

Catheter-associated Bacteriuria among Fistula Patients Attending National Obstetrics Fistula Centre Ningi, Bauchi State, Nigeria

Ngozi V. Uzuegbunam¹, Moshood, A. Yusuf², Faruk A. Umar², *Bassey Enya Bassey³

¹Medical laboratory services National Obstetric Fistula Ningi, Bauchi-Nigeria;

²Department of Microbiology, Abubakar Tafawa Belewa university, Bauchi State-Nigeria;

³World Health Organization (WHO) Nigeria Country Office, UN House, Plot 617/618, Diplomatic Drive, Central Business District, PMB 2861, Garki, Abuja, Nigeria,

ABSTRACT

Objectives: This study was carried out to determine the pattern of catheter-associated bacteriuria and to investigate the antimicrobial susceptibility profile. **Methods:** A cross sectional study was conducted at National Obstetric and fistula center Ningi, Bauchi state. A total of 305 urine samples were collected from three stages (Pre analytical, analytical and post analytical) of sample collection and investigated using standard microbiological technique. All the urine samples were cultured on CLED agar and blood agar. Antibiotics susceptibility test was performed using standard disc diffusion method to determine susceptibility of bacterial agents to antibiotics. Socio-demographic and risk factors were obtained using structured questionnaire. **Results:** The prevalence of catheter associated bacteriuria was 71.1% and significant bacteriuria was found among age range of 16-25years 85(81.0%). The bacteria isolated were *E coli* 85(39.1%), *Proteus* spp 38(17.5%), *klebsiella* spp 29(13.4), *Staphylococcus aureus* 14(6.5%), *Serriatiaspp* 3(1.4%), *Citrobacter* spp 4(1.8%), *Enterobacter* spp5(2.3%), Coagulase Negative *Stapylococcus* 21(9.7%). All the bacterial isolates showed complete resistant to Ampiclox (100%) and Gentamicin (100%). Some isolates showered multiple drug resistant to Sparfloxacin (79%), Septrin (77%), Amoxillin (68%) and Ciprofloxacin (55%). The isolates were sensitive to Streptomycin (74%), Rocephin (74%) and Oflaxacin (60%). This study suggests that for better management of VVF clients, urine culture should be part of routine diagnosis and use of antibiotic should be after antimicrobial susceptibility screening. **Conclusion:** There was a significant difference in isolates from the three stages of sample collection with p value < 0.05, while ciprofloxacin was sensitive to bacteria isolated from fistula patients who were undergoing the surgery for the first time compare to those their fistula repair was more than two time.

KEY Words: Catheter-associated Bacteriuria, Obstetric fistula, Antimicrobial susceptibility

*Corresponding author: Email: bassey69@yahoo.com; Tel: 08179338777;

ORCID iD: <https://orcid.org/0000-0002-5274-4824>.

Author's contributions: This work was carried out and approved in collaboration between all the authors. NVU designed the study; NVU sourced for funding; NVU, MAY, FAU wrote the protocol; NVU, BEB contributed in literature search; NVU did the Laboratory experiments; NVU, BEB did statistical analysis; NVU, BEB drafted the manuscript; MAY, FAU supervised the study; BEB Wrote the final manuscript; BEB proofread the manuscript

Received: May/14, 2019; **Accepted:** July/05, 2019; **Published:** August/31, 2019.

Citation: Uzuegbunam NV, Yusuf MA, Umar FA, Bassey BE. Catheter-associated Bacteriuria among Fistula Patients Attending National Obstetrics Fistula Centre Ningi, Bauchi State, Nigeria. *J Med Lab Sci*, 2019; 29: 49-58.

INTRODUCTION

Obstetric fistula is caused by an abnormal fistulous tract extending between the bladder and the vagina that allows the continuous or involuntary discharge of urine into the vagina (1). Globally, over 2 million women are estimated to be living with vesico vaginal fistula and majority is in sub-Sahara Africa and south Asia (2). Currently, there has been increase in Nigerian material's survival rate but despite the immense achievement, the country still bears the heaviest global burden of obstetric fistula with 200,000 cases and 12,000 incident cases annually (3).

