The Bacterial Isolates from Obstetric Patients Using Indwelling Urinary Catheters in Okigwe General Hospital Imo State, Nigeria

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Abstract: **- The Bacterial Isolates from Obstetric Patients Using Indwelling Urinary Catheters in Okigwe was carried out from OKigwe General Hospital, Okigwe Imo State Nigeria. Urine specimens were collected aseptically using standard microbiological laboratory techniques. The patients were examined for, urine analysis, urine culture and antibiotic susceptibility test. The bacterial complications of the inserting indwelling urethral catheters in General Hospital Okigwe as 21(52.5%). In bacterial isolates of catheterized pregnant women in General Hospital Okigwe, out of 40 patients catheterized, 21 patients were found with significant bacteriuria among 40 catheterized patients examined. *Escherichia coli* 7(33.3%), were the most common isolate followed by *Staphylococcus aureus* 4(19.0%), *Klebsiella pneumonia* 2(9.5%), *Pseudomonas aeruginosa* 3(14.3%), *Streptococcus faecalis* 3(14.3%) and *Proteus mirabilis* 2(9.5%). The indication of inserting indwelling urinary catheters shown that caesarian sections patient In General Hospital Okigwe, caesarian section patients had the highest isolates of 10(47.6%), followed by pro-longed labor patients of 4(19.1), Ectopic pregnancy 3(14.3%) while Severe Preeclampsia and Anterpatum hemorrhage had the lowest of 2(9.5%). In Antibiotic susceptibility test, it was shown that the most susceptible antibiotics for Gram negative isolates were Streptomycin (92.9%), followed by Ceftriazone (85.7%), Taravid (78.6%), Augumentine (71.4%), Gentamycin (64.3%), Ceporax (57.1%), Pefloxacin (57.1%), Ciprofloxacin (42.8%), Septrin (42.9%) and Ampicilin (14.3%) were the least susceptible antibiotics while in Gram positive isolates, the most susceptible antibiotics were Streptomycin (100.0%), followed by Gentamycin (71.4%), Erythromycin (57.1%), Ciprofloxacin (57.1%), Ceporax (57.1%), Ampiclox (57.10%), Amoxil (42.9%), Levofloxacin (42.9%), while Choramphenicol (14.3%) were the least. Availability and indiscriminate use of commonly used antibiotics without health care workers prescription lead to an increased multidrug resistance. The rate of baceriura were greatly higher during caesarean section than other indications. The routine of an indwelling catheter for cesarean is not necessary and with the increasing incidence of this surgery, the benefits of avoiding catheterization are likely to be substantial. Cesarean sections and other procedures can be done safely without the routine use of urethral catheter with reduced morbidities.**

Keywords: **Catheterization, Obstetric Patients, Bacterial Isolates**

I. INTRODUCTION

Indwelling urinary catheters are standard medical devices utilized in both hospital and nursing home settings to relieve urinary retention and urinary incontinence (Bower *et al.,* 2005). A major crisis with catheters is that they have a propensity to contribute to urinary tract infections (UTI) (Gupta, *et al*., 2016). Urinary Tract Infection (UTI) is the most severe bacterial infections in humans and common disease of women especially young ladies than men. Every year millions of people are affecting from this serious health problem. (JakiK, *et al*., 2017). More importantly, bacterial contamination of the catheter tip was associated with reduction in the clinical pregnancy rate (Matuka, *et al*., 2018). The urinary tract of catheterized patients is highly susceptible to severe infection (Chanda, *et al.,* 2015). Though urinary tract catheterization is an important aspect of medical care, it's inappropriate use may lead to significant morbidity and mortality, increased hospitalization and financial burden (Preshama, *et al*., 2017). Although indwelling urinary catheterization is a medical intervention with well-defined risks. Despite these known disadvantages, urethral urinary catheterizations are frequently used without an appropriate indication such as acute urinary retention (Ogwuegbu, *et al*., 2018).

