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## ANTIBIOGRAM OF PATHOGENIC BACTERIA ISOLATED FROM PRE- AND POST-SURGERY VESICOVAGINAL FISTULA (VVF) PATIENTS IN ABAKALIKI, EBONYI STATE

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**ABSTRACT:** Vesicovaginal fistula (VVF) is an abnormal fistulous tract that extends between the bladder and the vagina - thus allowing the continuous involuntary discharge of urine into the vaginal vault of the affected patient. This study evaluated presumptively the prevalence and antibiogram of pathogenic bacteria isolated from pre- and post-surgery VVF patients. Urine samples were collected in duplicates from the VVF patients; and these were bacteriologically analyzed using cysteine lactose electrolyte deficient (CLED) agar, MacConkey agar and blood agar. Susceptibility studies were carried out on the isolated pathogens using the disk diffusion method. *Klebsiella pneumoniae*, *Escherichia coli*, *S. pyogenes* and *S. aureus* were the most isolated bacteria from the urine samples of pre- and post-surgery VVF patients. The organisms showed highest levels of resistance to ceftazidime, cotrimoxazole, amoxicillin, nitrofurantoin, cefuroxime, amoxicillin-clavulanic acid and tetracycline. With the exception of some *S. aureus* isolates, all the organisms including *K. pneumoniae*, *E. coli* and *S. aureus* were completely resistant to imipenem. However, gentamicin, ciprofloxacin, and ofloxacin showed appreciable levels of antimicrobial efficacy against the *E. coli*, *K. pneumoniae*, *S. pyogenes* and *S. aureus* isolates from both the pre- and post-surgery VVF patients. The complications of UTI in VVF patients necessitate the need to back up treatment with proper susceptibility studies. Our study has shown that the isolated organisms are resistant to some commonly used drugs. Thus it is vital to make antimicrobial stewardship a vital part of VVF management in our hospitals so that antibiotic therapy for such affected patients can be properly guided.

**INTRODUCTION:** Vesicovaginal fistula (VVF), a subtype of female urogenital fistula (UGF) is an abnormal fistulous tract that extends between the bladder and the vagina - thus allowing the continuous involuntary discharge of urine into the vaginal vault of the affected patient.<sup>1, 2, 3</sup>

VVF is both a social calamity and pathological condition that leaves its sufferers with some sort of stigma. The affected tissue may necrotize, leaving a hole on the vesico-vaginal wall; and VVF patients are predisposed to several underlying urogenital infections that may affect the bladder.<sup>4, 5</sup> Urinary tract infection (UTI) is one of the commonest bacterial infections in VVF patients, and it is critical to manage the pathological condition with effective antibiotics.<sup>1,5</sup> The close proximity of the female genitalia (i.e. the vagina) and the urinary tract system predisposes females to several uropathogenic infections especially UTI. The uncontrolled leakage of urine into the vagina from

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the bladder can cause significant medical complications in both pre- and post-repair-VVF patients.<sup>5</sup> The resistance of pathogenic bacteria to antibiotics is not a new phenomenon in the health sector but it is a problem that is becoming more dangerous, and must be contained through effective and accurate antimicrobial therapy in order to protect and extend the efficacy and shelf life of available antibiotics.<sup>6, 7, 8</sup> Antimicrobial resistance makes it difficult and more expensive to treat bacterial related diseases, and this worsens the patient's treatment procedure due to a long period of delay in carrying out effective treatment.<sup>9, 10</sup>

The emergence and spread of antibiotic resistance genes has been attributed to many causes including the inappropriate use of drugs, unnecessary usage of antibiotics, non-compliance of patients in taking their drug regimens, and the use of human drugs for non-human purposes such as for animal husbandry and livestock production.<sup>7, 11, 12, 13</sup> The scourge of antimicrobial resistance makes the effective management of UTI especially in VVF patients difficult because of the possible development of antibiotic resistance in uropathogens implicated in UTI.<sup>5</sup>

Since antimicrobial agents are used to manage UTI in VVF patients, it is important to conduct adequate antimicrobial susceptibility testing (AST) to guide therapy so that resistant bacteria do not emerge and cause more complications. The continuous evaluation of the antibiotic usage for treating UTI in VVF patients coupled to proper antimicrobial susceptibility studies is central to effective management of the bacterial diseases in affected individuals. Thus, this evaluated the prevalence of antibiotics resistant bacteria from pre and post VVF-repair patients in Abakaliki Ebonyi State, Nigeria.

