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A 5-Year Retrospective Study of Microbial Isolates and Antibiogram from Endocervical Swabs of Infertile Women Attending Gynaecological Clinic At Bingham University Teaching Hospital Jos, Nigeria

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Abstract

Background: Infertility is a major public health concern with serious social and emotional burden. Genital tract infections contribute significantly to infertility by causing pelvic inflammatory disease which later results in tubal damage. This study aimed to determine the commonly isolated microorganisms from endocervical swab cultures of women with infertility and the antibogram sensitivity..

Methodology: All records of microbial culture and antibiotic sensitivity test results of endocervical swabs of infertile women attending the gynaecological clinic at the Bingham University Teaching Hospital, Jos from 1st January 2019 to 31st December, 2024 were retrieved and entered into excel sheet, cleaned and exported into the IBM SPSS Statistics version 25.0 and analyzed. Descriptive analysis was done for all relevant variables and presented in tables and chi-square was used to test for degree of association and $P<0.05$ was taken as statistically significant.

Result: Of the four hundred endocervical swab results retrieved, 121(30.3%) had normal cells with positivity index of 279(69.8%) on microscopy. There are six microbial organisms isolated with *Staphylococcus aureus* as the most commonly isolated in 41.3% (165/400), followed by *Klebsiella spp* 19%(76/400). Gentamycin and Ofloxacin were the only antibiotics with a >40% sensitivity rates.

Conclusion: The most prevalent microorganisms in the endocervix of infertile women in our facility were *Staphylococcus aureus* and *Klebsiella spp* while *Psudomonas* is the least prevalent. These organisms are mostly sensitive to Gentamycin, Ofloxacin and Levofloxacin. Empirical treatment with these antibiotics in the presence of genital tract infections may help to reduce the risk of infertility from tubal damage.

Keywords: Antibiogram, Bingham, Endocervical, Infertile, Microbial

Introduction

Infertility affects 10 -15% of couples, an estimate of 80 million people globally.[1] It is a major public health problem with serious social and emotional concern. The burden of infertility is inordinately higher among women in developing countries[2] and it has a significant impact on their families and communities. It is a problem of the male or female reproductive systems or occasionally, the cause may be unexplained. About

37% of cases of infertility are caused by the female factors[3], among which genital tract infections play an important role.[4]

Genital tract infections are frequent among sexually active women of reproductive age group and are strongly associated with morbidity such as pelvic inflammatory disease which could result in infertility.[5] Some pathogenic organisms have been isolated in the female genital tracts. For instance, Bacterial vaginosis has been found in about 30% of females of reproductive age group[6]. Few studies[7, 8] have also found increased incidences of organisms such as *Mycoplasma hominis* and *Ureaplasma urealyticum* among women with infertility. Similarly, the burden of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* on infertility is well established.[9]

Bacterial organisms that ascend the upper genital tract through the cervix are the major cause of pelvic inflammatory disease. Even though the mechanism by which microorganism ascend from the lower genital tract is unclear, several studies have shown multiple factors may be involved such as decreased cervical mucus barrier by vaginal inflammation and hormonal changed during ovulation and menstruation, indiscriminate antibiotics use disrupting the balance of endogenous vaginal flora in the lower genital tract causing non pathogenic organisms to overgrow and ascend, opening of the cervix during menstruation, sexual intercourse contributing to ascend of infection through rhythmic uterine contractions during orgasm.

The objectives of this study are to determine the commonly isolated microorganisms from the endocervical swab cultures of women with infertility and also to identify the antibiotics sensitivity pattern. Lower genital tract infection, be it symptomatic or asymptomatic, need to be diagnosed and treated properly, as this could help to reduce tubal inflammation, reduce tubal damages and improve fertility.