Pelvic disproportion; (a condition where the pelvic of the teenager is not fully developed as at pregnancy, thereby making the pelvic too small for the baby) and early marriage is also a common cause in northern Nigeria (4). In Sokoto about 93.6% of VVF patients got married before or at 19yrs of age while in Kano and Maiduguri 81.5% and 52% respectfully got married by 15yrs of age (3). Female genital mutilation, insertion of various traditional treatments of various conditions such as dyspareunia, infertility, congenital vaginal septum, illiteracy, poverty, ignorance, home delivery, non-utilization of antenatal and intrapartum medical facilities, husband dominance and the habit of performing traditional episiotomy (Gishiri cut) by untrained traditionalist and birth attendants are some of the factors that contribute to development of fistula in developing countries. In addition, most women acquire this condition while performing their legitimate functions (5,6). Many patients with obstetric bladder infection as well as urine and stool incontinences might live with these conditions for several years which may further predispose them to health related problems like urinary tract infections (UTI) (7). Microbial colonization occurs within five

to seven days of catheter placement and is frequently associated with the development of a bacterial biofilm, presumably the source of the catheter- acquired urinary tract infection (7) The diagnosis of UTI depends on signs and symptoms in the case of symptomatic infection and without sign in the case of asymptomatic infection with the presence of indwelling catheter (8). The laboratory diagnosis of UTIs is done by urinalysis and microscopy, if indicated a urine culture will be performed. In order for the laboratory evaluation to be useful it is necessary that there should be proper collection of urine. The aim of this project was to determine the pattern of catheter associated bacteriuria among fistula patients in National Obstetric Fistula Centre Ningi, Bauchi State. The objectives of this study were to identify the significant bacteriuria among fistula patients and determine the antimicrobial sensitivity pattern to commonly prescribed antibiotics.

MATERIALS AND METHODS

Study Area

The research was conducted at national obstetric and fistula centre Ningi, Bauchi state between June and December 2016. Urine samples were collected from the fistula patients admitted into the hospital during this study. After obtaining the informed consent, the patients were interviewed based on the socio demographic characteristics of fistula patients, duration of their clinical manifestation and information on related risk factor's using structured questionnaires

Ethical approval for this study was received from the Management of National obstetric and fistula centre, Ningi-Bauchi State. While consent letters for sample collection was obtained from the patients. The approval was on the agreement that patient anonymity must

be maintained, good laboratory practice/quality control ensured, and that confidentiality of every finding must be ensured and for purpose of research only. These concur with the national code for Health Research Ethics of Nigeria.

A total of 305 urine samples were collected from both Asymptomatic and Symptomatic fistula patients and 217 were positive. Sample size was determined using the Fischer’s expression for cross sectional study design and calculated according to (9).

$$n = \frac{z^2 p(1-p)}{d^2}$$

Where

n = sample size of subject required for the study.

z – Statistic for level of 95% confidence interval=1.96.

P= prevalence rate=76 % (9)

d= precision at 5 % (allowable error)=0.05

Clean catch mid-stream urine was collected from the patients before insertion of catheter, after removal of catheter and at catheter in situ with sterile syringe. The urine sample was analyzed using standard microbiological method (10). Briefly, the urine samples were cultured on Cysteine Lactose Electrolyte Deficient agar (CLED), Blood Agar, and ted.

MacConkeyAgar (11). The culture plates were incubated aerobically at 37°C for 24hours. Biochemical tests such as Motility test, Indole production, citrate utilization, urease activity, Triple Sugar Iron, oxidase test, catalase and coagulase test were used for identification. Antimicrobial susceptibility testing was carried out on Muller Hinton agar (Oxoid, England) by using disc diffusion method (12). Antimicrobial susceptibility result was interpreted according to CLSI. Data were analyzed and interpreted using SPSS version 20 software and association between variables were determined using Chi-square. All statistical tests were considered significant at p<0.05 according to Perez-Roth *et al.* (13)

RESULTS

4.1 Distribution of significant bacteriuria on stages of sample collection

Table 1: shows distribution of significant bacteriuria on stages of sample collection. Of the 105 urine samples collected in the 1st stage, 61 (58.1%) showed positive urine culture, 85(85%) were positive in the 2nd stage of 100 urine sample and 71(71%) were also positive in 3rd stage of 100 urine sample collected.

