

# Incidence of Urinary Tract Infection among Pregnant Women Attending Antenatal Clinic at Federal Medical Centre, Bida, Niger-State, North Central Nigeria

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**Abstract** **OBJECTIVE:** To determine the bacteriological aetiology and incidence of Urinary Tract Infections (UTIs) and antibacterial susceptibility patterns among pregnant women attending antenatal clinics at Federal Medical Centre, Bida, Niger-State, using the gold standard of culture. **STUDY DESIGN:** Data were obtained from the Medical Microbiology Department Registry from Ante-natal women coming for routine ante natal clinic between January 2010 and December 2012. Mid-stream urine samples were collected from a total of 1242 pregnant women between the ages of 15 and 54 years. Samples were collected inside sterile disposable universal bottles from pregnant women suspected to have UTIs at first antenatal booking. Data was coded, computed and analysed using SPSS version 16.0 and p values  $\leq 0.05$  were considered to be statistically significant. **RESULT:** Out of 1242 pregnant women with in the age bracket 15 and 54years in this study, our research showed that the incidence of UTI in this population was 46.1%, statistically significant ( $p = 0.046$ , with mean age of 30.92 years and standard deviation of  $\pm 5.46$ ). *Escherichia coli* were the most prevalence uropathogen (60%), followed by *Staphylococcus aureus* (28.3%). *Escherichia coli* was susceptible to Nitrofurantoin and Gentamycin (61.4%) and (51.5%) respectfully. **CONCLUSION:** The incidence of urinary tract infection of 46.1% uropathogen in this study is of public concern. Therefore, periodic screening should be carried out on pregnant women during antenatal clinics for symptomatic or asymptomatic UTIs.

**Keywords:** incidence, pregnancy, urinary tract infection, susceptibility

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## 1. Introduction

Urinary Tract Infection (UTI) is an infection caused by the presence and growth of microorganisms anywhere in the urinary tract. It is perhaps the single most common bacterial infection of mankind [1].

Urinary tracts include organs that collect, store and release urine from the body which include: kidneys, ureters, bladder, urethra and accessory structures. Urine formed in the kidney is a sterile fluid that serves as a good culture medium for proliferation of bacteria [2]. UTI affect all age groups, but women particularly pregnant women are more susceptible than men, due to pregnancy, short urethra, easy contamination of urinary tract with faecal flora and various other reasons [3,4]. Asymptomatic bacteriuria (ASB), occurring in 2–11% of pregnancies is a major predisposition to the development of pyelonephritis,

which is associated with obstetric complications, such as preterm labour and low birth weight infants.

Bacteriuria is defined as the presence of  $>10^5$  colonies of a single pathogen per millilitre of urine. It may be either an asymptomatic bacteriuria (ASB of pregnancy) or symptomatic acute cystitis and acute pyelonephritis [5]. The female urethra is relatively short and is anatomically proximal to the vagina, which is colonized with organisms from the gastrointestinal tract. Normal physiological changes in pregnancy place women at risk for pyelonephritis. There is also relative obstruction of the ureters because the enlarging uterus physically blocks them, and the hormonal milieu of pregnancy leads to relaxation of the smooth muscle of the ureters and the bladder. Furthermore, the glycosuria and aminoaciduria of pregnancy provide an excellent medium for bacterial proliferation [6,7,8]. Untreated upper UTI in pregnancy carries documented risk of morbidity, and rarely, mortality to the pregnant women [9]. Sexually active young women

are disproportionately affected. An estimated 40% of women reported having had a UTI at some point in their lives [10]. Urinary tract infection is a serious health problem affecting millions of people each year and is the leading cause of Gram-negative bacteraemia. UTIs are also the leading cause of morbidity and health care expenditures in persons of all ages. In the United States, it is estimated from surveys of office practices, hospital-based clinics and emergency departments that UTI account for over eight million cases of UTI annually and more than 1 million hospitalizations, with an overall annual cost in excess of \$1 billion [10,11,12].

Also, the anatomical relationship of the female urethra to the vagina makes it liable to trauma during sexual intercourse as well as bacteria being massaged up the urethra into the bladder during pregnancy, the moist environment of the females perineum favours microbial growth and predisposes females to bladder contamination [13,14,15]. Other factors including improper cleaning of the perineum, the use of napkins and sanitary towel together with pregnancy and sexual intercourse contribute to the higher incidence of UTI in various women. In addition, urine of females was found to have more suitable pH and osmotic pressure for the growth of *Escherichia coli* than urine from males [16,17].