Nowadays, indwelling catheters forms an integral component of patient care and the prevalence rate for short-term catheterization among hospitalized patients in the UK is 15–25%, including 9% in nursing homes and approximately 4% in the community (Gupta, *et al*., 2002). The use of indwelling urinary catheter is a routine part of the majority of cesarean deliveries performed. Indications for using a catheter include providing relief when there is urinary retention, monitoring of the urine output for critically ailing persons, managing urine outflow during surgery, prolong labor, rupture of the uterus, before and after the cesarean sections, prior to and following hysterectomies, patients with genital injury. However, indwelling catheters are allied with infection, maternal discomfort, deferred ambulation, and reasonable cost (Gupta, *et al*., 2016). The single most important risk factors for nosocomial bacteriuria and UTI mostly occur due to the presence of indwelling urethral catheters. Once the urethral

catheter is in place, the daily incidence of bacteriuria is 3-10%. Most patients who become bacteriuric do so by 30 days, because there is a convenient dividing line between short and long-term catheterization (Nicole, 2008).

Reducing the duration of catheter usage in the patients has a positive impact on the reduction of urinary tract infection. Catheter should be removed once it's no longer needed to reduce the rate of biofilm growth on the catheters (Ogwuegbu, *et al*., 2019 and Amat-Al, *et al.*, 2017). Once an indwelling catheter is inserted, bacteria quickly develop into colonies known as biofilms (living layers) that adhere to the catheter surface and drainage bag (Pratt et al., 2007). Urinary tract infection is a common contagion among men and women but the incidence is quite high among women due to their physiology. Pregnant females are considered immunocompromised hosts for UTI because of the physiologic changes associated with pregnancy (Gupta, *et al*., 2016). These changes augment the risk of serious infectious complications from symptomatic or asymptomatic urinary infections even in healthy pregnant women.

A range of bacterial species and yeast colonizes the catheters and has the important virulence factor that is to form biofilm which induces serious complications in the form of drug resistance. So keeping in view the use of catheters especially during pregnancy and the inclining likelihood of colonization of catheter. Urinary tract infection affects the parts of the urinary tract which includes the upper and lower urinary tract and the occurrence is high in females due to their reproductive anatomy (Parvean *et al*., 2011). Urinary tract infection caused by bacteria leads to inflammation and over growth of uropathogens and prevalence of infection for both genders, but women is more vulnerable especially at the sexually active ages (Karzan, *et al*., 2017). Bacterial entry into the bladder can occur at the time of catheter insertion, through the catheter-urethral interface. Entry of an infectious pathogen into the urinary tract causes the infection which usually occurs through the urethra. This is one of the prime reasons for higher incidence among women than men due to the shorter length of urethra in women which makes them vulnerable to such infections. Since the urethra is shorter in women (about 1.5 to 2 inches) when compared to men (8 inches), they are more prone to infections associated with the urinary tract. The shorter length of the urethra in women enhances the scope for the pathogen to invade the bladder resulting in bladder infection (Vasudevan, 2014).

Urinary tract infections are primarily caused by gram-negative bacteria, but gram-positive pathogens may also be involved. More than 95% of uncomplicated UTIs are mono-bacterial (Sobel, 2014). Females are more commonly affected than males. The predominant pathogen responsible for UTI is *E. coli* which constitutes up to 80-85% and is followed by *Staphylococcus saprophyticus* which accounts to 5-10%.

II. MATERIALS AND METHODS

Study Area

The study was carried out in General Hospital and All Saints hospitals all in Okigwe L.G.A. of Imo state Nigeria.

Subjects

It was a hospitals based cross sectional study that carried out from April - August 2019. Baseline demographic data including gestation age, age, level of education, patient's identification number were collected from Medical Record Department. Detailed physical and clinical examinations of patients were carried out to evaluate the condition. The patients were asked about any history of previous insertion of catheter device or UTI and indications for catheterization were recorded. Those with history of UTI and catheterization were excluded in the research. Pregnant women of 15 years of age and above on admission who inserted indwelling urinary catheters from 4 days were used for this research. A total sampling of 40 patients on indwelling urinary catheters were sampled in various hospitals :- Their ages range from 15- 45 years with 6 class intervals and they were placed in age bracket of 5 intervals (eg, 15-19, 20-24. etc).

