

Full Length Research Paper

Urinary tract infection amongst pregnant women in Amassoma, Southern Nigeria

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Urinary tract infection (UTI) is one of the most frequently seen medical complications in pregnancy. UTI in pregnancy poses risk of complications such as premature birth, low birth weight, still birth and pyelonephritis. A prospective study was undertaken to determine the prevalence of urinary tract infection among pregnant women attending antenatal clinic in Amassoma and to identify the bacteria involved. A total of 138 urine samples were analyzed and cultured by the standard loop technique on cystein lactose electrolyte deficient (CLED) medium, MacConkey and blood agar. A prevalence rate of 25.3% was observed in this study and the relationship between age and bacteriuria was non-significant ($P>0.05$), which signifies that bacteriuria is independent on age, while the relationship between bacteriuria and trimester was statistically significant as $P<0.05$. *Escherichia coli* (40%) was the most common bacteria isolated followed by *Pseudomonas aeruginosa* (22.9%). Screening of pregnant women for bacteriuria during every antenatal visit should be considered an essential care in the community to avoid complications in pregnancy at an early stage.

Key words: Complication, pregnancy, prevalence, screening, UTI.

INTRODUCTION

Urinary tract infections (UTI) is an infection caused by the presence and growth of microorganisms in the urinary tract, it is perhaps the single commonest bacterial infections of mankind and in pregnancy. It is the second most common clinical indication for empirical antimicrobial treatment in primary and secondary care (McKenzie et al., 1994). The urinary tract includes the organs that collect and store urine and release it from the body such as the kidneys, ureters, bladder and urethra. UTI has

been reported among 20% of the pregnant women and it is the most common cause of admission in obstetrical wards (Bacak et al., 2005). Anatomically, UTI can be classified into lower urinary tract infection involving the bladder and urethra and upper urinary tract infection involving the kidney, pelvis and ureter. The pathogenesis of urinary tract infection involves ascending infection with coliform bacteria colonizing the perineum in susceptible women. Bacteria incriminated in UTI include *Escherichia*

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coli, *Staphylococcus saprophyticus* with the remainder caused by *Proteus* and other Gram negative rods (Zalmanovici et al., 2010). The prevalence and degree of occurrence of one or two of these organisms over others are dependent on the environment, while not generally considered a cause of significant mortality, UTI do represent an important cause of morbidity (Hill et al., 2001).

Typical symptoms associated with UTI include the triad of dysuria (painful urination), urgency (the enhanced desire to void the bladder) and frequency (increased frequency of urination). While not thought to cause significant mortality, if left untreated or undertreated, UTI have the potential for serious and life-threatening sequelae. This is more likely to be the case where access to or availability of timely and appropriate medical intervention is limited due to inadequate numbers of health care providers. Possible sequelae include pyelonephritis which can lead to renal scarring and sepsis (Minassian et al., 2013). UTI can be particularly dangerous in pregnant women in whom it has been shown that up to 50% of those with asymptomatic bacteriuria go on to develop pyelonephritis and these women experience higher rates of intrauterine growth restriction and low birth-weight infants (Delzell 2000). The presence of a UTI has also been shown to increase the risk of preterm labor, preterm birth, pregnancy-induced hypertension, preeclampsia, amnionitis and anemia (Mazor-Dray et al., 2009).

Bacteriuria often develops in the first month of pregnancy and is frequently associated with a reduction in concentrating ability, suggesting involvement of the kidney (Sahay 2012). The smooth muscle relaxation and subsequent ureteral dilatation that accompany pregnancy are thought to facilitate the ascent of bacteria from the bladder to the kidney. As a result, bacteriuria during pregnancy has a greater propensity to progress to pyelonephritis (up to 40%) than in non pregnant women (Kovavisarach et al., 2009).

UTIs can cause uterine contractions if left untreated, preterm labor and possibly premature delivery can occur. An infection caused by group B streptococcus may cause spontaneous premature rupture of membranes; group B causes around 5% of all UTIs in pregnancy. A woman may not have any symptoms of a UTI even if she has bacteria in the urine and so may not seek medical treatment until contractions begin (Duarte et al., 2008).