According to Azubuike *et al*, [18], commonest mode of infection is the ascending route, through which organisms of the bowel flora contaminated the urethra, ascends to the bladder and migrate to the kidney or prostrate. Clinical manifestation of UTI varies but the symptoms range from dysuria, lower abdominal pain, pyrexia of unknown origin and foul smelling urine [19]. There are number of conditions associated with an increased prevalence of asymptomatic bacteriuria in pregnancy. Low socioeconomic status, sickle cell traits, diabetes mellitus and grand multiparity have been reported; each is associated with two-fold increase in the rate of bacteriuria [20]. UTI is the second most common clinical indication for empirical antimicrobial treatment in primary and secondary care, and urine samples constitute the largest single category of specimens examined in most medical microbiology laboratories [21].

According to Alexander *et al*, [24] standard quantitative urine culture should be performed routinely at first antenatal visit. The prevalent organisms that are usually isolated from UTIs patients are *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella aerogenes*, *Pseudomonas aeruginosa*, *Proteus* species, *Streptococcus faecalis* and *Enterobacter* species. The prevalence and degree of occurrence of one or two of these organisms over others are dependent on the environment (Omonigho *et al*, [2]).

**AIM:** This study reports on the bacteriological aetiology and incidence of Urinary Tract Infections (UTIs) and antibacterial susceptibility patterns among pregnant women attending antenatal clinics at Federal Medical Centre, Bida, Niger-State, North Central, Nigeria.

## 2. Materials and Methods

### 2.1. Study Population

The research was a retrospective studies carried out between January 2010 to December 2012 and was exempted from ethical approval.

Urine samples were collected from a total of 1242 pregnant women between the ages of 15 and 54 years. All these persons were pregnant women attending the antenatal clinics at Federal Medical Centre, Bida, Niger-State, North Central, Nigeria.

### 2.2. Sample Collection

One thousand two hundred and forty two (1242) mid-stream urine (MSU) samples were collected inside sterile disposable universal bottles from pregnant women suspected to have UTIs at first antenatal booking. They were instructed on how to collect samples and the need for prompt delivery to the laboratory. The samples were labelled and transported to the Medical Microbiology laboratory of the hospital and were processed within 30 min to 1 hour of sample collection.

### 2.3. Analysis, Characterization and Identification of Bacteria from Urine Samples

Urine specimen were cultured on Cysteine Lactose Electrolyte Deficient (CLED) agar and Blood agar as described by Cheesbrough [22], specimen that yielded pure isolate of bacterial pathogens were included in this study. Isolated bacterial species were characterized by Gram stain followed by microscopic examination, motility test and biochemical tests and identified according to standard bacteriological methods as highlighted by Omer and Fadil [23] and Cheesbrough [22].

Data was coded, computed and analysed using SPSS version 16.0 and p values  $\leq 0.05$  were considered to be statistically significant.

## 3. Result

Out of 1242 Samples examined in this study, 572(46.1%) had significant uropathogen and 670(53.9%) yielded no bacteria growth.

Table 1 showed the incidence of UTI in relation to age of the subjects. A higher percentage of pregnant women 52(53.1%) and 106(53%) with UTIs were found within the age brackets of 20-24years and 35-39years respectively. The age groups 15-19years had the least uropathogen 2(0.3%) and age groups 50-54 years, yielded no significant growth of bacteriuria.

**Table 1. INCIDENCE OF UTIs IN RELATION TO AGE DISTRIBUTION OF PREGNANT WOMEN**

| AGE INTERVAL | NO TESTED | % POSITIVE | % NEGATIVE |
|--------------|-----------|------------|------------|
| 15-19        | 10        | 2(20.0)    | 8(80.0)    |
| 20-24        | 98        | 52(53.1)   | 46(46.9)   |
| 25-29        | 432       | 196(45.4)  | 236(54.6)  |
| 30-34        | 414       | 180(43.5)  | 234(56.5)  |
| 35-39        | 200       | 106(53.0)  | 94(47.0)   |
| 40-44        | 76        | 32(42.1)   | 44(57.9)   |
| 45-49        | 10        | 4(40.0)    | 6(60.0)    |
| 50-54        | 2         | 0(0.0)     | 2(100)     |
| TOTAL        | 1242      | 572        | 670        |

Table 2 showed overall incidence of uropathogen in the study age groups among pregnant women. The highest

number of uropathogen was found within the age groups of 25-29years with 196(34.3%) followed by 30-34years with 180(31.5%) and 35-39years 106(18.5%) while the

lowest uropathogen was found in 15-19year, 2(0.3%) while 50-54years had no significant growth.