## **MATERIALS AND METHODS:**

**Study Area:** This study was conducted at the National Obstetrics Fistula Centre Abakaliki, Southeast Nigeria within a period of one year (October 2013 to September 2014). The centre is located at Kilometer 86, along Enugu Expressway in Abakaliki, Ebonyi State; and it is situated at 6.32°N latitude, 8.12°E Longitude and 117 m elevation above sea level.

## **Sample Collection:**

A total of 360 urine samples were collected from 180 patients. Two sets of urine samples were collected from each patient; and these represent the pre-surgery (before surgery) and post-surgery (after surgery) vesicovaginal fistula (VVF) urine samples. Urine samples from post-VVF patients were collected three days after surgery while the urine samples for pre-VVF patients was collected prior to surgery. All urine samples was collected in sterile urine containers and transported to the Laboratory section of Applied Microbiology Department, Ebonyi State University, Abakaliki where bacteriological analysis was carried out.

## **Bacteriological analysis:**

The urine samples were cultured on bacteriological media including blood agar, MacConkey agar, and Cysteine Lactose Electrolyte deficient (CLED) medium (Oxoid UK) for the isolation of uropathogens and other pathogenic bacteria. All the culture media were aseptically prepared according to the manufacturers' instruction; and the isolated bacteria were tested biochemically and microscopically using standard microbiology techniques.<sup>14</sup>

## **Antimicrobial Susceptibility Studies:**

The susceptibility patterns of isolated bacteria were determined by the Kirby Bauer disk diffusion test method as recommended by the National Committee for Clinical Laboratory Standards (NCCLS), now Clinical Laboratory Standard Institute (CLSI).<sup>15</sup> An overnight culture of the test bacteria (adjusted to 0.5 McFarland turbidity standards) were aseptically inoculated on the surface of Mueller-Hinton (MH) agar plate(s) using sterile swab sticks.

Commercially available single antibiotic disks including tetracycline (30µg), ciprofloxacin (10µg), cefuroxime (30ug) ofloxacin (10µg), gentamicin (10µg), ceftriaxone (30µg), amoxicillin/clavulanic (30µg), ceftazidime (30µg), imipenem (30µg), amoxicillin (30µg), nitrofurantoin (100µg), sulphamethoxazole/ trimethoprim (30µg), (Oxoid UK) were each aseptically placed on the MH agar plates. The plates were incubated at 37°C for 18-24 hrs, and the inhibition zone diameters (IZDs) were

measured with a meter rule and recorded as recommended by the NCCLS criteria.<sup>6, 7, 15</sup>

## RESULTS:

Three hundred and sixty (360) urine samples comprising of 180 urine samples collected from pre-surgery vesicovaginal fistula (VVF) patients and post-surgery VVF patients were bacteriologically analyzed in this study. Our preliminary results showed that the pathogenic bacteria isolated from both the pre-surgery and post-surgery VVF patients included *Klebsiella pneumoniae*, *Escherichia coli*, *Streptococcus pyogenes* and *Staphylococcus aureus* (Table 1). The rate of isolation of uropathogens from the urine

samples of both post- and pre-surgery VVF patients as shown in Table 1 is almost at par with little variations.

Overall, 41.4 %, 32.4 %, 13.5 %, 12.6 % and 471.2 %, 37.7 %, 11.4 %, 9.7 % of *Klebsiella pneumoniae*, *E. coli*, *S. pyogenes* and *S. aureus* were recovered from urine samples of pre- and post-surgery VVF patients respectively. Ninety three (93) *K. pneumoniae* and 79 *E. coli* isolates were isolated from urine samples of both pre- and post-surgery VVF patients while 38 isolates of *S. pyogenes* and 25 isolates of *S. aureus* were recovered from the urine samples of pre- and post-surgery VVF patients (Table 1).

**TABLE 1: DISTRIBUTION OF UROPATHOGENS ISOLATED FROM URINE SAMPLES OF PRE-SURGERY AND POST-SURGERY VVF PATIENTS**

Organisms	Number of isolated bacteria	Number of isolated bacteria	Total
	n(%) (Pre-surgery)	n(%) (Post-surgery)	
<i>Klebsiella pneumoniae</i>	46 (41.4%)	47 (41.2%)	93
<i>Escherichia coli</i>	36 (32.4%)	43 (37.7%)	79
<i>Streptococcus pyogenes</i>	15 (13.5%)	13 (11.4%)	38
<i>Staphylococcus aureus</i>	14 (12.6%)	11 (9.7%)	25
<b>Total</b>	<b>111</b>	<b>114</b>	<b>235</b>