Table 1: Distribution of significant bacteriuria on stages of sample collection. X² (2) = 18.1 p<0.05

Different Collection Point	Samples	Number Recorded	of % Positive Cases	of % Negative Cases
preoperative (1st stage)		61	58.1	41.9
Catheter Urine (2nd Stage)		85	85	15
Post Operative (3rd Stage)		71	71	29
Total (%)		217	71	88

4.2 Frequency of occurrence and types of bacteria isolated from fistula patients.

Table 2: shows frequency of occurrence and types of bacteria isolated among fistula patients admitted into NOFC, Ningi-Bauchi state. Out Of 305 urine samples investigated

E coli had the highest frequency of occurrence 85(39.1%) followed by Proteus38 (17.5%) and the least was Serratia species 3(1.4).

Table 2: Frequency of occurrence and types of bacteria isolated among fistula patients admitted into NOFC,Ningi-Bauchi State

Bacteria Isolated	Number of Occurrence	% Frequency of Occurrence
<i>Escherichia coli</i>	85	39.1
<i>Klebsiella pneumoniae</i>	15	6.9
<i>Klebsiella oxytica</i>	14	6.5
<i>Proteus mirabilis</i>	27	12.4
<i>proteus vulgaris</i>	11	5.1
<i>Pseudomonas spp</i>	18	8.3
<i>Citrobacter spp</i>	4	1.8
<i>Enterobacter spp</i>	5	2.3
<i>Serriatia spp</i>	3	1.4
<i>Staphylococcus aureus</i>	14	6.5
<i>CoagulaseNegative Staphylococcus</i>	21	9.7
Total	217	100

$X^2(10) = 264.1, P < 0.05$

4.3 Distribution of positive urine culture in relation to socio-demographic status of fistula patients.

Table 3: Shows distribution of positive urine culture in relation to socio-demographic status of the fistula patients. The age group 16-25 years old had the highest number of significant bacteriuria with 85 (81.0%) while the least was 6(54.5%) among patients aged

5-15 years old. Those who were married 284(93%), illiterate 210(68.8%), house wife 275(100%), rural dwellers 246(100%) and those who belonged to the lowest income had the highest incidence of bacteriuria than others.

Table 3: Distribution of positive urine culture in relation to socio-demographic status of fistula patients

Variables Age (years)	Significant bacteriuria (%)	Non-Significant bacteriuria (%)	% Total	
5-15	6(54.5)	5(45.5)	11(100)	
16-25	85(81.0)	20(19.0)	105(100%)	
26.35	54(61.4)	34(38.6)	88(100%)	
36.45	44(61.1)	25(38.9)	69(100%)	
>45	28(87.5)	4(12.5)	32(100%)	
Total %	217(71.1)	88(28.9)	305(100%)	X² (4)=17.9 P<0.05
marital Status				
Single	7	4	11(3.6)	
Married	202	82	284(93)	
Divorced	8	2	10(3.4)	
Total (%)	217(71)	88(29)	305(100)	X²(2) =0.683 P<0.05
Educational Status				
Illiterate	156	54	210(68.8)	
Primary school	43	25	68(22.4)	
Secondary School	18	9	27(8.8)	
Tertiary Institution	0	0	0(0)	
Total (%)	217(71)	88(29)	305(100)	X² (2)=3.35 P>0.05
Occupation				
Traders (petty)	15(75)	5(25)	20(100)	
Student	2(28.6)	5(71.4)	7(100)	
House wife	192(75)	83(25)	275(100)	
Civil servant	0	3(100)	3(100)	
Total	209	96	305(100)	X² (3)=11.158 p<0.05
Personal Income (Naira)				
0-500	194	81	275(90)	
501-1000	15	5	20(6.6)	
1001-1500	5	2	7(2.3)	
>1500	3	0	3(0.9)	
Total	217	88	305(100)	X² (3) =1.41 P<0.05
Residence				
Rural	182(74)	64(26)	246(100)	
Urban	35(59)	24(41)	59(100)	
Total (%)	217(71)	88(29)	305(100)	X²(1) =4.98 P<0.05

4.4 Antimicrobial susceptibility profile bacterial isolates.

Table 4: shows antimicrobial susceptibility pattern of gram negative bacterial isolates. Out of the 10 antibiotics tested, streptomycin

was the most sensitive with 74%. While all the bacteria isolated showed complete resistant to Gentamicin and Amoxicillin.