Ethical Clearance

The clearance to obtain specimens and work with the people in the hospital was given by the Head Medical Director in charge of the hospital after submitting the clearance letter from the Abia State University, Uturu ethical clearance committee to the various hospital.

Sterilization of media

The media to be used include nutrient agar, blood agar, Mueller hinton agar, Cystein Lactose Electrolyte Deficinent (CLED) agar and MacConkey agar. This was prepared in accordance with the manufacturer's instructions. The media was sterilized by autoclaving at 121^{O}c and 15 psi for 15 minutes.

Collection of Catheter Specimens Urine (CSU) for Urine Analysis and Urine Culture

- ✓ The old catheter was removed and the urethral part was cleaned with alcoholic-impregnated swab.
- ✓ With non-dominant hand, the gauze squares was be used to separate the labia minora exposing the urethral meatus.
- ✓ Using dominant hand to clean the labia minora and urethral orifice with gauze soaked with 0.9% sodium chloride, to performed one downward stroke per square.
- ✓ The dominant hand was be used to gently insert the catheter about 5-7 cm of the catheter into the urethral meatus.
- ✓ About 10mls of (CSU) urine was flows into a sterile urine bottle

- ✓ Sterile, dried, wide-necked leak-proof containers was used to collect 10-20mls of urine specimens before connecting the urine bag.
- ✓ The balloon of the catheter was inflated with 10mls of water and care was taken to avoid the catheter resting against the bladder neck. (Chessbrough, 2006).

Examination of Urine (Micro And Macro)

- ✓ Aseptically, 10mls of well mixed urine was transferred into a labeled tube.
- ✓ It was centrifuged at 500-1000rpm for 5 minutes and the supernatant fluid was poured out by completely inverting the tube into the waste container.
- ✓ The sediment was released by tapping the bottom of the tube gently.
- ✓ One drop of the well-mixed sediment was transferred onto a clean glass slide and cover with cover slip.
- ✓ It was examined microscopically using the 10x and 40x objective lens with low light intensity to check the presence of bacterial, pus cells, crystals and red blood cells (Cappucino and Sherman 2014).

Media used:

Cystine Lactose Electrolyte Deficient (CLED) Agar

Nutrient Agar (NA)

MacConkey Agar (MCA)

Mueller Hinton Agar (MHA)

Media Preparation

The culture media were obtained in the commercially prepared (hydrated) form. Preparation of each medium was done according to the manufacturer's specifications. The specified quantity of the media were dissolved in specified volume of distilled water and sterilized by autoclaving at 121^0C and 15 p.s.i for 15 minutes in well stopper conical flasks. This was allowed to cool to about 45-50^0C before dispensing into pre-sterilized petri dishes and allowed to gell on flat surface.

Urine Culture

The urine specimen was inoculated on cystine lactose electrolyte-deficient (CLED) agar using the streaking technique of Cappucino & Sherma 2014

The inoculated plates were incubated at 37^0 C for 24-48hr and observed for bacterial growth Cappucino & Sherma 2014

Isolation And Purification of Bacterial Isolates

- ✓ On each of the culture media typed used, discrete colonies of representative groups of microorganisms were sub-cultured.
- ✓ The sub-culturing was done using the streaking inoculation technique on fresh media.
- ✓ This was repeated to obtain pure isolates of each bacterial species where the first failed.
- ✓ The purified bacterial isolate was inoculated into Agar slant and incubated for 18hours before strong in the refrigerator at 4^0C as stock culture (Cappucino & Sherma 2014).

Statistical Analysis

Chi-square Test of independence and three way ANOVA Analysis of Variance were employed to analyzed the data.