Materials and methods

This is a hospital based retrospective descriptive study conducted on 400 women with infertility over a five (5) year period at the gynaecological unit of Bingham University Teaching Hospital, Jos. This institution is one of the three tertiary healthcare institutions located in Jos, which is the capital city of Plateau State, North-Central Nigeria. The institution has a well established gynaecological unit with 98 beds and the institution is well known for its urogynaecological services especially vesico-vaginal fistulae (VVF) and recto-vaginal fistula (RVF) repairs. A total of 400 case notes/folders of women who were attending infertility clinic over a five-year-period, between 1st January 2019 and 31st December, 2024 were retrieved. Data including age, results of requested endocervical swabs for Microscopy Culture and Sensitivity (MCS) were retrieved and entered into excel sheet, cleaned and exported into the IBM SPSS Statistics version 25.0 and analyzed. Descriptive analysis was done for all relevant variables and presented in tables and chi-square was used to test for degree of association and the level of significance was set at $P<0.05$.

Result

Four hundred endocervical swab microscopy, cultured and sensitivity results were obtained from the folders analyzed and the following results obtained as showed in the tables.

Table 1: Shows the age group distribution of the studied group of patients.

Variables	Frequencies (Percentage) N= 400
Age (in years)	
Mean ± SD	32.5 years ± 8.64 years
15-19	23(5.8)
20-24	46(11.5)
25-29	89(22.3)
30-34	**91(22.8)**
35-39	58(14.5)
40-44	63(15.8)
45-49	15(3.8)
50 and above	15(3.8)
Total	**400(100.0)**

Table 1 showed the age group distribution of the infertile women attending the gynaecological clinic. The average age of women in the study was 32.5 years with a standard deviation of 8.6 years with more women, 91(22.8%) belonging to the age group 30-34 years.

Table 2: Shows microscopy/wet preparation and culture results.

Microscopy wet preparation	Frequency (%)
Normal	121(30.3)
Epithelial cells	162(40.5)
White blood cells	195(48.8)
Pus cells	73(18.3)
Positivity index	
Normal	121(30.3)
Positive	**279(69.8)**
Total	400(100.0)
Prevalence of organism	N=400
Staphylococcus aureus	165(41.3)
E. Coli	56(14.0)
Klebsiella Spp	76(19.0)
Proteus	12(3.0)
Candida	39(9.8)
Pseudomonas	3(0.8)

Table 2 above showed the result of the microscopy/wet preparation and culture. It showed that, of the 400 samples examined in the study, 162(40.5%) had epithelial cells, 195(48.8%) had white blood cells (WBC), 73(18.3%) had pus cells while 121(30.3%) had normal cells with positivity index revealing 279(69.8%) positivity. The organisms isolated from the samples showed the presence of *Staphylococcus aureus*, *E. coli*, *Klebsiella spp*, *Proteus*, Candida and *Pseudomonas* while *Staphylococcus aureus* was the most prevalent with 165 representing 41.3% of organisms isolated.

Table 3: Shows the microscopy findings in terms of those with epithelial cells.

Variables	Epithelial cells			
	Yes	No	Chi-square	p-value
Staph. Aureus	72(43.4))	93(56.4)	1.146	0.286
E.coli	22(39.3)	34(60.7)	0.040	0.842
Klebsiella spp	28(36.8)	48(63.2)	0.521	0.470
Proteus	8(66.7)	4(33.3)	3.445	0.063
Candida	13(33.3)	26(66.7)	0.921	0.337
Pseudomonas	**3(100.0)**	**0(0.0)**	**4.441**	**0.035**

Microscopy findings in terms of those with epithelial cells, showed that only *Pseudomonas* was found to be associated with the epithelial cells with X^2=4.441 and p-value = 0.035

Table 4: Shows microscopy findings in terms of those with pus cells.

Variables	Pus cells			
	Yes	No	Chi-square	p-value
Staph. Aureus	24(14.5)	141(85.5)	2.583	0.108
E.coli	**16(28.6)**	**40(71.4)**	**4.650**	**0.031**
Klebsiella spp	1(8.3)	11(91.7)	0.815	0.367
Proteus	8(66.7)	4(33.3)	3.445	0.063
Candida	5(12.8)	34(87.2)	0.854	0.355
Pseudomonas	**3(100.0)0**	**(0.0)**	**13.540**	**0.000****

Microscopy findings in terms of those with pus cells, showed that *E. coli* with X^2=4.650 and p-value = 0.031 and *Pseudomonas* with X^2=13.540 and p-value < 0.001 were associated and statistically significant.

