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Full Length Research Paper

Prevalence of asymptomatic bacteriuria during pregnancy in Adama city, Ethiopia

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Asymptomatic bacteriuria (ASB) during pregnancy is the primary cause of acute pyelonephritis, preterm labor, low birth weight fetus, etc., if left untreated. Adequate and early treatment reduces the prevalence of these obstetric complications. This study aimed to determine the prevalence of ASB during pregnancy and to detect the effective antimicrobial regimen. A total number of 367 pregnant women were included in the present study for a period ranging from September 2014 to May 2015. Out of the 367 patients studied, ASB was observed in 59 patients (16.1%), while UTI was recorded in 98 patients (26.6%). Maternal age, parity and gestational age did not significantly affect the prevalence of mixed infection (P>0.05). The highest rate of ASB was reported in the age group of 30-35 years and the lowest was in the age group of 15 - 20 years. *Esherichia coli* was detected as the predominant etiological agent (37.3%), while *Pseudomonas aeruginosa* was the least detected (10.2%). Similarly, higher mixed infection rates were shown in the age group of >35 years. Quinolones were the most active antibacterial agent observed in this study. though ASB is not infrequent in antenatal patients. The high prevalence warrants that all pregnant women should be screened by urine culture to detect asymptomatic bacteriuria at their first visit to prevent overt urinary tract infections (UTI) and other complications in both mother and fetus.

Key words: Asymptomatic bacteriuria, incidence, pregnancy, urinary tract infections, antimicrobials.

INTRODUCTION

"Asymptomatic bacteriuria" (ASB) or asymptomatic urinary infection, is isolation of a specified quantitative count of bacteria in an appropriately collected urine specimen obtained from a person without symptoms or signs referable to urinary infection. Asymptomatic bacteriuria in pregnancy is defined as the presence of ≥ 1,00,000 organisms per milliliter (ml) of urine taken from a clean catch mid-stream urine specimen with no symptoms referable to the genito-urinary tract (Gilbert and Macones, 2013). However ASB often is the primary cause of complications such as pyelonephritis, preterm labor, low birth weight fetus, maternal sepsis, anemia and prenatal death.

Even without progression to pyelonephritis, bladder infection during pregnancy is associated with increased risk of maternal hypertension, anemia, amnionitis, and premature labor, as well as preterm birth, and low birth weight (Schnarr and Smaill, 2008). However, in countries with rigorous screening and treatment of bacteriuria in pregnancy, only a small percentage of pregnant women progress to pyelonephritis (Imade et al., 2010).

Urinary Tract Infections (UTI) is the microbial invasion and subsequent multiplication on part or entire urinary tract (Boye et al., 2012). Pregnancy causes numerous changes in the physiology of a woman's system. Various anatomic and physiological changes which include dilatation of the renal pelvis and ureters in as early as the eighth week of pregnancy (Fatima and Ishrath, 2006) and displacement of the bladder itself superiorly and anteriorly are responsible for ASB. Also, smooth muscle relaxation induced by progesterone may also play a role. As a consequence of smooth muscle relaxation,

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peristalsis of theureters are decreased, bladder capacity is increased which in turn lead to urinary stasis (El-Sokaray, 2011). Henceforth, screening and treatment of ASB prerequisite to be incorporated as routine antenatal care for an integrated approach to safe motherhood and newborn health.

Literature on Ethiopian prevalence of ASB was reported to be ranging from 7 to 10.6% (Gebre-Silase, 1998; Emiru et al., 2013; Endale et al., 2014). However, there are little or no reports that are recorded on the prevalence of ASB and antibiogram pattern in Adama. Therefore, the present study aims to determine the prevalence and identify the etiological microbial agents associated with ASB in various trimesters concurrently and its sensitivity to various available antibiotics in antenatal mothers.

MATERIALS AND METHODS

Pregnant women under test

A total number of three hundred and fifty seven pregnant women with or without symptoms of urinary tract infections were included in this study. This prospective study on ASB was carried out in Adama Referral Hospital, Adama from September 2014 until May 2015. Pregnant women having renal diseases, diabetes mellitus, or on prior antibiotic therapy within 72 hours to the study days were excluded due to the fact that the antibiotic must have subdued or destroyed the pathogens. Verbal informed approval was obtained from each woman before the commencement of the study.