III. RESULTS

Out of 40 women examined, 21 patients were positive for significant bacteria, giving a prevalence of 52.5 % among the pregnant women. FIG 1: Shows the age distribution of bacterial isolates of CA-UTI from General Hospital Okigwe. The highest rate of 28.6% was found in the age group of 25-29 years while the lowest rate of 4.8% occurred in the age brackets of 40-44.

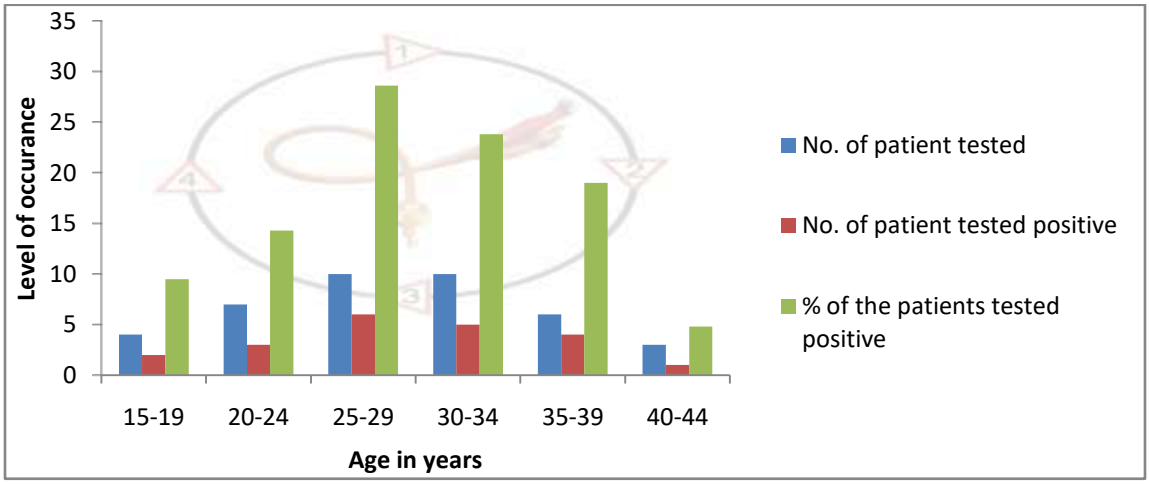