Table 5: Shows microscopy findings in terms of those with WBC.

Variables	WBC			
	Yes	No	Chi-square	p-value
Staph. aureus	90(54.5)	75(45.5)	3.776	0.052

E.coli	25(44.6)	31(55.4)	0.440	0.507
Klebsiella spp	**26(34.2)**	**50(65.8)**	**7.939**	**0.005***
Proteus	8(66.7)	4(33.3)	1.589	0.207
Candida	17(43.6)	22(56.4)	0.461	0.461
Pseudomonas	0(0.0)	3(100.0)	2.875	0.090

The above table 5 showed that only *klebsiella spp* with X^2=7.939 and p-value = 0.005 were associated with presence of WBC and statistically significant.

Table 6: Shows the antibiotics sensitivity pattern of the cultured organisms.

Sensitivity pattern	Frequency (%)
Augmentin	49(12.3)
Ofloxacin	161(40.3)
Gentamycin	185(46.3)
Erythromycin	47(11.8)
Cefixime	13(3.3)
Imipenem	29(7.2)
Ampiclox	2(0.5)
Azithromycin	33(8.3)
Ceftriaxone sulbactam	74(18.5)
Nalidixic acid	1(0.3
Ceftazidime	34(8.5)
Cefuroxime	33(8.3)
Levofloxacin	97(24.3)
Cefotaxime	30(14.2)
Ciprofloxacin	57(14.2)

Table 6 above showed the anti-bacterial agents with sensitivity and propensity to dissipate the isolated organisms; Augmentin (Amoxicillin and clavulanic acid combination), Ofloxacin, Gentamycin, Erythromycin, Cefixime, Imipenem, Ampliclox (ampicillin/cloxacillin combination), Azithromycin, Ceftriaxone, Nalidixic acid, Ceftazidime, Cefuroxime, Levofloxacin, Cefotaxime, Ciprofloxacin with Gentamycin showing the greatest sensitivity action with 185(46.3%) closely followed by ofloxacin with 161(40.3%).

Discussion

The mean age of the infertile women in this study was 32.5 years with more women, 91(22.8%) belonging to the age group 30-34 years. This is comparable to the mean age of 34.3 years in a review of infertile women that had microbial isolates of endocervical swabs in Ilorin.[10] It is also consistent with findings of a previous study[11] that reported that women are more fertile in their late teens to early thirties and then subsequently decline over time.

Of the 400 endocervical swab samples examined on microscopy/wet preparation and cultured, 121(30.3%) had normal cells with positivity index revealing 279(69.8%) positivity. This is relatively similar to what was obtained in a previous study[12] that recorded 22% normal cells and 78% microbial isolates on microscopy. This could be because these studies were conducted in health facilities with similar settings. In our study, among those with positivity index, either epithelial cells, WBC, pus cells or combination of any of these were seen on microscope. White blood cells (WBC) were found on microscopy in 195(48.8%) endocervical swab samples while 162(40.5%) endocervical swabs had epithelial cells. Only 73(18.3%) had pus cells. Even though, wet preparation for microscopic inspection is the most widely used diagnostic tool worldwide for laboratory diagnosis of vaginal and cervical infections, its sensitivity and specificity are questioned.[10]

The organisms isolated in our study showed the presence of *Staph. aureus*, *Klebsiella spp*, *E. coli*, *Candida*, *Proteus* and *Pseudomonas* among infertile women with the prevalence of 41.3%, 19%, 14%, 9.8%, 3.0%, and 0.8% respectively. While *Staph. aureus* was the most prevalent with 165 representing 41.3% of organisms isolated, only three endocervical swab samples isolated *Pseudomonas*, making it the least with 0.8% prevalence. The finding in our study was similar to Oguntoyinbo et al study[10] that reported *Staph. aureus* as the most commonly isolated organism (28.3%) in a prospective study of pre-HSG endocervical swabs for MCS of 53 infertile women. Similarly, Adekoya and colleagues[13] in Ogun state, Nigeria reported *Staph. aureus* as the most predominant organism in HVS/ECS accounting for 42.3% of isolates among