Table4: Antimicrobial susceptibility profile of bacteria isolated.

Bacteria	Antibiotics Tested							
	Isolated	SXT	CH	SP	CPX	AM	CN	PEF
<i>E. coli</i> (n=85)	S	10(11.8)	45(53.0)	15(17.6)	28(32.9)	20(23.5)	0(0.0)	24(28.2)
	I	5(5.9)	4(4.7)	6(7.0)	14(16.5)	8(9.4)	0(0.0)	4(4.7)
	R	70(82.4)	36(42.4)	64(75.3)	43(50.6)	57(67.0)	85(100)	57(67.0)
<i>Klebsiella spp</i> (n=29)	S	8(27.6)	10(34.5)	5(17.2)	10(34.2)	5(17.2)	0(0.0)	14(48.3)
	I	1(3.4)	0(0.0)	0(0.0)	0(0.0)	2(2.4)	0(0.0)	0(0.0)
	R	20(69.0)	19(65.5)	24(82.8)	19(65.5)	22(25.9)	29(100)	15(51.7)
<i>Proteus spp</i> (n=38)	S	8(21.1)	19(50.0)	5(13.2)	15(39.5)	12(31.6)	0(0.0)	15(39.5)
	I	1(2.6)	3(7.9)	0(0.0)	3(7.9)	0(0.0)	0(0.0)	0(0.0)
	R	29(76.3)	16(42.1)	33(86.8)	20(52.6)	26(68.4)	38(100)	23(60.5)
<i>Pseudomonas spp</i> (n=18)	S	5(27.8)	7(38.9)	5(27.8)	8(44.4)	6(33.4)	0(0.0)	8(44.4)
	I	1(5.6)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
	R	12(66.6)	11(61.1)	13(72.2)	10(55.6)	12(66.7)	18(100)	10(55.5)
<i>Citrobacter spp</i> (n=4)	S	1(25)	1(25)	0(0.0)	1(25)	1(25)	0(0.0)	1(25)
	I	0(0.0)	1(25)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
	R	3(75)	2(50)	4(100)	3(75)	3(75)	4(100)	3(75)
<i>Enterobacter spp</i> (n=5)	S	2(40)	2(40)	1(20)	2(40)	1(20)	0(0.0)	3(60)
	I	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0)	0(0.0)	0(0.0)
	R	3(60)	3(60)	4(80)	3(60)	4(80)	5(100)	2(40)
<i>Serratia spp</i> (n=3)	S	0(0)	0(0.0)	1(33.3)	0(0.0)	2(66.7)	0(0.0)	1(33.3)
	I	0(0.0)	0(0.0)	0(0.0)	1(33.3)	0(0.0)	0(0.0)	0(0.0)
	R	3(100)	3(100)	2(66.7)	2(66.7)	1(33.3)	3(100)	2(66.7)

KEY:

S=sensitive, I=Intermediate, Resistant, SXT=Septrin(30µg), CH=Chloramphenicol(30µg), SP=Sparfloxacin,(10µg) CPX=Ciprofloxacin(10µg) AM=Amoxicillin(30µg), CN=Gentamicin (10µg) PEF=Pefloxacin(30 S=Streptomycin(30µg) AU=Augumentin(30 µg)

DISCUSSION

The prevalence of significant bacteriuria determined in this study was relatively high which could be attributed to the nature of their condition, because people with vesico vaginal fistula (VVF) can have frequent bladder infections as well as urine and stool inconsistencies. These further predispose them to health-related problems like urinary

tract infection (UTI), kidney infection and bacteremia if not diagnosed and treated properly (15, 16, 8, and 17). This concurs with the report of CDC, (7) on catheter associated UTI that high microbial infection may occur due to use of catheter. Lindsay *et al.* (8) and Maki *et al.* (18) reported that 70-80% of UTI infection in hospitalized patients occurs due to use of catheter. Majority of

research carried out in Nigeria and beyond recorded *E. coli* to be predominantly isolated due to its special virulence factor for colonization and invasion of urinary epithelium. This report is in contrast with the work of Wondimeneh *et al.* (12) in Addis Ababa, Ethiopia, which showed that *Citrobacter spp* were predominantly isolated among the gram-negative bacteria isolated. This could occur due to differences in geographical locations.