Questionnaires

Standard questionnaires were filled in order to obtain socio-demographic data such as age, parity and duration of gestation.

Urine sample

A 'clean-catch mid stream' urine sample was collected in wide-mouthed sterile screw capped containers, after giving proper instructions to women under study.

Specimens analysis

The specimens were analyzed by the following screening methods:

i. Wet mount of urine for cytology: Centrifuged urine deposit was observed for the presence of >10 W.B.Cs per high power field was considered significant. Microscopic examination was done to detect the presence of pus cells, epithelial cells, crystals and yeast like cells, as per standard protocol (Patricia, 2014).
ii. Gram stain: Presence of at least one organism per oil immersion field was considered significant to correlate with significant bacteriuria (>10^5 CFU/ml) (Patricia, 2014).
iii. With a calibrated micro-loop, 0.001 ml of urine was inoculated onto the surface of Blood agar, MacConkey agar and Muller Hinton Agar plates. Upon incubation of the media at 37°C for 24-48 h, colony counts yielding bacterial growth of ≥10^5 / ml was counted as being significant in asymptomatic pregnant women.
iv. The isolates were identified by standard microbiological methods (Patricia, 2014).
v. Antimicrobial susceptibility test was performed using Kirby-Bauer Disc Diffusion test using standard CLSI guideline (2007).

Statistical analyses

Statistical Package for Social Sciences (SPSS) software version 16.0 was used for analyzing the data. Descriptive summaries are presented. P ≤0.05 was considered statistically significant in all the analyses.

RESULTS AND DISCUSSION

Out of 367 samples examined for ASB, significant bacteriuria was observed in 16.1% of the total samples, while UTI was prevalent in 26.6% cases (Figure 1) which is lower than the prevalence rate reported by Endale et al. (2014). Nevertheless, our findings are analogous to the reports of Gebre-Silassie (1998), Masinde et al. (2009) and Hamdan et al. (2011). ASB during pregnancy needs special consideration, due to lack of indication and its adverse consequences in pregnancy (Gilbert and Macones, 2013). An early detection and treatment of ASB may be of considerable importance not only to forestall acute pyelonephritis and chronic renal failure in the mother, but also to reduce the prematurity and fetal mortality in the progeny (Foxman, 2002). The prevalence of asymptomatic bacteriuria observed in our study is radically high compared to those reported in developed countries (Gilbert and Macones, 2013) and this can be attributed to low socio-economic status (Ankur et al., 2015; Oladiende et al., 2015). Varied prevalence of ASB from one country to the other and among the regions of the same country might be ascribed to the difference in risk factors, geographical variations and also the level of health care development.

Parity and gestational age significantly affected the prevalence of urinary tract infection (Table 1). These have been previously reported (Hamdan et al., 2011; Emiru et al., 2013; Oladiende et al., 2015). Pregnant women in the 3rd trimester of current pregnancy and those having more than one child were mostly at risk of acquiring UTI. Several anatomical and hormonal changes in pregnant women lead to urethral dilation and urinary stasis which contribute to increased risk of developing UTI (Alemu et al., 2012). Urinary stasis increases with advancing pregnancy (Assefa et al., 2008). This coupled with bad clean up technique, further complicated by heavily distended belly of pregnant women in the 3rd

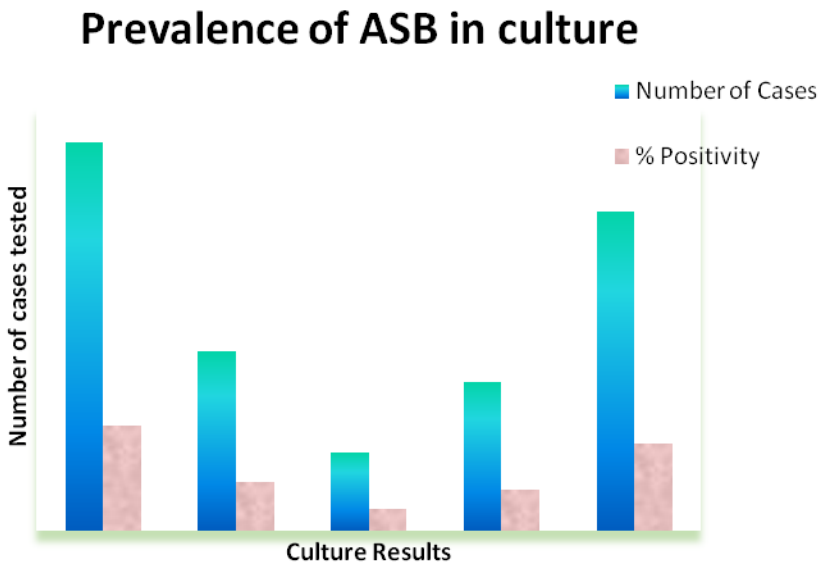

Figure 1. Culture results showing the prevalence of ASB.

