceptives on the prevalence of vaginal colonization with *Candida* species in Edo State, Nigeria

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Summary

High vaginal swabs (HVS) obtained from 500 volunteers in Edo State, Nigeria which comprised 394 contraceptive users and 106 non-contraceptive users were screened for the prevalence of *Candida* species using standard procedures. Results revealed the isolation of *Candida* species in 246 of volunteers. These included *Candida albicans* 174 (38.4%), *Candida pseudotropicalis* 20 (4%), *Candida stellatoidea* 15 (3%), *Candida krusei* nine (1.8%), *Candida guilliermondii* 12 (2.4%), *Candida tropicalis* 11 (2.2%) and *Candida glabrata* five (1%). Of the 394 contraceptive users, 203 (51.5%) had *Candida* species isolated from them compared to 43 (40.6%) from 106 non-contraceptive users. There was significant relationship (P<0.001) between the type of contraceptive used and the prevalence of vaginal colonization. Age and marital status of the volunteers sampled had significant relationship (P<0.001) with the prevalence of vaginal colonization. Results have revealed an association between use of contraceptive and the prevalence of vaginal colonization in our environment.

Key words Contraceptives, Vaginal colonization

Efecto de los anticonceptivos en la prevalencia de la colonización vaginal por *Candida* spp. en el Estado Edo, Nigeria

Resumen

Se estudió la prevalencia de *Candida* spp. en muestras vaginales de 500 voluntarias de Edo State (Nigeria), de las que 394 utilizaba algún método anticonceptivo. Se aislaron *Candida* spp. en 246 muestras, de las que 174 eran *Candida albicans* (38,4%), 20 *Candida kefyr* (4%), 15 *Candida stellatoidea* (3%), nueve *Candida krusei* (1,8%), 12 *Candida guilliermondii* (2,4%), 11 *Candida tropicalis* (2,2%) y cinco *Candida glabrata* (1%). De las 394 usuarias de anticonceptivos 203 (51,5%) presentaron aislamientos de *Candida* spp. frente a 43 de las 106 que no utilizaban anticonceptivos (40,6%). Se encontró una relación significativa entre la prevalencia de colonización vaginal y el tipo de anticonceptivo utilizado, la edad y la situación marital de las voluntarias (P<0.001). Estos resultados revelan una asociación entre el uso de anticonceptivos y la prevalencia de colonización vaginal en nuestro entorno.

Palabras clave Anticonceptivos, Colonización vaginal

Vaginal condition is a primary or secondary infection of the vagina involving *Candida* species with *Candida albicans* being a leading cause [1]. This disease condition could be exacerbated by a change in the normal vaginal ecology [2].

Some agents reported to increase the occurrence of *Candida* species in the vaginal microbiota include broad spectrum antibiotics, steroids, high dose of estrogen and contraceptives) [3], while conditions predisposing the vaginal conditions include diabetes mellitus, T-cell dysfunction which could be congenital or acquired, and pregnancy.

Contraceptives are chemical substances used for birth control measures. Examples include oral contraceptives, intrauterine contraceptive devices (IUCD)/copper T, injectable contraceptives (Dopoprovera and Noristerate), jellies, creams, foams, vaginal tablets and cervical caps [4].

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The role of gestrogenic contraceptives in the prevalence of vaginal candidosis has been documented [5-8], but there have been no reports from Nigeria. Oriel *et al.* [8] reported a prevalence of 32% for women taking oral contraceptive as against 18% for non-contraceptive users. Harley *et al.* [9] reported yeasts in 1538 (23.2%) of 6629 vaginal swabs with *C. albicans* accounting for 93-95% of the isolates. It has also been documented that a large majority of candidosis cases are due to *C. albicans* noting that *Candida* species may be normal inhabitants on human genitalia in over 20% of the population [10]. Other studies conducted elsewhere [11,12] have identified isolation rates of 50% and 3.8% respectively of *C. albicans* vulvovaginal candidosis.