Again, the information obtained from the structured questionnaire showed that poverty, broken homes, rejection from their husbands and relations made it difficult for these patients to observe proper personal hygiene. Geographically those living in rural areas showed highest level of significant bacteriuria with 182(74%) than those in urban areas 35(59%). This conformed with the finding of Daru *et al.* (19) on the burden of fistula in north central Nigeria and research by Kabir *et al.* (6) on medico social problems of patients with VVF in Murtala Mohammed specialist hospital kano agree that those rural dwellers had high rate of bacterial infection than urban dwellers. In table 3: this study finding also revealed that past history of catheterization, UTI and urine retention is an important risk factor associated with significant bacteriuria which agrees with research carried out by Yismeen *et al.* (20) and Tekalagn (17). The statistical result ($p < 0.05$) shows that there were significant differences on the above-mentioned factors. The information obtained from structured questionnaire revealed that 80-90% of fistula in Nigeria was caused by obstructed or prolonged labour, about 20% were as a result of other issues like traditional episiotomy “gishiri cut”, home delivery, female circumcision which is similar to the work done by kabir *et al.* (6) and Ibrahim *et al.*, (21). This is in contrast to the developed world where 70% of fistulae were as a result of pelvic surgery, radiation therapy and

neurologic disorder (22). Earlier reports from other parts of Nigeria had indicated that prevalence of bacteriuria was higher among younger patients. Lindsay *et al.* (8) and Maki *et al.* (18) reported that 70-80% of UTI infection in hospitalized patients occurs due to use of catheter. This finding is similar to the work of Adeoye *et al.* (9) on assessment of asymptomatic bacteriuria among fistula patients at Abakaliki, south east Nigeria who reported high bacteria infection in age group of 15-30yrs. Also Dereje *et al.* (23) on urinary tract infection among fistula patients admitted at Hamlin fistula hospital Addis Ababa, Ethiopia had similar report that age groups of 21-25, 16-20 and 26-30 had highest bacterial infection than other age group. High rate of bacterial infection at this age group could be due to low personal hygiene arising from their inexperience to keep themselves clean. Again, the age range of 46-55yrs had highest percentage of bacterial isolates of 87.5% which is in concordance with the report of Agba *et al.* (24); Ibrahim *et al.* (21) and Yabaya and Auta, (25) on microbial colonization of urogenital tract of elderly women stating that elderly women had highest infection when compared to the younger patients. This also could be attributed to hormonal changes and low immunity that occur at this stage. There was no significant difference in isolates between their age group (P -value=0.683) (25, 26) The overall prevalence of significant bacteriuria in this study was 71.1% which is almost similar to the study done in Nigeria on assessment of asymptomatic bacteriuria among women with vesico vaginal fistula in south eastern with prevalence of significant bacteriuria 76.1% as reported by Adeoye *et al.*(9) but contrary to the work done in Ethiopia on UTI among obstetric fistula patients in Gondar university hospital north west were the prevalence was 58.2% as stated by Wondimeneh *et al.*, (12), Okonko *et al.*,(27)

In this work, gram negative bacteria isolated showed high level of resistance to gentamicin (100%), Sparfloxacin (79%) septrin (77%) Amoxicillin (69%), Pefloxacin (62%) and ciprofloxacin (55%) as shown in Table 4. while the bacteria isolated showed low resistance to Streptomycin (26%), Ofloxacin (37%), Augumentin (45%), and Chlorophenicol (49%). This is in contrast to previous study done in Ethiopia where gentamicin were considered as appropriate antimicrobial therapy for empirical treatment of urinary tract infections as reported by kibret and Abera (28). Also all the isolates were highly sensitive to Strptomycin (74%) and Ofloxacin (60%). In this work ciprofloxacin were sensitive to bacteria isolated from fistula patients who were undergoing the surgery for the first time compare to those their fistula repair was more than two times. This could be due to use of ciprofloxacin as prophylaxis on fistula patient immediately after surgery. In this work streptomycin was found to be drug of choice fo r all the bacteria isolated and some of the isolates showed complete or multiple drug resistance.