Table 1. Prevalence of ASB with respect to parity, gestation period and age.

Characteristics	N	No. and % of infection	No. and % of mixed infection	P	P*
Parity					
Nulliparous	78	9 (15.3)	1 (1.3)		
Primiparous	204	19 (32.2)	9 (4.4)	0.0002	0.2134
Multiparous	85	31 (52.5)	2 (2.4)		
Gestational period					
1st Trimester	94	11 (18.6)	2 (2.1)		
2nd Trimester	162	22 (37.3)	4 (2.5)	0.0004	0.3149
3rd Trimester	111	26 (44.1)	6 (5.4)		
Age					
15-20	26	4 (15.4)	0 (0.0)		
21-25	38	6 (15.8)	1 (2.6)		
26-30	99	18 (18.2)	2 (2.0)	0.015	0.112
30-35	80	16 (20)	3 (3.8)		
36-40	93	8 (8.6)	2 (2.2)		
>40	31	7 (22.6)	7 (21.6)		

N = Number tested (n=367); P = Statistical significance; P* = Statistical significance of mixed infections.

trimester may well explain the high prevalence of urinary tract infection observed among pregnant women in the 3rd trimester of pregnancy (Figure 2). However, there was no definite association between maternal age, parity and gestational age with bacteriuria. Maternal age, parity and gestational age did not significantly affect the prevalence of mixed infection (P>0.05). The highest rate of ASB was reported in the age group of 30-35 years and the lowest was in the age group of 15 - 20 years. Advanced maternal age is found to be associated with increased risk of asymptomatic bacteriuria in pregnancy, as women of this age group are likely to be multiparous which is a risk factor for acquiring asymptomatic bacteriuria in pregnancy (Fathima and Ishrath, 2006). Similarly, higher mixed infection rates were shown in the age group of >35 years. This is consistent with previous findings (Oladiende et al., 2015; Ankur et al., 2015).

The most common isolated organism was *E. coli*

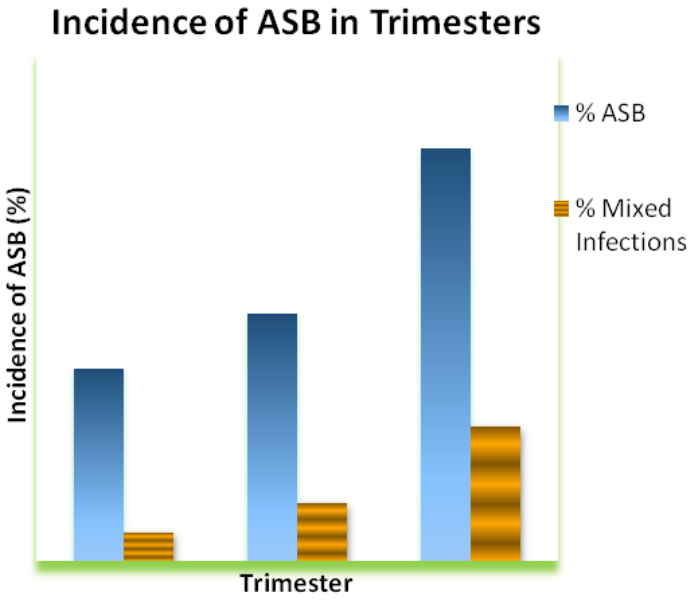

Figure 2. Prevalence of ASB with respect to trimesters.
Note: %ASB is in correspondence to the total number of cases under study (n = 367).

Table 2. Frequency of single and mixed bacterial infections in ASB.