**Table 2. Overall Incidence of Uropathogen against Age Distribution among Pregnant Women with UTI**

| ISOLATES             | NUMBER    | FREQUENCY(%) |         |           |           |           |         |        |       |
|----------------------|-----------|--------------|---------|-----------|-----------|-----------|---------|--------|-------|
|                      |           | 15-19        | 20-24   | 25-29     | 30-34     | 35-39     | 40-44   | 40-44  | 50-54 |
| <i>E. coli</i>       | 342(60.0) | 2(0.6)       | 30(8.8) | 144(42.1) | 94(27.5)  | 56(16.4)  | 16(4.7) | -      | -     |
| <i>S. aureus</i>     | 162(28.3) | -            | 14(8.6) | 32(19.8)  | 58(35.8)  | 40(24.7)  | 14(8.6) | 4(2.5) | -     |
| <i>K. pneumoniae</i> | 6(1.0)    | -            | 6(100)  | -         | -         | -         | -       | -      | -     |
| <i>P. aeruginosa</i> | 10(1.7)   | -            | -       | 4(40.0)   | 2(20.0)   | 2(20.0)   | 2(20.0) | -      | -     |
| <i>P. mirabilis</i>  | 2(0.3)    | -            | -       | -         | -         | 2(100)    | -       | -      | -     |
| <i>S. merscenci</i>  | 4(0.7)    | -            | -       | -         | 4(100)    | -         | -       | --     | -     |
| <i>C. albicans</i>   | 46(8.0)   | -            | 2(4.3)  | 16(34.8)  | 22(47.8)  | 6(13.0)   | -       | -      | -     |
| TOTAL                | 572(100)  | 2(0.3)       | 52(9.1) | 196(34.3) | 180(31.5) | 106(18.5) | 32(5.6) | 4(0.7) | (0.0) |

*E. coli* – *Escherichia coli*, *S. aureus*- *Staphylococcus aureus*,  
*K. pneumoniae*- *Klebsiella Pneumoniae*, *P. aeruginosa*- *Pseudomonas aeruginosa*  
*P. mirabilis*- *Proteus mirabilis*, *S. merscenci*- *Serratia merscenci*,  
*C. albicans* - *Candida albicans*.

Table 3 showed the incidence of bacteria isolated in UTI among pregnant women and the percentage prevalence of the uropathogen. *Escherichia coli* 342(60.0%) was found to be the most prevalence uropathogen followed by *Staphylococcus aureus* 162(28.8%), *Candida albicans* 46(8.0%), *Pseudomonas aeruginosa* 10(1.7%), *Klebsiella pneumoniae* 6(1.0%), *Serratia marcescens* 4(0.7%) and *Proteus mirabilis* 2(0.3%) being the lowest prevalence isolates.

**Table 3. PERCENTAGE OCCURENCE AND DISTRIBUTION OF BACTERIA PATHOGEN IN UTIs AMONG PREGNANT WOMEN**

| ISOLATES                      | NO OF OCCURENCE | % OCCURENCE |
|-------------------------------|-----------------|-------------|
| <i>Escherichia coli</i>       | 342             | 60.0        |
| <i>Staphylococcus aureus</i>  | 162             | 28.3        |
| <i>Klebsiella pneumoniae</i>  | 6               | 1.0         |
| <i>Pseudomonas aeruginosa</i> | 10              | 1.7         |
| <i>Proteus mirabilis</i>      | 2               | 0.3         |
| <i>Serratia marcescens</i>    | 4               | 0.7         |
| <i>Candida albicans</i>       | 46              | 8.0         |
| TOTAL                         | 572             | 100         |

Table 4 showed the antibiotics susceptibility pattern of the isolates.