Fig. 1: Age distribution of bacterial isolates of CA-UTI from HMB Okigwe

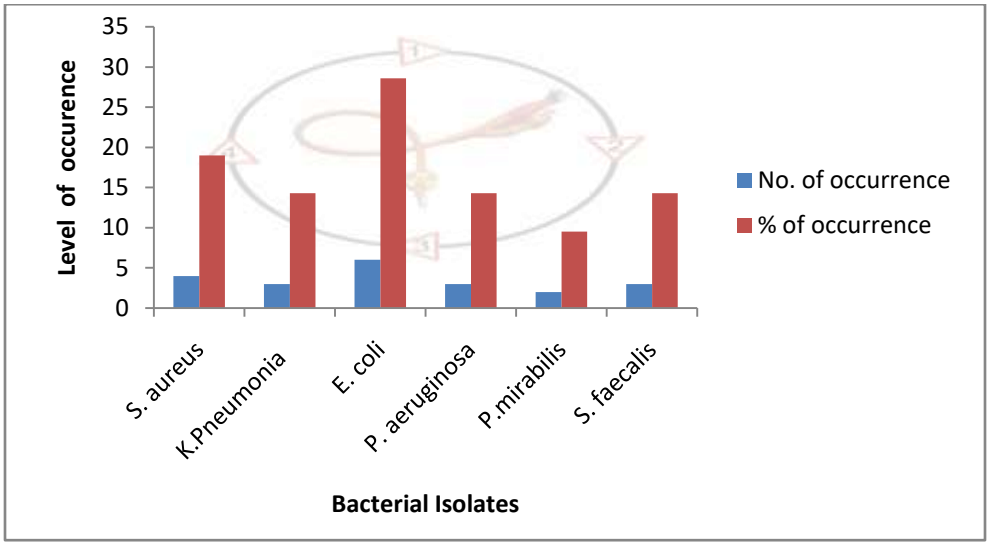

Fig. 2: Bacterial Isolates from catheterized patients from HMB Okigwe

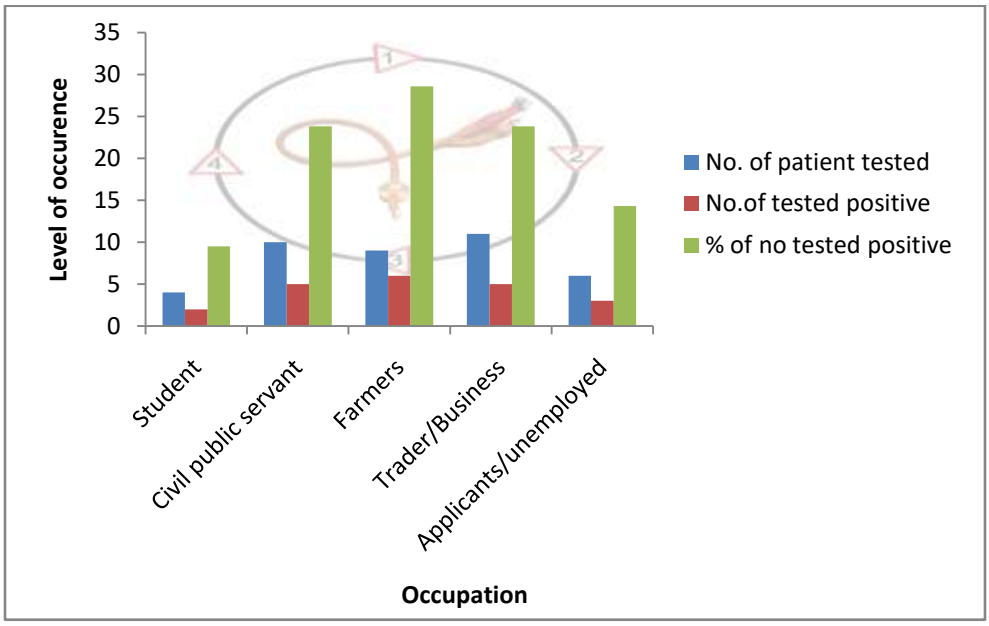

Fig. 3: Social Economic status related of CA-UTI from HMB Okigwe

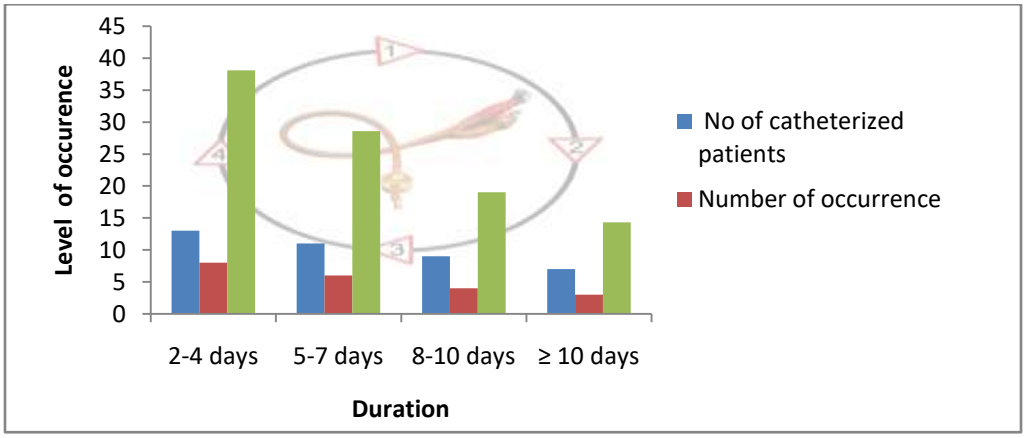

Fig. 4: Relationship between the Length of catheterization and development of significant bacteriuria among patients from HMB Okigwe