Isolate	Frequency %
Single infection	
Escherichia coli	22 (37.3)
Klebsiella sp	12 (20.3)
Proteus sp	8 (13.6)
P. aeruginosa	6 (10.2)
S. saprophyticus	7 (11.9)
Mixed infection	
E. coli and *S. saprophyticus*	3 (5.1)
Proteus sp and *Candida albicans*	1 (1.7)
Total	59 (100)

(37.3%) followed by *Klebsiella spp* (20.3%), *Proteus mirabilis* (13.6%), whereas the least found bacteria was *P. aeruginosa* (10.2%) (Table 2). Gram negative ASB showed a high variability in terms of period of pregnancy. Overall, 22.6% of positive cases in first trimester, 29% in second and 48.4% in third trimester were due to gram negative organisms. Difference in second and third trimester was statistically significant. This could be attributed to the normal inhabitance of gram negative bacteria in the intestinal tract especially the rectum which is in close proximity to the urethral orifice (Gilbert and Macones, 2013; Vasudevan, 2014). During pregnancy there is increase in levels of amino acids and lactose which particularly encourages *E. coli* growth. It could also be due to infection by fecal contamination due to poor hygiene during pregnancy (Foxman, 2002). *E. coli* is the most common etiologic agent in asymptomatic and symptomatic bacteriuria of pregnancy (Imade, 2010; Jalali et al., 2014; Oladiende et al., 2015). The findings of the present study is consistent with previous findings. This shows that the etiologic pattern of ASB with respect to bacterial pathogens is apparently similar universally.

The results of this study proved that quinolones were the most active antibacterial agent (Table 3). However, these antibiotics have limited use in pregnancy. Moderate activity against bacterial isolates was observed with Gentimycin, and Amoxicillin-cluvanate, while there is very poor sensitivity of the isolated bacterial pathogens to Nitrofurantoin, Tetracycline, Chloramphenicol and Sulphamethoxazole-Trimetoprim. Prescription of antibiotics without laboratory guidance as well as over-the-counter sales of antibiotics without prescription is also a probable factor for increased bacterial resistance to antimicrobial agents in the country.

In conclusion, ASB was observed to be 16% in the present study undertaken. Women with ASB may have serious consequences on both mother and fetus. Therefore, it is important to screen all antenatal women for asymptomatic bacteriuria at their first prenatal visit, preferably in first trimester, and those who are positive should be followed up closely after treatment because about one-third will experience a recurrence (Imade et al., 2010). All the sequelae of ASB during pregnancy could be reduced by antimicrobial treatment early in pregnancy. It is time that we have a look at this strategy

Table 3. Antibiotic Susceptibility pattern of the bacterial isolates.

Bacterial pathogens	Frequency of strains sensitive to antibiotics %										
	Nor	**Cip**	**Pef**	**Ofl**	**Aug**	**CoT**	**Nft**	**Cef**	**Tet**	**Chl**	**Gen**
Escherichia coli (25)	25 (100)	25 (100)	25 (100)	25 (100)	12 (48)	7 (28)	15 (60)	23 (92)	19 (76)	14 (56)	21 (84)
Klebsiella sp (12)	12 (100)	12 (100)	10 (83)	12 (100)	6 (50)	7 (58)	9 (75)	11 (92)	10 (83)	8 (67)	9 (75)
Proteus sp (9)	9 (100)	9 (100)	9 (100)	9 (100)	0 (0)	8 (89)	7 (77)	9 (100)	4 (44)	5 (55)	2 (22)
P. aeruginosa (6)	6 (100)	6 (100)	5 (83)	6 (100)	0 (0)	5 (83)	0 (0)	4 (67)	0 (0)	1 (16)	0 (0)
Staph. saprophyticus (10)	10 (100)	10 (100)	9 (90)	10 (100)	10 (100)	10 (100)	0 (0)	10 (100)	0 (0)	8 (80)	8 (80)
Candida albicans (1)	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)
Total (63)	63 (100)	63 (100)	59 (94)	63 (100)	29 (46)	37 (59)	31 (49)	58 (92)	33 (52)	36 (57)	40 (64)

Nor - Norfloxacin; Cip - Ciprofloxacin; Pef - Pefloxacin; Ofl - Ofloxacin; Aug - Augmentin; CoT - Sulphamethoxazole-Trimetoprim; Nft - Nitrofuratoin; Cef - Cefotaxime; Tet - Tetracycline; Chl - Chloramphenicol; Gen - Gentamicin.

for improving the healthcare and for reducing the maternal and fetal morbidity and mortality (Demilie et al; 2012).

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