REFERENCES

- 1 Adeoye IS, Oladeinde O, Adeoye J. An assessment of asymptomatic bacteriuria among women with vesico- vaginal fistula in South-Eastern, Nigeria. *Nepal J of Epidemiology*, 2010; 1(2): 64 -69.
- 2 Afrenish H, Javid U, Fatima K, Maria O, Ali K, Muhammad I. Evaluation of different detection methods of biofilm in the clinical isolate. *Brazilian J of Infectious Diseases*, 2011; 15(4): 305-11.
- 3 Agba MI, Chukwekere IC, Chukwukere SC, Nwobu GO, Okapala HO. Bacterial colonization of urinary tract of pregnant women attending antenatal clinic in Vom, Plateau. *Nigerian J of Biotechnology*, 2002; 13(1): 73 – 77.
- 4 Ahmed S, Creenga A, Tsui A. The role of delayed child bearing in the prevention of obstetric fistulas. *International J of Gynecology and Obstetrics*, 2007; 2(3) 5.
- 5 Andrew O. The effect of VVF in Africa, *International J of Gynecology and Obstetrics*, 2011; 3(5): 243-4.
- 6 Center for disease and presentation. Catheter associated urinary tract infection (CAUTI) events center for disease control and prevention retrieved from [http:// www. cdc.gov](http://www.cdc.gov) at 4.00 am, 17th February, 2016.
- 7 Cheesbrough M. *District laboratory practice in tropical countries*. Cambridge university press.
- 8 Daru PH, karshima JA, Mikah S, Nyango D. The burden of vesico vaginal fistula in North central, Nigeria. *Journal West African College of Surgeon*, 2011; 1(2): 50 – 62.
- 9 Dereje M, Woldeamanuel Y, Asrat D, Ayenachew F. Urinary tract infection among fistula patients admitted at Hamlin fistula hospital, Addis Ababa, Ethiopia. *BMC Infectious Diseases*, 2017; 17(1): 150.
- 10 El-Naggar W, Hassan R, Barwa R, Shokralla S, Elgaml A. Molecular diagnosis of gram negative bacteria in urinary tract infections. *Egyptian J of Medical Microbiology*, 2010; 19(1).
- 11 Ezegwui HU, Nwogu-Ikojo EE. Vesico-vaginal fistula in Eastern Nigeria. *J of Obstetrics Gynaecology*, 2005; 25(6): 589-911
- 12 Graham JC, Galloway A. The laboratory diagnosis of urinary tract infection. *J Clinical Pathology*, 2001; 54:911– 919.
- 13 Handley MA, Reingold AL, Shiboski S, Padian NS. Incidence of acute Urinary tract infection in young