All the isolated uropathogens from both pre- and post-surgery urine samples of VVF patients showed varying levels of susceptibility and resistance to the tested antibiotics used in this study; and the results are presented in Tables 2-5. The antibiogram of the *Klebsiella pneumoniae* isolates to conventional antibiotics is shown in Table 2. The *K. pneumoniae* isolates from urine samples of both pre- and post-surgery patients were completely resistant to imipenem. The *K. pneumoniae* isolates from pre- and post-surgery VVF patients showed reduced

susceptibility to cotrimoxazole, tetracycline, amoxicillin, and amoxicillin-clavulanic acid. However, ceftazidime, cefuroxime, ceftriaxone, ciprofloxacin and nitrofurantoin were effective against *K. pneumoniae* isolates recovered from pre-surgery VVF patients. The level of susceptibility recorded for *K. pneumoniae* isolates of pre-surgery VVF patients was also akin to the antibiogram obtained for *K. pneumoniae* isolated from urine samples of post-surgery VVF patients (Table 2).

**TABLE 2: ANTI BIOGRAM OF KLEBSIELLA PNEUMONIAE ISOLATED FROM URINE SAMPLES OF PRE- AND POST-OPERATIVE VVF PATIENTS**

Drugs (concentration)	Percentage susceptibility of <i>K. pneumoniae</i> isolates			
	Pre-surgery		Post-surgery	
	Resistant	Susceptible	Resistant	Susceptible
Gentamicin (10 µg)	20 (44%)	26 (56%)	20 (45%)	27 (57%)
Cotrimoxazole (25 µg)	40 (87%)	6 (13%)	41 (87%)	6 (13%)
Tetracycline (30 µg)	38 (83%)	8 (17%)	38 (81%)	9 (19%)
Amoxicillin (30 µg)	42 (91%)	4 (9%)	40 (85%)	7 (15%)
AMC (30 µg)	38 (83%)	8 (17%)	39 (83%)	8 (17%)
Ofloxacin (10 µg)	20 (44%)	26 (56%)	20 (43%)	27 (57%)
Nitrofurantoin (200 µg)	18 (39%)	28 (61%)	19 (40%)	28 (60%)
Ciprofloxacin (10 µg)	18 (39%)	28 (61%)	17 (36%)	30 (64%)
Ceftriaxone (30 µg)	20 (44%)	26 (56%)	19 (40%)	28 (60%)

Cefuroxime (30 µg)	26 (56%)	20 (44%)	26 (55%)	21 (45%)
Ceftazidime (30 µg)	20 (44%)	26 (56%)	20 (43%)	27 (57%)
Imipenem (10 µg)	0 (0%)	46 (100%)	0 (0%)	47 (100%)

AMC = amoxicillin-clavulanic acid

**Table 3** shows the antimicrobial susceptibility patterns of *E. coli* isolated from urine samples of both pre- and post-surgery VVF patients. As observed, the *E. coli* isolates from both pre- and post-surgery VVF patients were completely resistant to imipenem. The *E. coli* isolates showed varying rates of susceptibility and resistance to the

tested antibiotics. However, gentamicin, ofloxacin, nitrofurantoin, ciprofloxacin and ceftazidime were the most effective tested antibiotics against the test bacteria. The *E. coli* isolates showed reduced susceptibility to ceftriaxone, cefuroxime, cotrimoxazole, amoxicillin-clavulanic acid and tetracycline (**Table 3**).

**TABLE 3: ANTIMICROBIAL SUSCEPTIBILITY PATTERNS OF *ESCHERICHIA COLI* ISOLATED FROM PRE- AND POST-SURGERY VVF PATIENTS**

Drugs (concentration)	Percentage susceptibility of <i>E. coli</i> isolates			
	Pre-surgery		Post-surgery	
	Resistant	Susceptible	Resistant	Susceptible
Gentamicin (10 µg)	15 (42%)	21 (58%)	18 (42%)	25 (58%)
Cotrimoxazole (25 µg)	26 (72%)	10 (28%)	30 (70%)	13 (30%)
Tetracycline (30 µg)	28 (78%)	8 (22%)	32 (74%)	11 (26%)
Amoxicillin (30 µg)	25 (69%)	11 (31%)	27 (63%)	16 (37%)
AMC (30 µg)	21 (58%)	15 (42%)	25 (58%)	18 (42%)
Ofloxacin (10 µg)	15 (42%)	21 (58%)	18 (42%)	25 (58%)
Nitrofurantoin (200 µg)	14 (39%)	22 (61%)	17 (40%)	26 (60%)
Ciprofloxacin (10 µg)	15 (42%)	21 (58%)	18 (42%)	25 (58%)
Ceftriaxone (30 µg)	14 (39%)	22 (61%)	18 (42%)	25 (58%)
Cefuroxime (30 µg)	22 (61%)	14 (39%)	22 (51%)	21 (49%)
Ceftazidime (30 µg)	16 (44%)	20 (56%)	17 (40%)	26 (60%)
Imipenem (10 µg)	0 (0%)	36 (100%)	0 (0%)	43 (100%)