*Escherichia coli* the highest uropathogen showed high susceptibility to Nitrofurantoin (61.4%) and Gentamycin (51.5%) but least susceptible to Cotrimoxazole (15.8%), Cefuroxime (14.0%), and Ampicillin (2.3%). *Staphylococcus aureus* the second uropathogen was susceptible to Augmentin (60.5%), Nitrofurantoin (51.9%) and least susceptible to Cloxacillin (19.8%), Nalidixic acid (17.3%) and Ampicillin (2.5%). *Klebsiella pneumoniae* was susceptible to Nitrofurantoin and Cefuroxime both by (66.7%) but completely resistance to Ampicillin by (100%). *Pseudomonas aeruginosa* was susceptible to Gentamycin and Ceftriazone both by (40%) but resistance to Augmentin, Azythromycin, Streptomycin, Cefuroxime, and Cotrimoxazole all by (100%). *Proteus mirabilis* was susceptible to Azythromycin, Gentamycin, Ceftriazone and Cotrimoxazole by (100%) but resistance to Augmentin, Streptomycin, Ampicillin, Nitrofurantoin and Nalidixic acid by (100%). While *Serratia marcescens* was susceptible to Gentamycin, Nitrofurantoin and Nalidixic acid by (100%) but resistance to Ampicillin, Augmentin, Azythromycin and Cefuroxime by (100%) respectively.

**Table 4. Antibiotic Susceptibility Pattern of the Urinary Isolates from Antenatal patients**

| ANTIBIOTICS | <i>E.coli</i><br>(N=342) | <i>S. aureus</i><br>(N=162) | <i>K. Pneumoniae</i><br>(N=6) | <i>P. aeruginosa</i><br>(N=10) | <i>P. mirabilis</i><br>(N=2) | <i>S. merscenci</i><br>(N=4) |
|-------------|--------------------------|-----------------------------|-------------------------------|--------------------------------|------------------------------|------------------------------|
| AMP.        | 8(2.3%)                  | 4(2.5%)                     | 0(0.0%)                       | NA                             | 0(0.0%)                      | 0(0.0%)                      |
| CLOX.       | NA                       | 32(19.8)                    | NA                            | NA                             | NA                           | NA                           |
| AUG.        | 158(46.2%)               | 98(60.5%)                   | 2(33.3%)                      | 0(0.0%)                        | 0(0.0%)                      | 0(0.0%)                      |
| AZY.        | 142(41.5%)               | 64(39.5%)                   | 2(33.3%)                      | 0(0.0%)                        | 2(100%)                      | 0(0.0%)                      |
| STREPT.     | 100(29.2%)               | 42(25.9%)                   | 2(33.3%)                      | 0(0.0%)                        | 0(0.0%)                      | 2(50.0%)                     |
| GENT.       | 176(51.5%)               | 60(37.0%)                   | 2(33.3%)                      | 4(40.0%)                       | 2(100%)                      | 4(100%)                      |
| CEF.        | 48(14.0%)                | 14(8.6%)                    | 4(66.7%)                      | 0(0.0%)                        | 0(0.0%)                      | 0(0.0%)                      |
| CEFT.       | 120(35.1%)               | 36(22.2%)                   | 2(33.3%)                      | 4(40.0%)                       | 2(100%)                      | 2(50.0%)                     |
| COT.        | 54(15.8%)                | 36(22.2%)                   | 2(33.3%)                      | 0(0.0%)                        | 2(100%)                      | 2(50.0%)                     |
| NIT.        | 210(61.4%)               | 84(51.9%)                   | 4(66.7%)                      | NA                             | 0(0.0%)                      | 4(100%)                      |
| NAL.        | 144(42.1%)               | 28(17.3%)                   | 2(33.3%)                      | NA                             | 0(0.0%)                      | 4(100%)                      |

An isolates with zone of inhibition =16mm is sensitive while ≤15mm is resistant to a particular antibiotics.

AMP- AMPICILIN, CLOX-CLOXACILIN, AUG- AUGMENTIN, AZY- AZYTHROMYCIN, STREPT.-STREPTOMYCIN, GENT.- GENTAMYCIN, CEF.- CEFUROXIME, CEFT.- CEFTRIAZONE, COT.- COTRIMOXAZOLE, NIT.- NITROFURANTOIN, NAL.- NALIDIXIC ACID.