- women and use of male condoms with and without nonoxynol-9 spermicides. *J of Epidemiology*, 2002;13: 431- 436.
- 14 Hilton P. Vesicovaginal fistulas in developing countries. *International J of Gynaecology Obstetric*,2003; 82: 285-295.
- 15 Hoiby N, Bjarnsholt T, Givskov M, Molin S, Ciofu O. Antibiotic resistance of bacterial biofilms, *International J of Antimicrobial Agents*, 2010; 35(4): 322-332.
- 16 Ibrahim T, Sadiq AU, Daniel SO. Characteristics of VVF patients as seen at the specialist hospital Sokoto, Nigeria. *West African J of Medicine*, 2000; 19(1):59-63.
- 17 Kabir M, Iliyasu Z, Abubakar IS, Umar UI. Medico-social problems of patient vesico-vaginal fistula in Murtala Mohammed specialist hospital, Kano. *Annual African Medicine*, 2003; 2(2): 54–57.
- 18 Kibret M, Abera B. Prevalence and antibiogram of bacterial isolates from urinary tract infections at Dessie Health Research Laboratory, Ethiopia. *Asian Pacific J of Tropical Biomedicine*, 2014; 4(2): 164-168.
- 19 Lindsay EN. Catheter associated urinary tract infections. *Antimicrobial, Resistant Infection and Control*.2004; 3-23
- 20 Maki DG, Tambyah PA. Engineering out the risk for infection with urinary catheters. *Emerging Infectious Diseases*,2001;7:342–347.
- 21 Morhason BIO, Ojengbede OA, Adedekun BO, Oladokun A, Okunlola MA. Obstetric fistula repair in Nigeria.Tertiary health institution. *Tropical. J of Obstetric Gynecology*, 2011; 2: 28.
- 22 Ojanuga OD, Ekwempu CC. An investigation of socio-medical risk factors associated with vaginal fistula in northern Nigeria. *Women Health*, 1999; 28(3):103-16.
- 23 Okonko IO, Ijandipe LA, Ilusanya AO, Donbraye-Emmanuel OB, Ejembi J, Udeze O, Egun OC, Fowotade A, Nkang AO. Detection of Urinary Tract Infection among pregnant women in Oluyoro Catholic Hospital, Ibadan, South Western Nigeria. *J of Microbiology*,2010; 6(1): 16-24.
- 24 Parvin U, Mymensingh B. Comparative study among the bacterial causes of community acquired and nosocomial urinary tract infection.2009; Department of Microbiology Mymensingh Medical College,pp 11.
- 25 Perez-Roth E, Lorenzo-Díaz F, Batista N, Moreno A, Méndez-Álvarez S. Tracking methicillin-resistant *Staphylococcus aureus* clones during a 5-year period, 1998 to 2002 in a Spanish hospital. *J of Clinical Microbiology*, 2004; 42(10): 4649-4656.
- 26 Sunday AI. Obstetric fistula.The Ebonyi experience, *Ebonyi Medical. J*, 2009;1(8): 4-9.
- 27 Taiwo SS, Aderounmu AO. Catheter associated urinary tract infection,etiology agents and antimicrobial susceptibility pattern in Ladoke, Akintola University Hospital, Osogbo, Nigeria. *African J of Biomedical Research*, 2006; 9:141-148.
- 28 Tekalign K, Ketema B. Prevalence and antibiotic susceptibility pattern of how to cite this article: methicillin-resistant *Staphylococcus aureus* (MRSA) among primary school children and prisoners in Jimma Town, Southwest Ethiopia. *Annals of Clinical Microbiology and Antimicrobials*, 2013; 12:11.

- 29 Trautner BW, Darouiche RO. Role of biofilm in catheter associated urinary tract infection. *American Journal of Infection Control*, 2004;32: 177–118.
- 30 Udeh K. The Influence of Media Campaigns on Vesico Vaginal Fistula Prevention and Control in North West Nigeria (Doctoral dissertation). Retrieved from <https://www.repository.unn.edu.ng/xmlui/handle/12.00> pm, 5th July, 2017.
- 31 Wondimeneh Y, Muluye D, Alemu A, Atinafu A, Yitayew, G, Gebrecherkos T, Alemu AG, Damtie D, Ferede G. Urinary tract infection among obstetric fistula patients at Gondar University Hospital, Northwest Ethiopia. *BMC Women's Health*, 2014; 14:12.
- 32 Yabaya A Auta B. Microorganisms associated with the urinogenital system of vesico vaginal fistula (VVF) patients in north western Nigeria. *Science World J*, 2002; 1(1):37-37
- 33 Yasmeeen G, Asrat D, Woldeamanuel Y, Chandrashekhkar G. Urinary Tract Infection: Bacteria etiologies, drug resistance profile and associated risk factors in diabetic Patients attending Gondar University Hospital. *European J of Experimental Biology*,2012; 2(4):889-898.
- 34 Yismaw G, Negeri C, Kassu A, Tiruneh M, Mulu A. Antimicrobial resistance pattern of Salmonella isolates from Gondar University Hospital, North West Ethiopia. *Ethiopian Pharmaceutical J*, 2007; 25: 85-90.