AMC = amoxicillin-clavulanic acid

*Streptococcus pyogenes* showed varying levels of susceptibility to the tested antibiotics as shown in **Table 4**. It is worthy of note that all the *S. pyogenes* isolates from the urine samples of both pre- and post-surgery VVF patients showed complete resistance to the carbapenem imipenem. Ceftazidime, ciprofloxacin, gentamicin, cefuroxime and ceftriaxone showed appreciable levels of activity against the *S. pyogenes* isolates.

Nevertheless, reduced susceptibility of the *S. pyogenes* isolates from both pre- and post-surgery patients was also recorded against cotrimoxazole, tetracycline, and nitrofurantoin. Amoxicillin-clavulanic acid and ofloxacin were however effective against the *S. pyogenes* isolates from both the pre- and post surgery patients as shown in **Table 5**.

**TABLE 4: SUSCEPTIBILITY PATTERNS OF *STREPTOCOCCUS PYOGENES* ISOLATED FROM URINE SAMPLES OF PRE- AND POST-SURGERY VVF PATIENTS**

Drugs (concentration)	Percentage susceptibility of <i>S. pyogenes</i> isolates			
	Pre-surgery		Post-surgery	
	Resistant	Susceptible	Resistant	Susceptible
Gentamicin (10 µg)	7 (47%)	8 (53%)	6 (46%)	7 (54%)
Cotrimoxazole (25 µg)	9 (60%)	6 (40%)	8 (62%)	5 (35%)
Tetracycline (30 µg)	10 (69%)	5 (33%)	9 (69%)	4 (31%)
Amoxicillin (30 µg)	8 (53%)	7 (47%)	7 (54%)	6 (46%)
AMC (30 µg)	7 (47%)	8 (53%)	6 (46%)	7 (54%)
Ofloxacin (10 µg)	7 (47%)	8 (53%)	6 (46%)	7 (54%)
Nitrofurantoin (200 µg)	9 (60%)	6 (40%)	8 (62%)	5 (38%)
Ciprofloxacin (10 µg)	6 (40%)	9 (60%)	5 (38%)	8 (62%)
Ceftriaxone (30 µg)	7 (47%)	8 (53%)	6 (46%)	7 (54%)
Cefuroxime (30 µg)	9 (60%)	6 (40%)	8 (62%)	5 (38%)
Ceftazidime (30 µg)	7 (47%)	8 (53%)	6 (46%)	7 (54%)
Imipenem (10 µg)	0 (0%)	15 (100%)	0 (0%)	13 (100%)

AMC = amoxicillin-clavulanic acid

**Table 5** shows the susceptibility patterns of *Staphylococcus aureus* isolated from pre- and post-VVF surgical patients to some conventional antibiotics. Only three isolates of *S. aureus* from the urine samples of both pre- and post-surgery VVF patients were susceptible to imipenem (**Table 5**). It is worthy of note that all the *S. aureus* isolates were completely resistant to amoxicillin. Varying rates of susceptibility and resistance of the *S. aureus* isolates from both pre- and post-surgery

patients was recorded against the test drugs. Gentamicin, ofloxacin, amoxicillin-clavulanic acid, nitrofurantoin, cotrimoxazole, and ceftazidime were the most active tested drugs against the test isolates of *S. aureus* from both the pre- and post-surgery patients. However, the *S. aureus* isolates from both the pre- and post-surgery VVF patients showed reduced susceptibility to tetracycline, cefuroxime, ceftriaxone and ciprofloxacin.