Although, asymptomatic bacteriuria can cause fetal complications; fetuses whose mothers have untreated or undiagnosed urinary tract infections are more likely to have low birth weights and intrauterine growth retardation, which means they are smaller than most babies of the same gestational age. Babies may also develop pneumonia or group B streptococcal (GBS) infection right after birth if the urine contains GBS (Major-Dray et al., 2009). The incidence of hypertensive

disorders such as pregnancy-induced hypertension rises in pregnant women with urinary tract infections, but which is the cause and which the effect is not clear (Hill et al., 2005).

Considering the risk factors associated with urinary tract infection in pregnancy, screening for urinary tract infection should be considered as a compulsory test for every antenatal visit. Studies on the prevalence of UTIs among pregnant women have been studied in other parts of Nigeria (Onuoha et al., 2013; Akinloye et al., 2006, Okonko et al., 2009). However no data is available from this part of the country hence the main objective of the study to determine the prevalence of urinary tract infection among pregnant women in Amassoma, Bayelsa state and such data will be useful for the Health Ministry in policy formulation.

MATERIALS AND METHODS

Study area

The study was carried out in Amassoma, an Ijaw speaking community in Southern Ijaw Local Government Area of Bayelsa state in the Niger Delta Area of Nigeria. Amassoma is one of the largest communities in Southern Ijaw LGA. It is surrounded by water and creeks. It comprises of both non indigenes and indigenes. Amassoma is a home to people from different area, because of the State University which is located in the town.

Study population

Pregnant women of all ages living and attending antenatal clinic in the Amassoma General Hospital and Southern Ijaw Health centre were recruited into the study between the months of August to September 2013. The sample size was determined using the statistical formulae $n = t^2 \times p (1-p)/m^2$ as described by Magnani (1997).

Ethical approval

Ethical approval was obtained from the Administrators of the General Hospital and Health Centre and also individual consent obtained from each pregnant woman who were assured of anonymity and confidentiality.

Sample collection

Subjects were instructed on how to obtain a clean catch mid-stream urine samples in the morning into a sterile universal container and a total of 138 urine samples were collected from the pregnant women. Information on maternal age and gestational age was obtained by oral interview with each participant.

Sample processing

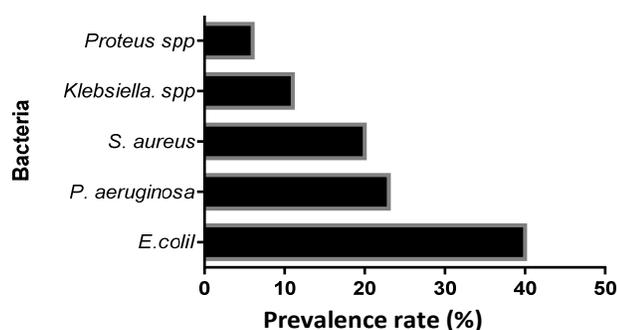
Samples were processed as described by McNeely (1990) and Cheesbrough (2006), several fields were searched to identify and count the number of white cells, red cells, bacteria, yeasts cells,

Table 1. Age distribution of pregnant women with bacteriuria.

Age (years)	Total no of samples	Cases with bacteriuria N (%)	Cases without bacteriuria N (%)	X ²	P value
14 - 18	20	4 (20.0)	16 (80)	5.116	0.276
19 - 23	29	7 (24.0)	22 (75.9)		
24 - 28	49	13 (26.5)	36 (73.5)		
29 - 33	25	4 (16.0)	21 (84.0)		
34 & above	15	7 (46.7)	8 (53.3)		
TOTAL	138	35(25.3)	103 (74.6)		

Table 2. Distribution of bacteriuria according to gestational age.