In spite of the high frequency of candidosis reported in developing and developed countries [13] there is a paucity of research works in the area of candidosis in general and vaginal candidosis in particular in Nigeria. In Nsukka, Njoku-Obi [13] isolated 57 *Candida* isolates from the skin of 52 healthy indidivuals. In a related study, Osoagbaka [14] reported *C. albicans* isolates in eight (40%) of 20 cases of bronchitis pulmonary infections at Nsukka. Acholonu *et al.* [15] documented a 14.8% prevalence of *C. albicans* and *C. tropicalis* associated with cases of mycosis in Lagos, Nigeria. Equally worthy of mention is the association of *C. albicans* (38.1%) and *Candidatropicalis* (21.4%) in cases of asymptomatic candidosis amongst female students of the University of Jos, Nigeria [16]. But in Edo State, Nigeria, we are not aware of any report on the role of contraceptives in vaginal candidosis. This study, therefore, reports for the first time, the role of contraceptives on the prevalence of vaginal colonization by *Candida* species in Edo State, Nigeria. This will provide base-line data of epidemiological and clinical significance.

MATERIALS AND METHODS

Five hundred high vaginal swabs (HVS) were collected in duplicates from volunteers attending the Gynaecology and Obstetrics clinics of the University of Benin Teaching Hospital, Benin City; Otibhor Okhae Teaching Hospital, Irrua; Okpebho Maternity and Clinic Centre, Ekpoma; Faithdome Health Clinic, Ekpoma and Ambrose Alli University Health Centre, Ekpoma, all in Edo State, Nigeria. These comprised 394 contraceptive and 106 non-contraceptive users. The samples were immediately transported to the microbiology laboratory for analysis. The method reported by Enweani *et al.* [17] was employed for identification. Briefly the HVS samples were inoculated onto Sabouraud dextrose agar (SDA) and incubated at 37 °C for 24-48 h. Suspected colonies were examined microscopically using lactophenol cotton blue. Tests for chlamydospore formation were done and identified as double walled large round cells. Other tests also performed to fully identify the organisms were as previously described [16].

The chi-square test was used for statistical analysis.

RESULTS

Of the 500 HVS samples from contraceptive and non-contraceptive users screened for the prevalence of *Candida* species, 246 of *Candida* species were isolated. These included *C. albicans* 174 (38.4%), *Candida kefyr* 20 (4.0%),. *Candida stellatoidea* 15 (3.0%) *Candida krusei* nine (1.8%) *Candida guillermondii* 12 (2.4%), *Candida tropicalis* 11 (2.2%) and *Candida glabrata* five (1.0%) (Table 1).

Table 1. *Candida* species isolated from the high vaginal swabs of 500 volunteers.

Organism	No. isolated	(%)
Candida albicans	174	(38.4)
C. kefyr	20	(4.0)
C. stellatoidea	15	(3.0)
C. krusei	9	(1.8)
C. guillermondii	12	(2.4)
C. tropicalis	11	(2.2)
C. glabrata	5	(1.0)
Total	246	(49.2)

Table 2. The incidence of vaginal colonization in female contraceptive and non-contraceptive users.

Female Volunteers	No. sampled	No. infected	(%)
Contraceptive users	394	203	(51.5)
Oral pills	123	85	(69.1)
IUCD	149	74	(49.7)
Injectables	84	30	(35.7)
Vaginal tablets	38	14	(36.8)
Non-contraceptive users	106	43	(40.6)
Total	500	246	(49.2)

X^2 (5df) = 20.52** (P<0.001)

Table 3. The relationship between the age of the volunteers and the prevalence of vaginal colonization**.**

Age (Years)	No. sampled	No. infected	(%)
<20	47	36	(76.6)
20 < 25	207	86	(41.5)
25 <30	168	70	(41.6)
>30	78	54	(69.2)
Total	500	246	

X^2 (3df) = 16.27** (P<0.001).