**TABLE 5: SUSCEPTIBILITY PATTERNS OF ISOLATES OF STAPHYLOCOCCUS AUREUS ISOLATED FROM URINE SAMPLES OF PRE AND POST-OPERATIVE VVF PATIENTS**

Drugs (concentration)	Percentage susceptibility of <i>S. aureus</i> isolates			
	Pre-surgery		Post-surgery	
	Resistant	Susceptible	Resistant	Susceptible
Gentamicin (10 µg)	6 (43%)	8 (57%)	5 (45%)	6 (55%)
Cotrimoxazole (25 µg)	8 (57%)	6 (43%)	7 (64%)	4 (36%)
Tetracycline (30 µg)	9 (64%)	5 (36%)	7 (64%)	4 (36%)
Amoxicillin (30 µg)	14 (100%)	0 (0%)	11 (100%)	0 (0%)
AMC (30 µg)	7 (50%)	7 (50%)	6 (55%)	5 (45%)
Ofloxacin (10 µg)	6 (43%)	8 (57%)	4 (36%)	7 (64%)
Nitrofurantoin (200 µg)	7 (50%)	7 (50%)	6 (55%)	5 (45%)
Ciprofloxacin (10 µg)	6 (43%)	8 (57%)	4 (36%)	7 (64%)
Ceftriaxone (30 µg)	5 (36%)	9 (64%)	5 (45%)	6 (55%)
Cefuroxime (30 µg)	9 (64%)	5 (36%)	6 (55%)	5 (45%)
Ceftazidime (30 µg)	10 (71%)	4 (29%)	7 (64%)	4 (36%)
Imipenem (10 µg)	3 (21%)	11 (79%)	3 (27%)	8 (73%)

AMC = amoxicillin-clavulanic acid

**DISCUSSIONS:** Bacterial resistance to some conventional antimicrobial agent's complicates the treatment outcome of some infectious diseases especially those that are caused by bacterial pathogens; and the slow pace in the discovery of novel drugs necessitates the need to protect the antimicrobial efficacy of these agents for future use. Nosocomial and community acquired infections in which resistant pathogenic bacteria are implicated as causative agents abound around the world, and Nigeria is not an exception to it – owing to the ease with which people obtain drugs over-the-counter (OTC) even without a physician's prescription.<sup>7, 11, 12, 16</sup>

It is therefore vital to monitor the emergence and spread of drug resistant bacteria in both the clinical and community settings through proper antimicrobial surveillance networking system (especially in the area of basing therapy on proper antimicrobial susceptibility testing's) in order to contain the situation. Vesicovaginal fistula (VVF) is an abnormal fistulous tract that extends between

the bladder and the vagina - thus allowing the continuous involuntary discharge of urine into the vaginal vault of the affected patients.<sup>2, 5</sup> And since urinary tract infection (UTI) is a common secondary bacterial infection seen amongst VVF patients (inclusive of pre- and post-surgery VVF patients), it beholds on our health institutions across the world (especially in VVF- endemic regions) to include the detection and antibiogram of uropathogens a core part of the management of VVF patients.

This study evaluated the antimicrobial susceptibility of urine samples obtained from pre- and post-surgery VVF patients who attended the National Obstetrics Fistula Centre in Abakaliki, Ebonyi State, South-Eastern Nigeria for medical attention. Out of the 320 urine samples (collected from both the pre- and post-VVF patients) examined bacteriologically, a total of 111 bacterial isolates was recovered from pre-surgery VVF patients while the bacterial isolates recovered from post-surgery VVF patients was 114 isolates. The

most commonly isolated pathogens from the urine samples of both pre- and post-surgery VVF patients were *Klebsiella pneumoniae* (93), *Escherichia coli* (79), *Streptococcus pyogenes* (38) and *Staphylococcus aureus* (25). Similar organisms as obtainable in this study have also been implicated as microorganisms associated with urogenital tract of VVF patients in North-West Nigeria.<sup>5</sup> In another study, Adaoye et al,<sup>17</sup> also reported similar pathogens as causative factors in asymptomatic bacteriuria amongst women with VVF. The antimicrobial susceptibility test results of *K. pneumoniae* isolated from urine samples of pre-surgery VVF patients showed that some of the most frequently used antibiotics including cotrimoxazole, tetracycline, amoxicillin, amoxicillin-clavulanic acid, ofloxacin and cefuroxime encountered resistance levels in excess of 50 % to all the *K. pneumoniae* isolates with the exception of ofloxacin where the resistance level was 44 %.

Most notably in this study was the fact that all the *K. pneumoniae* isolates from the urine samples of pre-surgery VVF patients was completely resistant to imipenem – a newer drug and last-line antibiotic for most multidrug resistant infections. Gentamicin, nitrofurantoin, ciprofloxacin, ceftriaxone and ceftazidime had some appreciable levels of efficacy on the *K. pneumoniae* isolates from pre-surgery VVF patients. All the *K. pneumoniae* isolates from urine samples of post-surgery VVF patients also showed complete resistance to imipenem (as was obtainable to the *K. pneumoniae* isolates from pre-surgery patients).