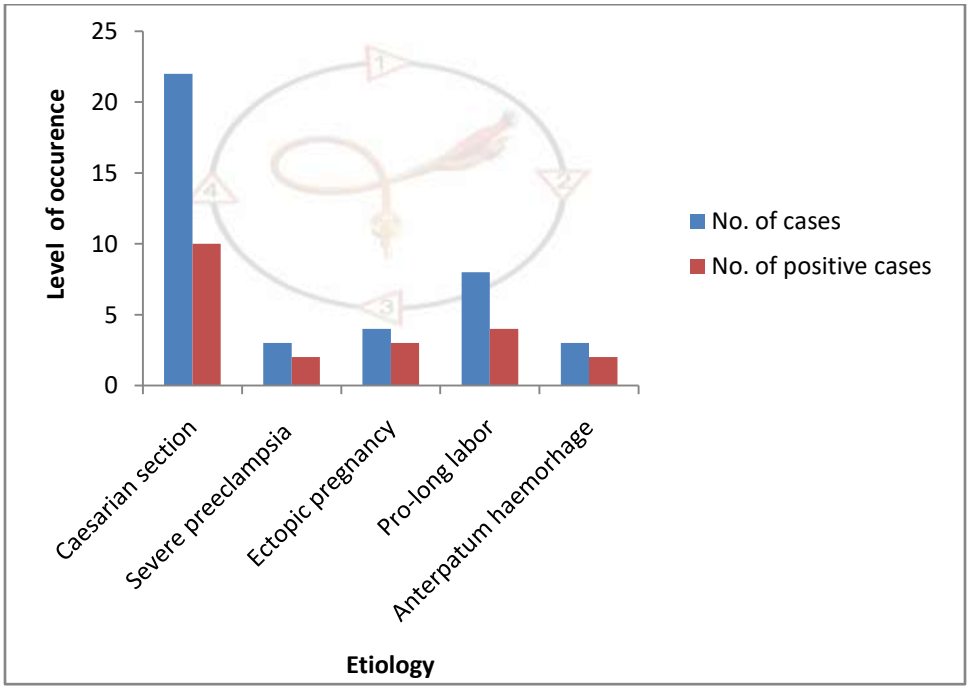

Fig. 5: Indications for the insertion of catheter among the patients from HMB Okigwe

Table 6: Bacterial Isolates from Urine Culture and their Antibiotic Susceptibility Patterns from HMB Okigwe, Gram Negative organism

Organisms	**E. coli (N= 6)**	**P. mirabilis (N=2)**	**K. pneumonia (N=3)**	**P. aeruginosa (N=3)**
Antibiotics	**S % R %**	**S % R %**	**S % R %**	**S % R %**
Augumentine	4(66.7) 2(33.3)	2(100.0) 0(0.0)	2(66.7) 1(33.3)	2(66.7) 1(33.3)
Taravid	5(83.3) 1(16.7)	2(100.0) 0(0.0)	2(66.7) 1(33.3)	2(66.7) 1(33.3)
Ciprofloxacin	3(50.0) 3(50.0)	1(50.0) 1(0.0)	1(33.3) 2(66.7)	1(33.3) 2(66.7)
Gentamycin	3(50.0) 3(50.0)	2(100.0) 0(0.0)	2(33.3) 1(66.7)	2(66.7) 1(33.3)
Streptomycin	6(100.0) 0(0.0)	2(100.0) 0(0.0)	3(100.0) 0(0.0)	3(100.0) 0(0.0)
Ceporax	3(50.0) 3(50.0)	1(50.0) 1(50.0)	2(66.7) 1(33.3)	2(66.7) 1(33.3)
Ceftriazone	5(83.3) 1(16.7)	2(100.0) 0(0.0)	3(100.0) 0(0.0)	2(66.7) 1(33.3)
Septrin	2(33.3) 4(66.7)	0(0.0) 2(100.0)	1(33.3) 2(66.7)	3(100.0) 0(0.0)
Ampicilin	1(16.7) 5(83.3)	0(0.0) 2(100.0)	0(0.0) 3(100.0)	1(33.3) 2(66.7)
Pefloxacin	3(50.0) 3(50.0)	1(50.0) 1(50.0)	2(66.7) 1(33.3)	2(66.7) 1(33.3)