Table 4. The relationship between the marital status of the volunteers and the prevalence of vaginal colonization.

Marital Status	No. sampled	No. infected	(%)
Married	153	78	(50.9)
Single	347	168	(48.4)
Total	500	246	

X^2 (1df) = 10.83* (P<0.001)

Further analysis of the result showed that *Candida* species were isolated from 203 (51.5%) contraceptive users and 43 (40.6%) non-contraceptive users (Table 2). There was a significant relationship (P<0.001) between the type of contraceptive used and the prevalence of vaginal colonization. The highest prevalence of 85 (69.1%*)* of 123 patients examined was recorded among oral pill users (Table 2). This was followed by IUCD recording 74 (49.7%), injectables was recording 30 (35.7%) and those using vaginal tablets recording 14 (36.8%).

There was significant relationship (P<0.001) between the ages of the volunteers sampled and the prevalence of vaginal colonization (Table 3).

The results also revealed that the marital status of the volunteers had significant relationship (P<0.001) with the prevalence of vaginal colonization (Table 4).

DISCUSSION

Out of 500 HVS samples from the volunteers screened for the isolation of *Candida* species, 246 were positive. The *Candida* species isolated included *C. albicans* (38.4%), *C. kefyr* (4%), *C. stellatoidea* (3%), *C. krusei* (1.8%), *C.guilliermondii* (2.4%), *C. tropicalis* (2.2%), and *C. glabrata* (1%) (Table 1). This result agrees with those of other workers [1,5,8]. Rippon [1] reported that *C. albicans* is the most predominant species causing vaginal candidosis.

There was a significant relationship ($p<0.001$) between the type of contraceptive used and the prevalence of vaginal colonization (Table 2) in the volunteers. The contraceptive users had a prevalence of 51.5% of vaginal colonization compared to 40.6% for non-contraceptive users. This could be attributed to the presence of estrogen and progesterone hormones in the contraceptive that increased glycogen in the vagina, thus exposing it to the activities of lactobacilli. The lactobacilli are widely believed to play a role in the conversion of glycogen to lactic acid thus raising the pH of the vagina. The increase in pH reduces the activities of the bacterial biota a while favour that of yeasts including *Candida* species [1,13]. Amongst the volunteers using oral contraceptives, a prevalence of 69.1%) was observed as compared to those using injectables and vaginal tablets (35.7%) and (36.8%) respectively. This is in line with other reports [7,19]. Oriel *et al.* [8] reported a prevalence of 32% and 18% respectively for oral contraceptive and non-contraceptive users. However, Milson and Ferrsman [7] earlier had suggested that this may be due to the presence of steroids and some hormones used in the oral contraceptive. Ryley [18] postulated that the low prevalence rate in injectable contraceptive users may be related to the induction of hormonal changes. The IUCD users accounted for 49.7% of those from whom *Candida* species were isolated. This might be due to local changes and secretions resulting from foreign body contamination in the vagina.

Results revealed a prevalence of 40.6% in the non-contraceptive users. This finding suggested that there might be other causes for the high prevalence of vaginal colonization in females apart from the use of contraceptives that may further increase yeast infections. It could also be attributed to sexual behavioural predisposition. This conformed with other reports incriminating natural factors to be predisposing to candidosis [1,13]. The high level of sexual promiscuity and low personal hygiene in our society may also partly explain this high prevalence.

There was significant relationship ($P<0.001$) in respect to age, marital status of the volunteers screened and the prevalence of vaginal colonization. This report is consistent with previous ones [8,16]. These workers reported that there was association between age and prevalence of colonization Furthermore, we speculate that both single and married females avail themselves of the use of contraceptives and are likely to be equally susceptible to the natural factors that predispose to candidosis.

This study has revealed a strong association between the use of contraceptives and prevalence of vaginal colonization with *Candida* species.

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