Trimester	Total no. of samples	Cases with bacteriuria N (%)	Cases without bacteriuria N (%)	X ²	P value
First	12	1 (8.3)	11 (91.7)	17.10	0.0002
Second	46	11 (23.9)	35 (76.1)		
Third	80	23 (30)	57 (70)		
Total	138	35 (25.3)	103 (74.6)		

**Figure 1.** Distribution of bacteria isolated from urine culture among the women.

crystals, casts and *Trichomonas vaginalis*. More than 3 - 5 white blood cells (WBC) per high power field were considered as significant. The urine samples were cultured using standard loop technique on blood agar, CLED agar and MacConkey agar. Plates were then incubated for at 24 h at 37°C.

Statistical analysis

Statistical analysis was performed with the Graphpad Prism version 6.01 (Graphpad software, San DIEGO, CA). Differences between groups were determined with the Chi square with the level of significance set at $p < 0.05$.

RESULTS AND DISCUSSION

Table 1 shows the prevalence rate of 25.3% and also bacteriuria according to the maternal age range. Women within the age range 24-28 years were more infected but

was not statistically significant as $p > 0.05$. Table 2 shows pregnant women in their third trimester were more infected than those in other trimester which was statistically significant. *Escherichia coli* (40%) was the most common bacteria isolated followed by *Pseudomonas aeruginosa* (20%). The distribution is shown in Figure 1.

Urinary tract infection is considered to be the most common bacterial infection and the second most common infectious disease in women after gastrointestinal disorders. According to the National Ambulatory medical care survey and National Hospital Ambulatory medical care survey, UTI accounted for nearly 7 million office visits and 1 million emergency department visits, resulting in 100,000 hospitalizations. This situation is further complicated by the fact that accurate diagnosis depends on both the presence of symptoms and a positive urine culture, although in most outpatient setting this diagnosis is made without the benefit of culture (Salvatore, 2011).

UTI occurs in every age and in every gender. It is however more frequent in women and pregnancy increases the risk of UTI in women. The high incidence of UTI in pregnant women is as result of some physiological and hormonal changes observed during pregnancy. At 6th week of pregnancy, the ureter begins to dilate and it continues until delivery. Increased progesterone and estrogens levels normally leads to decreased ureteral and bladder tone. Increased plasma volume during pregnancy leads to decrease urine concentration and increase bladder volume. The combination of these factors leads to urinary stasis and uretero-vesical reflux (Delzell and Lefevre, 2000).

A prevalence of 25.3% was observed in this study which is similar to that of Akinloye et al. (2006) in Ibadan who

reported a prevalence of 21.7% but relatively lower than the study of Onuh et al. (2006) in Benin with a 32.7% prevalence rate and Okonko et al. (2009) with a prevalence rate of 45.7% in Ibadan. However, it is higher than the study in Abakaliki by Onyemelukwe et al. (2003) who reported a prevalence of 12.7% and 14.6% prevalence in Tanzania by Masinde et al., 2009. In other parts of the world, 8.5% by Sevki et al. (2011), 10.4% by Agersew et al. (2012) and 10.4% by Nawaz et al. (2012).

This prevalence reported in this study may be as a result of the socio economic status of the group of women, which has been shown to be strong predictors of a range of physical and mental health problems (Andriole, 1985). Such factors as poor housing, poor drainage systems, lack of proper personal and environmental hygiene, genuine population susceptibility; since it is that factors such as low socio-economic status, sexual intercourse and pregnancy among others are common among Nigerian women (Andriole, 1985; Akinyemi et al., 1997; Kolawole et al., 2009). It could also be due to variation in the environment, social habits of the community and their standard personal hygiene. Contaminated drinking water likely fosters a dangerous combination of dehydration and diarrheal illness. As the well accepted mechanism of UTI involves coliform bacteria from the host being transferred to a susceptible urethra, it would be reasonable to assume higher UTI rates where diarrheal illness is common and sanitation is poor (Omonigho et al., 2001). In addition to these environmental factors, lack of education regarding personal hygiene such as wiping from front to back is also likely to contribute to high UTI prevalence.