N= TOTAL NUMBER

NA- NOT APPLICABLE.

## 4. Discussion

Out of 1242 pregnant women with in the age bracket 15 and 54years in this study, our research showed that the incidence of UTI in this population was 46.1%, statistically significant ( $p=0.046$ ,  $\chi^2 = 30.92$  and  $S.D = \pm 5.46$ ).

This finding is in agreement with Okonko *et al*, [24] who reported incidence of 47.5% at Ibadan, Nigeria and Ajayi *et al*, [25] who reported 40% but our finding is relatively higher than 8.9% reported by Kalantar Enayat *et al*, [26], 10.4% by Alemu Agersew *et al*, [27], 8.5% reported Sevki Celen *et al*, [28] and 14.6% by Masinde *et al*, [29].

However, our finding is lower than a prevalence rate of 71.6% reported in a similar study by Jellheden *et al*, [30], 88.6% by Akerele *et al*, [31] and 52.6% by Igwegbe *et al*, [32].

Obiogbolu [33], stated that high incidence of UTI may be due to hormonal effects produced during pregnancy which reduces the tone of uteri musculature aided by mechanical pressure from the gravid uterus resulting to urinary stasis thus encouraging bacterial proliferation in urine. It may also be due to social economic status and sexual intercourse [34,35].

Our study showed that there was high incidence of UTIs between age groups 25-29years (34.3%) followed by 30-34years (31.5%). This result was similar to the findings of Adeyeba *et al*, [36] and Obiogbolu *et al*, [37].

The most common uropathogen isolated in this study was *Escherichia coli* (60%). Our report is in support of other findings where *Escherichia coli* was reported as major uropathogen [26,27,28,38].

However, our finding is contrary to Akinola *et al*, [25] where *Staphylococcus aureus* was reported as the commonest isolate in ASB in antenatal patient. Other isolated uropathogen in this study were *Staphylococcus aureus* (28.3%), *Klebsiella pneumoniae* (1.0%), *Pseudomonas aeruginosa* (1.7%), *Proteus mirabilis* (0.3%), *Serratia marcescens* (0.7%), and *Candida albicans* (8.0%).

Stamey and Sexton [39], stated that bacteria uropathogen are likely to originate from gastrointestinal tract and ascend via faecal-urethral route.

The antibiotics susceptibility showed that *Escherichia coli* exhibited (61.4%) and (51.5%) susceptible to Nitrofurantoin and Gentamycin respectively. In contrast *Escherichia coli* showed (70.9%) and (64.9%) resistant rate to Streptomycin and Ceftriazone respectively and least susceptible to Ampicilin (2.8%), Cefuroxime (14%) and Cotrimoxazole (15.8%).

Also, it was observed that Nitrofurantoin and Gentamycin were susceptible to most of the uropathogens isolated. This report is similar to Akinola *et al*, [25] who reported susceptibility rate of Nitrofurantoin (100%) and Gentamycin (50%) against *Escherichia coli* in ASB among antenatal patient, Igwegbe *et al*, [32] reported Nitrofurantoin (100%) and Gentamycin (73.3%) and Turpin *et al*, [40] in Ghana.

Gupta and Stamm, [41] stated that Nitrofurantoin is relatively safe in pregnancy and effective against most UTIs, but may cause haemolysis in glucose-6-phosphate dehydrogenase deficient infant if used close to term.

Shanson *et al*, [42] says Gentamycin is effective in treating asymptomatic bacteriuria in pregnant women but

known to be nephrotoxic and reported resistance rate of Gentamycin in urinary isolates to be (2%). This is contrary to the finding of Kalantar enayat *et al*, [26] who reported Cefotaxime, Ciprofloxacin and Cefotizoxime as drug of choice in UTI.

Some isolates were moderately susceptible to Augmentin, Azythromycin, Ceftriazone and Nalidixic acid.

However, Ampicilin, Cefuroxime and Cotrimoxazole were poorly susceptible to the tested isolates. This report is similar to the study carried out in (1996) at Seychelles Victoria hospital where *Escherichia coli* isolated from urine samples was (78.6%) resistance to Ampicilin [43].