infertile women undergoing HSG in the facility. In another study conducted by Ahabwe et al[14] which examined the bacterial isolates and antibiotic susceptibility among women with abnormal vaginal discharge attending the gynaecological clinic of a tertiary hospital in Uganda, *Staph. aureus* was reported as the most prevalent isolate, which is in keeping with findings of Audu et al study[15], Okoro et al study[16] and our study. The consistency in these findings may be due to the fact that Staph. aureus is a resident flora on the skin, including the perineum, and sexual activity increases the chance of transmission from the skin to the upper vagina and cervix.[17] In contrast, Hashem et al[12] in Egypt found *Staph. aureus* as the least organism isolated in their study with a prevalence of 0.6%. This contrast finding might be due to the differences in the socio-demographic characteristics of the studied patients.

Klebsiella spp and *E. coli* were the 2nd and 3rd most prevalent organisms isolated in our study with prevalence of 19% and 14% respectively. These findings could be because these organisms usually inhabit the gastrointestinal tract and are more common in stool samples. The closer proximity of the female genital tract and the anal opening makes it easy for these organisms to spread to the genitourinary tract, with sexual intercourse, facilitating this transmission.[18] While some studies[10, 19, 20, 21] reported high prevalence of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* causing Pelvic Inflammatory Disease (PID) and subsequent tubal disease which later results in infertility, our study did not isolate these organisms, which is similar to findings in Adekoya et al study.[13] This could be due to lack of special culture media for these organisms as at the time of investigating these patients.

When the microscopy findings were compared with the organisms cultured (table 3), our study revealed that whenever there are epithelial cells, *Pseudomonas* organism is likely to be present. Also, whenever there are pus cells, *Pseudomonas* and *E. coli* organisms are likely to be present (table 4). The presence of WBC on microscopy suggests the possibility of *Klebsiell*a being isolated (table 5). Hence, the findings on microscopy may predict the likely organism to be isolated.

The overall sensitivity across all bacterial isolates showed that Augmentin, Ofloxacin, Gentamycin, Erythromycin, Cefixime, Imipenem, Ampliclox, Azithromycin, Ceftriaxone, Nalidixic acid, Ceftazadime, Cefuroxime, Levofloxacin, Cefotaxime, Ciprofloxacin are all sensitive to the isolated organisms, with Gentamycin showing the greatest sensitivity action with 185(46.3%), followed by Ofloxacin 161(40.3%) and Levofloxacin 97(24.3%) while Ampiclox 2(0.5%) and Nalidixic acid 1(0.3%) were the least. This is consistent with Audu et al[15] findings that reported Cephalexin and Gentamicin as the only antibiotics with sensitivity rate greater than 50%. These could be as a result of less indiscriminate use of Gentamycin because it is only available in parenteral form which requires medical personnel for administration, unlike the over-the-counter oral antibiotics such as Ampiclox which are widely abused especially in our environment. This may explain why Ampiclox has a low antimicrobial sensitivity in our study.

In contrast to our findings, Okoro et al[16] reported that *Staph. aureus, Strept. pyogens* and *Neisseria* isolated in their study were resistant to Gentamicin. Other antibiotic sensitivity studies conducted have reported high sensitivity to other antibiotics such as Ciprofloxacin.[14, 22]

Our study has a limitation as we might have under-reported the bacterial isolates due to our facility's inability to culture some organisms such as *Chlamydia trachomatis* and *Neisseria gonorrhoeae* are commonly associated with pelvic infections as at the time of managing these patients.

Conclusion

The most prevalent micro-organisms in the endocervix of infertile couples in our facility are *Staph. aureus* and *Klebsiella spp* while *Psudomonas* is the least prevalent. These organisms are sensitive to Gentamycin, Ofloxacin and Levofloxacin. Empirical treatment with these antibiotics in the presence of genital tract infections may help to reduce infertility from tubal damage.

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