The most common uropathogen isolated from the urine of infected subjects of this study was *E. coli*, which constituted 40% of the bacteria isolated, this is in agreement with the findings of Sheiner et al. (2009), who found that, *E. coli* represents 80.0% of bacterial isolates in bacteriuria, also consistent with the study at UCH Ibadan 2006 (Rahman et al., 1990; Ahmed et al., 1996; Okonko et al., 2009; Mausbau et al., 2013). This could be due to the fact that uropathogenic *E. coli* express a multitude of virulence factors to break the inertia of the mucosal barrier, and can persist within the urinary tract serving as a reservoir for recurrent infections and serious complications. It was also postulated by Nowicki et al. (2011) tissue receptors CD55 also called DAF, upregulated by progesterone, a hormone that increases with gestational age. Paradoxically, *E. coli* which recognises CD55 may gain an advantage in the colonization and/or invasion of tissues, a process that is directly proportional to CD55 receptor density (Norwicki, 2002). This was followed by *P. aeruginosa* (22.9%), *Staphylococcus aureus* (20%), *Klebsiella* spp. (11.4%), *Proteus* spp. (5.7%). The second most common pathogen in this study was *P. aeruginosa* unlike other studies that showed that *Staphylococcus* was the second most prevalent bacteria

causing bacteriuria, such as that of Ahmed et al. (1999), Anayet et al. (2007) and Nawaz et al. (2012). This variation shows that etiologic pattern of urinary tract infection with respect to bacteria pathogens is not similar worldwide.

In relation to maternal age, it was observed that the incidence of bacteria was highest in the age group 34 and above (46.7%). Though it was not statistically significant, the reason could be due to the fact that many women within this age group are likely to have many children and it has been reported that multiparity is a risk factor for acquiring bacteriuria in pregnancy (Sharma, 2009). Also, nearly 1 in 3 women usually have at least 1 episode of UTI requiring antimicrobial therapy by the age of 24 years and almost half of all women will experience one UTI during their life time and in non institutional elderly populations, UTIs are the second most common form of infection, accounting for nearly 25% of all infections and occur most frequently between the ages of 16 and 35 years, with 10% of women getting an infection yearly and 60% having an infection at some point in their lives (Nicolle, 2008). Recurrences are common, with nearly half of people getting a second infection within a year. Risk factors include female anatomy, sexual intercourse and family history (Smaill 2007).

In this study, the frequency of urinary tract infection was higher in the third trimester compared to the first and second trimester. This is in agreement with Leigh and Sharma (2009) who reported an increased frequency of urinary tract infection in the third trimester compared to the first and second trimester of pregnancy and was also in agreement with the study by Okonko et al. (2009) who also reported a high incidence of UTI in pregnant women in their third trimester. This may be as a result of the pressure effect of a bigger uterus on the ureter at the third trimester, also the increasing smooth muscle relaxing effect of pregnancy hormones and the pressure on the bladder from the descending presenting part may lead to stasis of urine, which will encourage bacteria multiplication.

However, this report does not agree with Onuh et al. (2006), who reported a higher prevalence of urinary tract infection in the second trimester compared to the third trimester. This difference may be as a result of either change in urinary stasis and vesico ureteral reflux or decrease in urinary progesterones and oestrogens in the various trimester of pregnancy. Also, the relationship between trimester and bacteriuria in this study is significant as P is less than 0.05. The high incidence rate of 25.3% reported in this study should be of great concern, as not only do UTI pose a threat to the health of pregnant women and their fetus, but they also impose an economic and social burden due to the stigma associated with these infections. The findings of this study also reveal that the important infecting organisms were found to be the commensals of perianal and vaginal regions. This calls for increase in personal hygiene (Kolawole et al.,

2009). This study has highlighted the need to raise awareness of UTIs and to expand services for prevention and treatment for pregnant women. To do this effectively, however, it may be necessary to improve the quality of health care provided at the community level. Since UTI may be symptomatic and asymptomatic in most cases, it is therefore suggested that routine screening of patients with unexplained sources of fever be done for UTI and the appropriate antimicrobials administered after sensitivity tests have been carried out in order to prevent the cases becoming symptomatic later with resultant renal damage.

Conflict of interests

The authors did not declare any conflict of interest.

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