Higher levels of resistance of the *K. pneumoniae* isolates from urine samples of post-surgery VVF patients was recorded in cotrimoxazole (87 %), tetracycline (81 %), amoxicillin (85%), amoxicillin-clavulanic acid (83 %) and cefuroxime (55 %). Ceftazidime, ceftriaxone, ciprofloxacin, nitrofurantoin, ofloxacin and gentamicin were the most effective agents against the *K. pneumoniae* isolates from post-surgery VVF patients. The *E. coli* isolates from both the pre- and post-surgery VVF patients were completely resistant to imipenem. Cotrimoxazole, tetracycline, amoxicillin, amoxicillin-clavulanic acid and cefuroxime were the least active agents against the

*E. coli* isolates from pre-surgery patients while ceftazidime, ceftriaxone, ciprofloxacin, nitrofurantoin, ofloxacin and gentamicin were effective against the *E. coli* from pre-surgery VVF patients.

This study also showed a high cefuroxime, amoxicillin-clavulanic acid, amoxicillin, tetracycline and cotrimoxazole resistance in *E. coli* isolates from urine samples of post-surgery VVF patients at 51 %, 58 %, 63 %, 74 % and 70 % respectively. Nonetheless, ceftazidime, gentamicin, cotrimoxazole, ofloxacin, nitrofurantoin, ciprofloxacin, ceftriaxone, and cefuroxime were the most active agents against the *E. coli* isolates from urine samples of post-surgery VVF patients. Similar findings regarding the antimicrobial susceptibility/resistance patterns of *E. coli* and *K. pneumoniae* isolates from VVF patients have also been reported by other researchers.<sup>5, 17</sup>

All the *S. pyogenes* isolates from urine samples of pre- and post-surgery VVF patients were found to be completely resistant to imipenem as was obtainable in *K. pneumoniae* and *E. coli* isolates. *S. pyogenes* isolates from pre-surgery VVF patients were found to be resistant to cefuroxime, nitrofurantoin, cotrimoxazole, tetracycline and amoxicillin. In terms of susceptibility, some of the *S. pyogenes* isolates from pre-surgery VVF patients were susceptible to gentamicin, amoxicillin-clavulanic acid, ofloxacin, ciprofloxacin, ceftazidime and ceftriaxone.

The susceptibility result obtained with *S. pyogenes* from urine samples of post-surgery VVF patients showed that the isolates were resistant to cotrimoxazole, tetracycline, amoxicillin, nitrofurantoin, and cefuroxime. However, gentamicin, amoxicillin-clavulanic acid, ceftazidime, ceftriaxone, ciprofloxacin and ofloxacin showed some levels of activity against the *S. pyogenes* isolates from urine samples of post-surgery VVF patients.

Most of the *S. aureus* isolates from urine samples of both pre- and post-surgery VVF patients were susceptible to imipenem. The *S. aureus* isolates from urine samples of pre-surgery VVF patients were resistant to cotrimoxazole, tetracycline,

cefuroxime and ceftazidime. However, some of the *S. aureus* were susceptible to gentamicin, amoxicillin-clavulanic acid, ofloxacin, and nitrofurantoin. The *S. aureus* isolates from urine samples of pre- and post-surgery VVF patients were also completely susceptible to amoxicillin. Different levels of susceptibility and resistance of the *S. aureus* isolates from the post-surgery VVF patients were also recorded for the test antibiotics. And these results concur with those of other researchers in Nigeria who reported varying levels of resistance and susceptibility patterns amongst bacterial organisms isolated from urine samples of pre- and post-surgery VVF patients.<sup>5, 17</sup>

**CONCLUSION:** Conclusively, this study has presumptively shown that *K. pneumoniae*, *E. coli*, *S. pyogenes* and *S. aureus* are common bacterial isolates prevalent in women with VVF conditions. And the antibiogram of these organisms to various conventional antibiotics showed that the bacteria exhibit varying levels of resistance. The likelihood of people obtaining drugs over-the-counter (OTC) especially in developing countries including Nigeria is a vital contributing factor to the development and spread of drug resistant bacteria. Thus, antimicrobial therapy especially amongst VVF patients should be guided by proper antimicrobial susceptibility studies in order to prevent treatment failure.

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