Also, Mezue *et al*, [44] at university of Nigeria found Cotrimoxazole to be virtually useless against uropathogen. The emergence of antimicrobial resistance is primarily due to excessive and often unnecessary use of antibiotics in human and animals. [45,46,47]. It is established in African population that self medication with antibiotics led to drug resistance [48,49].

## 5. Conclusion

The high incidence of urinary tract infection of 46.1% uropathogen in this study is of public concern. The predominant uropathogen was *Escherichia coli* and was susceptible to Nitrofurantoin and Gentamycin.

It was observed in this locality that Nitrofurantoin and Gentamycin were drugs of choice.

Authors therefore recommended that routine microbiological analysis and antibiotic susceptibility test of mid-stream urine samples of pregnant women should be carried out so as to enhance in the administration of drugs for the treatment and management of UTIs.

Also, there should be public education programmes on the importance of proper personal hygiene and good environmental sanitation habits mostly during pregnancy; periodic screening should also be carried out on pregnant women at the antenatal clinics for symptomatic or asymptomatic UTIs.

## Conflict of Interest

No conflict of interest.

## References

- [1] Ebie MY, Kandakai-Olukemi YT, Ayanbadejo J, Tanyigna KB; Urinary Tract Infections in a Nigerian Military Hospital. *Niger. J. Microbiol.* 15(1): 31-37, 2001.
- [2] Omonigho SE, Obasi EE, Akukalia RN; *In vitro* Resistance of Urinary Isolates of *Escherichia coli* and *Klebsiella* species to Nalidixic Acid. *Niger. J. Microbiol.*, 15(1):25-29, 2001.
- [3] Gupta K, Sahm DF, Mayfield D, Stamm WE : Antimicrobial resistance among uropathogens that cause community-acquired urinary tract infections in women: a nationwide analysis. *Clin Infect Dis.*; 33: 89-94, 2001.
- [4] Al-Dujaii AA: Urinary tract infection during pregnancy in Tikrit. *Med. J. Tikrit*, 6: 220-4, 2000.
- [5] Kass E.H and M. Finland; "Asymptomatic infections of the urinary tract," *Transactions of the Association of American Physicians*; vol., 69, pp. 56-63, 1956.
- [6] Sobel J.D and D. Kaye, "Host factors in the pathogenesis of urinary tract infections," *American Journal of Medicine*, vol. 76, no. 5, pp. 122-130, 1984.