Table 7: Bacterial Isolate from Urine Culture and their Antibiotic Susceptibility Patterns from HMB Okigwe, Gram Positive organisms

Organisms	**S. aureus (N = 4)**	**S. faecalis (N =3)**
Antibiotics	**S % R %**	**S % R %**
Amoxil	1(25.0) 3(75.0)	2 (66.7) 1 (33.3)
Rifampicin	1(25.0) 3(75.0)	2 (66.7) 1 (33.3)
Ciprofloxacin	2(50.0) 2(50.0)	2 (66.7) 1 (33.3)
Gentamycin	3(75.0) 1(25.0)	2 (66.7) 1 (33.3)
Streptomycin	4(100.0) 0(0.0)	3 (100.0) 0 (0.0)
Ceporax	2(50.0) 2 (50.0)	2 (66.7) 1 (33.3)
Levofloxacin	2(50.0) 2 (50.0)	1 (33.3) 2 (66.7)

Erythromycin	3(75.0)	1 (25.0)	3 (100.0)	1 (33.3)
Ampicox	1(25.0)	3 (75.0)	0 (0.0)	3(100.0)
Choramphicol	0(0.0)	4 (100.0)	1 (33.3)	2 (66.7)

IV. DISCUSSION

It is commonly accepted that a high frequency of UTI during pregnancy is due to physiological changes that the human body undergoes in the pregnant condition (Nubia, *et al.*, 2012). The most important risk factors for nosocomal bacteriuria and UTI are the presence of an indwelling urethral catheters. Once the urethral catheter is in place, the daily incidence of bacteriuria is 3- 10% (Nicole, 2008).

In this research the Bacterial Isolates from pregnant women using indwelling urinary catheters was accessed in three hospitals in Okigwe, Imo State Nigeria.

using cultural method techniques and this study lasted for 4 months period. In this study, it was observed that age influenced the chance of getting infection due to the use of indwelling urinary catheters among the pregnant women in the three locations.

The highest rate of 28.6% was found in the age group of 25-29 years while the lowest rate of 4.8% occurred in the age brackets of 40-44. The findings from this work disagreed with the results of Gupta, *et al.*, (2016) whose work could not show the significant relationship between the age and acquisition of CA-UTI. However, this work is in accordance with Ani, (2008) who their results shows the prevalence rates of 75.0%, 39.0% and 40.0% followed by the age group 15-23 years, 24-27 years and 33-above years, respectively.

Urinary tract infection (UTI) is the predominant type of bacterial infection among pregnant women (Nowicki, 2002). With what the human body undergoes in the pregnant condition Urinary tract infection (UTI) is common during pregnancy and can be associated with negative outcomes for both the mother and fetus. In the microbiological analysis of the urine specimens Okigwe General Hospital with prevalence rate of 21(52.5%).

The microorganisms isolated from the study were *E. coli*, *Staphylococcus aureus*, *Steptococcus faecalis*, *Pseudomans auroginosa*, *Klebsiella* and *Proteus mirabils.* The results obtained showed that *E. coli* was the most prevalent followed by *Staphylococcus aureus* while *Proteus mirabils* had the least prevalent rates and that gram negative bacteria predominated the list of isolated bacteria. In Okigwe General Hospital with *Escherichia coli* 7(33.3%), *Staphylococcus aureus* 4 (19.0%), *Klebsiella pneumonia* 2(9.5%), *Pseudomonas aeruginosa* 3 (14.3%), *Streptococcus faecalis* 3(14.3%) and *Proteus mirabilis* 2(9.5%). These findings agrees with Sharm and Bidwai (2013) whose work shows that *Escherichia coli* (43.47%) was predominant isolate followed by *Proteus spp.* (19.56%) and *Klebsiella spp.* (5.43%) respectively. In a work done by Gupta, *et al.*, (2016) it was also observed that *Escherichia coli* 10 (23.8%), were the most common isolate followed by *Klebsiella species* 09 (21.4%), *Staphylococcus aureus* 06 (14.3%), *Candida albicans* 06 (14.3%), *Pseudomonas aeruginosa* 05 (11.9%) *Coagulase negative staphylococci (CoNS)* 04 (9.5%), *Proteus mirabilis* 02 (4.8%).

Occupational prevalence showed that generally, farmers had the highest prevalence followed by the Traders/Business people, This showed that awareness and access to healthcare facilities influenced the prevalence of the CAUTIs in pregnant women. This observation tallies with those of and who also reported that socio-economic status and awareness are important in CAUTIs in pregnant women in Hossain, *et al.*, (2017) said that the high rate of infection in their study could also be linked to the level of personal and environmental hygiene of the patients.

In the relationship between the duration of inserting urinary catheter and the time of developing significant bacteriua among the patient was observed that generally acquisition of bacterial growth were higher from 5-7 days and above. This observations were similar in both study locations. This observation agrees with Gupta, *et al.*, (2016) that the length of catheterization related to significant Urinary Tract Infections was higher from 4-6 days with 15 (44.11%).

The rate of medical interventions and inability to manage patient during pregnancy can result in nosocomial infection; for example, urethral instrumentation and catheterization predispose to ascending bacteriuria (Timothy *et al.*, 2008).

Generally, the indication of inserting indwelling urinary catheters shown that caesarian sections patients had the highest bacterial isolates in the location. In General Hospital Okigwe, caesarian sectioned patients had the highest isolates of 10(47.6%), followed by pro-longed labor patients of 4(19.1), Ectopic pregnancy 3(14.3%) while Severe Preeclampsia and Anterpatum haemorrhage had the lowest of 2(9.5%) respectively.

The rate of baceriura were greatly high during caesarean section than other indications. According to Acharya *et al.*, (2012) the routine of an indwelling catheter for cesarean is not necessary and with the increasing incidence of this surgery, the benefits of avoiding catheterization are likely to be substantial. Cesarean section can be done safely without the routine use of urethral catheter with reduced morbidities. In the same line, Senanayaka, (2005) suggested in his work the need of elective Cesarean section without urethral catheterization.

Treatment of UTI is considerably more challenging if the causative agent is resistant to antibiotics. From our study, we observed that the most sensitive antibiotics for Gram negative isolates were Streptomycin followed by Ceftriazone, Taravid, Augumentine, Gentamycin, Ceporax, Pefloxacin while Ciprofloxacin, Septrin shows resistance of more than 50%. The resistant to Ampicillin is the most resistant antibiotics in the study. The increase in drug resistance of Ampicillin and Septrin are not encouraging. Availability and indiscriminate use of commonly used antibiotics without health care workers prescription lead to an increased multidrug resistance. Due to the increasing multidrug resistance among uropathogens, the health care workers are left with a limited choice of routinely used antibiotics to choose from for the treatment of urinary tract infections (Assefe, *et al.,* 2008). This can be attributed the fact that bacteria undergo mutation which makes their susceptibility vary from one geographical to the other (Gupta *et al*., 2001).

Amongst the Gram positive isolates, the most susceptible antibiotics were Streptomycin, followed by Erythromycin, Ceporax, Rifampicin, Gentamycin. Choramphenicol, Levofloxacin and Ciprofloxacin shows resistance of more than 50% while resistant to Ampiclox are Amoxil are the most resistant antibiotics in the study. Few of the isolated uropathogens showed resistance to more than two of the commonly used antibiotics (Gupta, *et al.,* 2002) and could be due to abuse, misuse and underuse of antibiotics (Albrich *et al.,* 2004 and Oladeinde *et al.,* 2011).

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