- [7] Stamey T.A, "The role of introital enterobacteria in recurrent urinary infections," *Journal of Urology*; vol. 109, no. 3, pp. 467-472, 1973.
- [8] Hinman F. Jr., "Bacterial elimination," *Journal of Urology* ; vol. 99, no. 6, pp. 811-825, 1968.
- [9] Nicolle LE; Asymptomatic Bacteriuria: When to Screen and When to Treat. *Infect. Dis. Clin. North Am*; 17 (2): 367-94, 2003.
- [10] Kunin C.M; Urinary tract infections in females. *Clinic. J. Infec. Dis*. 18:1-12, 1994.
- [11] Patton JP, Nash DB, Abrutyn E; Urinary tract infection: economic considerations. *Med. Clin. North Am.*; 75: 495-513, 1991.
- [12] Aiyegoro OA, Igbinsola OO, Ogunmwoyi IN, Odjadjare EE, Igbinsola OE, Okoh AI; Incidence of urinary tract infections (UTI) among children and adolescents in Ile-Ife, Nigeria. *Afr. J. Microbiol. Res.*;pp. 013-019, 2007.
- [13] Weatherall DJ, Ledingham JGG, Warrel DH; *Oxford textbook of medicine 4<sup>th</sup> edition*, Heinemann, London; 1988: 1(11): 45-11-46.
- [14] Duerden BI, Reid TMS, Jewsbury JM, Turk DC; A New Short book of Medical Parasitic Infection. *ELBS Publishers* 1990; pp. 576-581.
- [15] Ebie MY, Kandakai-Olukemi YT, Ayanbadejo J, Tanyigna KB; Urinary Tract Infections in a Nigerian Military Hospital. *Nig. J. Microbiol.*; 15 (1): 31-37, 2001.
- [16] Asscher AW; Urinary Tract Infection. *J. Royal College of Physician of London*; 15(4): 236, 1981.
- [17] Obiogbolu CH; Incidence of Urinary Tract Infection amongst Pregnant women within Akwa Metropolis. A B.Sc. Project in the Department of Applied Microbiology and Brewing, Nnamdi Azikwe University, Awka, Anambra State, Nigeria., p. 55, 2004.
- [18] Azubuike JC, Nkeaniginieme KEO; *Paediatrics and Applied Health in Nigeria* pp. 236-239, 1999.
- [19] Davidson S, Edwards CRW, Bouchier IAO; Principles and practice of medicine. *Up Cambridge*; pp. 654-661, 1989.
- [20] Kiningham RB; Asymptomatic bacteriuria in pregnancy. *Am Fam Physician*; 47: 1232-8, 1993.
- [21] Morgan MG and McKenzie H; Controversies in the Laboratory Diagnosis of Community Acquired Urinary Tract Infection. *Eur. J. Clin. Microbiol. Info. Dis.*; 12(7): 491-504, 1993.
- [22] Cheesbrough M; Medical laboratories manual for tropical countries 2: 2002; p. 479.
- [23] Omer EI, Fadil E; Principles of Medical Microbiology. University Students Library, *Makkah Al Mukarramah ed.*1986, p. 926.
- [24] Okonko I.O, Ijandipe L.A, Ilusanya AO, Donbraye-Emmanuel OB, Ejembi J, Udeze AO, Egun OC, Fowotade A, Nkang AO; Incidence of urinary tract infection (UTI) among pregnant women in Ibadan, South-Western Nigeria. *Afr J Biotechnol*, 8: 6649-6652, 2009.
- [25] Akinola B.Ajayi, Charles Nwabuisi, Abiodun P. Aboyeji, Nanji S.Ajayi, Adeola Fowotade, Olurotimi O. Fakeye; Asymptomatic Bacteriuria in Antenatal Patients in Ilorin, Nigeria. *Oman Medical Journal*; Vol.(27), No. 1:31-35, 2012.
- [26] Kalantar Enayat, Farhadifar Fariba, Nikkho Bahram; Asymptomatic Bacteriuria among Pregnant Women Referred to Outpatient Clinics in Sanandaj, Iran. *International Braz J Urol.*;Vol. 34 (6): 699-707, 2008.
- [27] Agersew Alemu, Feleke Moges, Yitayal Shiferaw, Ketema Tafess, Afework Kassu, Belay Anagaw and Abebe Agegn; Bacterial profile and drug susceptibility pattern of urinary tract infection in Pregnant women at University of Gondar Teaching Hospital, Northwest Ethiopia. *BMC Research Notes*, 2012; 5: 197.
- [28] Sevkic Celen, Ayla Sargin Oruc., Rana Karayalcin, Sibel Saygan, Serpil Unlu, Belgin Polat and Nuri Danis, man; Asymptomatic Bacteriuria and Antibacterial Susceptibility Patterns in an Obstetric Population. *ISRN Obstetrics and Gynecology* 2011; Vol. 2011, Article ID 721872, 4 pages.
- [29] Masinde A, Gumodoka B, Kilonzo A, Mshana SE; Prevalence of urinary tract infection among pregnant women at Bugando Medical Centre, Mwanza, Tanzania. *Tanzan J Health Res*, 11: 154-159, 2009.
- [30] Jellheden B, Norrby RS, Sandberg T; Symptomatic Urinary Tract Infection in Women in Primary Health Care. *Bacteriological, Clinical and Diagnostic Aspect in Relation to Host Response to Infection (Comment)*. *Scand. J. Pri. Health Care*; 14 (2): 122-128, 1996.
- [31] Akerele J, Abbulimen P, Okonofua F; Prevalence of asymptomatic bacteriuria among pregnant women in Benin City, Nigeria. *J Obstet Gynaecol.*; 21(2):141-144, 2001.
- [32] A. O. Igwegbe, J. O. Ugboaja and O.A. Okoli; Prevalence of asymptomatic bacteriuria among pregnant women in Nnewi, southeast Nigeria. *Int. J. Biol. Chem. Sci.*; 6(1): 88-98, 2001.
- [33] Obiogbolu CH; Incidence of Urinary Tract Infection amongst Pregnant women within Akwa Metropolis. A B.Sc. Project in the Department of Applied Microbiology and Brewing, Nnamdi Azikwe University, Awka, Anambra State, Nigeria 2004; p. 55.
- [34] Andriole VT; The role of Tamm-Horsfall protein in the pathogenesis of reflux nephropathy and chronic pyelonephritis. *Yale J. Biol. Med.*; 58: 91-100, 1985.
- [35] Ebie MY, Kandakai-Olukemi YT, Ayanbadejo J, Tanyigna KB; Urinary Tract Infections in a Nigerian Military Hospital. *Niger. J. Microbiol.* 2001;15(1): 31-37, 2001.
- [36] Adeyeba OA, Adekoya JA, Lowed AO, Adesiji YO; Urinary Tract Infections amongst Patients attending Sexually Transmitted Disease Clinic in Ibadan, Nigeria. *J. Sci. Eng.*; 9 (4): 4552-4560, 2002.
- [37] C. H. Obiogbolu, I. O. Okonko, C. O. Anyamere, A. O. Adedeji, A. O. Akanbi, A. A. Ogun, J. Ejembi And T. O. C. Faleye; Incidence of Urinary Tract Infections (UTIs) among pregnant women in Akwa metropolis, Southeastern Nigeria. *Scientific Research and Essay*; Vol. 4 (8) pp. 820-824, 2009.
- [38] Okonko IO, Ijandipe LA, Ilusanya AO, Donbraye-Emmanuel OB, Ejembi J, Udeze AO, Egun OC, Fowotade A, Nkang AO; Incidence of urinary tract infection (UTI) among pregnant women in Ibadan, South-Western Nigeria. *Afr J Biotechnol*, 8: 6649-6652, 2009.
- [39] Stamey, T.A. and C.C. Sexton; The role of vaginal colonization with enterobacteriaceae in Urinary tract infection. *J. Urol.*; 131: 214-217, 1975.
- [40] C.A. Turpin, Bridget Minkah, K.A. Danso and E.H. Frimpong; Asymptomatic Bacteriuria in Pregnant Women attending Antenatal Clinic At Komfo Anokye Teaching Hospital, Kumasi, Ghana. *Ghana Medical Journal*; Vol. 41, Number 1, 2007.
- [41] Gupta K and Stamm W.E; Pathogenesis and management of recurrent urinary tract infections in women. *World J Urol*; 17: 415, 1999.
- [42] Shanson D.C; Infection of the urinary tract. In: *Microbiology in clinical practice*, 2<sup>nd</sup> ed. Butterworth, London; 1989; P.430-450.
- [43] Hajamis, S; Suspected urinary tract infection: identification of micro-organisms and sensitivity to antibiotics in Seychelles. *SMDJ*; pp: 3, 1996.
- [44] Mezue K, Ofong C, Nmezi D, Ugochukwu-Obi G; Antibiotic Sensitivity patterns in urinary tract infections at a Tertiary Hospital. *Journal of the University Of Nigeria Medical students*, 2006. Available on [http:// www.1990unecmedclass.com](http://www.1990unecmedclass.com). Extracted on 12/12/2007.
- [45] Rao, G.G; Risk factors for the spread of antibiotic-resistant bacteria. *Drugs. (PubMed)*; 55(3):323-330, 1998.
- [46] Okeke, I.N., R. Laxminarayan, Z.A. Bhutta, A.G. Duse, P. Jenkins, T.F. O'Brien, M.A. Pablos and K.P. Klugman; Antimicrobial resistance in developing countries: Recent trends and current status. *Lancet Infect Dis*; 5: 481-493, 2005.
- [47] Eggleston, K., Z. Ruifang and J. Richard; The Global Challenge of Antimicrobial Resistance: Insights from Economic Analysis. *Int. J. Environ. Res. Public Health*; 7: 3141-3149, 2010.
- [48] Olayemi, O., B. Olayinka and A. Musa; Evaluation of Antibiotic Self-Medication Pattern amongst Undergraduate Students of Ahmadu Bello University (Main Campus), Zaria. *Research Journal of Applied Sciences Engineering and Bacterial Technology*; 2(1): 35-38, 2010.
- [49] Abdelmoneim A, E Idris and M.Lloyd; Self- medication with Antibiotics and Antimalarials in the Community of Khartoum State, Sudan. *J. Pharm Pharmaceut Sci.*; 8(2): 326-33, 2005.